Ethiopian Electric Power
Federal Democratic Republic of Ethiopia

PREPARATORY SURVEY REPORT FOR THE PROJECT FOR GEOTHERMAL WELLHEAD POWER SYSTEM IN FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

JUNE 2017

JAPAN INTERNATIONAL COOPERATION AGENCY
（JICA）

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Summary

SUMMARY

1. Background of the Project

In the Federal Democratic Republic of Ethiopia (hereinafter referred to as "Ethiopia"), more than 90 percent of the total generated electric power (e.g. 10,464 GWh in 2015/2016)[1] is annually produced by hydroelectric power generation. However, the hydroelectric power supply becomes unstable during the dry season. Furthermore, the gap in supply and demand between the existing facility capacity in 2016 and the peak load prediction for 2020 is expected to be approximately 4,800 MW. Electricity access rate is 23.3% (e.g. the average access rate in Sub-Saharan Africa is approximately 43%). Stable power supply is one of the main issues in Ethiopia's Second Growth and Transformation Plan (hereinafter referred to as "GTP2"). As an alternative base load power supply to hydroelectric power, the potential amount of geothermal resources in Ethiopia is expected to be around 5,000 MW (GTP2). Geothermal power development is expected to contribute to improving both the quality and quantity of Ethiopia's power supply. According to the domestic electric power development plan (2013 - 2037), by 2037 geothermal power generation of 5,000 MW by 50 units of generation facilities is planned. On the other hand, currently both Ethiopian Electric Power (hereinafter referred to as "EEP") and Geological Survey of Ethiopia (hereinafter referred to as "GSE") lack experience in geothermal power development. There are currently no geothermal power plants in operation in Ethiopia.

Aluto Langano area (located approximately 200 km to the south of Addis Ababa) is one of the most promising areas for commercialization of geothermal power generation. In 2010 – 2016, The Japanese government assisted in the production of two (2) exploration wells (LA-9D and LA-10D) using the Program Grant Aid for Environment and Climate Change. The Ethiopian government has also started procuring drilling rigs for the World Bank (hereinafter referred to as "WB") supported project to drill production and reinjection wells. Including the successfully completed exploration wells of LA-9D and LA-10D by Japan, continuous drilling of production wells is planned for the large-scale geothermal power generation project in Aluto Langano area. However, there is concern that the existing wells might be left idle until the power plant is commissioned, because a considerable amount of time is necessary to drill the production wells, then to confirm the expected steam quantity, and then to construct the plant.

In this project, by installing a geothermal wellhead power system which uses these existing wells (LA-9D and LA-10D), it will enable early generation of geothermal power in parallel with the drilling of the production wells. This will allow project cost recovery to be attained from the initial stage of geothermal development. Also, early manifestations of the project development effect can be expected. Risks for production well development for the proposed geothermal wellhead power system need not be taken into account because the system plans to use steam of the existing wells LA-9D and LA-10D. Furthermore the proposed system is a mobile unit type that can be transferred to other geothermal development sites. Utilizing this method of operating a geothermal wellhead power system is expected to facilitate a rapid effect regarding domestic geothermal generating operations in Ethiopia.

Based on the above background, the Ethiopian government requested in a letter dated 21 April 2015 (ref No. B-C-3/20/34) to receive Japan Grant Aid for a geothermal wellhead power project that will contribute to the development and promotion of the geothermal power business in Aluto Langano. In response to the request from the Ethiopian government, the Japanese government decided to conduct a Preparatory Survey for the Project for Geothermal Wellhead Power System (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA"). JICA sent the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Survey Team") to Ethiopia in

[1] EEP Generation Operation Data, Ethiopian Fiscal year July 2015/June 2016

July 2016 and January 2017, and the Survey Team produced the Outline Design of the Project.

2. Contents of the Project

To achieve above target of the Project, a Geothermal Wellhead Power System (5 MW) will be installed in Aluto Langano area to start power generation in the early stages of geothermal development. The Project will contribute to Ethiopia's energy policy of increasing power supply capability to urban areas, reinforcing of base load plants, developing renewable energy in order to export electricity to neighboring countries, and improving the present situation of hydropower dependency.

This Project consists of the following components.

[1] Steam Gathering System:
Two phase flow is separated into steam and brine at a separator. The separated steam is sent to a turbine for the wellhead power system. The separated brine is sent to a reinjection well.

[2] Wellhead Power System:
Geothermal steam drives the turbine of the wellhead power system, and the generator connected to the turbine generates electricity. The generated electricity is sent to the power line through a step-up transformer.

[3] Substation System (Including 15 kV Distribution Line):
The voltage of the generated electricity is boosted to 15 kV by the step-up transformer, and the boosted electricity is sent to the new 15 kV power line and the existing 15 kV distribution line, which is connected to the national grid through the Adami Tulu substation.

Steam Gathering System

Item	Qty	Description
Two-phase piping	1 set	From 2 x production wells (LA-9D and LA-10D) to separator; piping, valves, instruments, insulation, pipe supports, etc.
Steam piping	1 set	Piping, safety valve, bypass valve, rapture disk, steam flow meter, valves, instruments, insulation, pipe supports, etc.
Brine pipeline	1 set	Pipeline between separator and reinjection well; piping, valves, instruments, insulation, pipe supports, etc.
Separator	1 set	Bottom outlet cyclone separator, hot water tank (depending on contractor's system), level control valve, discharge valve, brine flow meter, valves, instruments, insulation, pipe supports, etc.
Scrubber	1 set	Scrubber, piping, valves, instruments, pipe supports, etc. Scrubber type will be decided by contractor.
Pressure control system	1 set	Steam relief valve, bypass valve, thermal insulation, etc.
Separator level control system	1 set	Level control valve, brine relief valve, piping, thermal insulation, etc.
Drain transfer pump	1 set	Pump, motor, piping, power supply system, instruments (To transfer the miscellaneous drains from LA-9D thermal pond to reinjection pipeline.)
Steam flowmeter	1 set	Main steam flowmeter, transmitter, thermal insulation, etc.
Instrumentation	1 set	Temperature instrumentation, pressure instrumentation, flow instrumentation, level instrumentation, instrumentation mounting material, installation accessories, etc.
Platform	1 set	Scaffolding, corridor, steps, ladder, hand rail, etc. for maintenance works
Hoist	1 set	Hoist, gantry, hanging metal fitting, etc. for maintenance works
Foundation works	1 set	Foundations for pipeline, vessels, equipment, etc. including foundation bolt, anchor bolt, supports, culvert, etc.
Installation	1 set	Including transportation and corrosion proof painting
Test, adjustment and commissioning	1 set	Hydrostatic test of pipeline and nondestructive test at welding points based on international standards such as ASME B31.1, ASME BPVC, or equivalent
Consumables, spare parts	1 set	Spare parts, consumables during commissioning, special tools, etc.
Detailed design	1 set	Design documents and drawings
Manuals	1 set	As built drawing, operation manuals and maintenance manuals
O&M training	1 set	
Fence	1 set	EEP's scope

Components of Wellhead Power System

Equipment	Qty	Description
Turbine and auxiliaries	1 set	Single flash single flow back pressure type turbine including steam strainer, main steam stop valve and governor valve
Turbine exhaust silencer	1 set	10 m height silencer with piping, valves, instruments, insulation and supports
Lube oil system	1 set	Oil tank, oil pump, emergency oil pump, oil cooler, vapor extractor, strainer, filter, etc.
Gear reducer	1 set	Depend on manufacturer's design
Generator and auxiliary equipment	1 set	Horizontal cylindrical type generator with blush less/PMG static type exciter
Enclosure	1 set	To protect turbine, generator and auxiliaries from wind, rain, dust, etc. also for countermeasures against noise from turbine and/or aux equipment. Door(s), lighting, maintenance working space should be equipped.
Station service transformer	1 set	Outdoor type oil immersed ONAN step-down transformer with ± 5% tap changer
Medium voltage switchgear	1 set	Outdoor type metal enclosed self-standing 6.6 kV switchgear (voltage level 12 kV) with circuit breakers, disconnection switches with earthing switch, potential transformer and lightning arrester
Low voltage switchgear	1set	Indoor type metal enclosed self-standing 400 V motor and load control center
DC power supply system	1set	Indoor type metal enclosed self-standing DC 110V distribution board(s) including AC/DC converter, transformer, dropper, battery and battery charger system
Distributed control system	1set	Indoor type metal enclosed self-standing, which can operate and monitor all the equipment of the wellhead power plant, steam gathering system and 15 kV distribution line
Turbine-Generator control panel	1set	Indoor type self-standing metal enclosed panel with turbine speed control, load control, voltage control, plant OPS function and maintenance tools
Generator and transformer protection panel	2 panels	Indoor type metal enclosed self-standing protection panel for generator and transformer including test terminal and maintenance tools
Medium voltage cable	1 set	Power cable and accessories (generator – generator switchgear, medium voltage switchgear – station service transformer, power receiving panel – 15 kV step-up transformer)
Earthing system	1 set	Grounding mesh, wire, rod or plate
Low voltage cables	1 set	Power cables and accessories (low voltage switchgear – each load)
Control cables	1 set	Control cables and accessories
Control room (Container)	1 set	Container type with air-conditioning equipment and H_2S filter
Remote operation system	1 set	Remote monitoring system for wellhead power plant from the existing Pilot Plant
Fire protection equipment	1 set	Fire extinguisher as necessary based on manufacturer's design, smoke and fire detector, alarm device
Conduit pipes	1 set	Conduit pipes for cable installation and protection
Cable tray	1 set	Cable tray and supports for cable installation

Components of Wellhead Power System

Equipment	Qty	Description
Lighting	1 set	Lighting devices for plant compound
Lightning protection equipment	1 set	Lightning protection devices in plant compound
Hoist	1 set	Hoist, gantry, hanging metal fitting, etc. for maintenance works
Foundation works	1 set	Foundations for equipment, oil-water separator, oil fence etc. including foundation bolt, anchor bolt etc.
Installation	1 set	Including transportation and corrosion proof painting
Test, adjustment and commissioning	1 set	Hydrostatic test of pipeline and nondestructive test at welding points based on international standards such as ASME B31.1, ASME BPVC, or equivalent
Consumables, spare parts	1 set	Spare parts, consumables during commissioning, special tools, etc.
Detailed design	1 set	Design documents and drawings
Manuals	1 set	As built drawing, operation manuals and maintenance manuals
O&M training	1 set	
Fence	1 set	EEP's scope

Substation including 15 kV Distribution Line System

Equipment	Qty	Description
15 kV step-up transformer	1 set	Outdoor type ONAN step-up transformer with OLTC 15 kV +/- 7.5%
15 kV switchgear	1 set	Outdoor type metal enclosed self-standing type 15 kV switchgear (voltage level 24 kV) with circuit breakers, disconnection switches with earthing switch, potential transformer and lightning arrester
15 kV cables and accessories	1 set	Power cable and accessories (15 kV step-up transformer – 15 kV switchgear – line switch of electric pole)
Termination pole with line switches	2 sets	Termination H type wooden pole, cross arm, earthing rod, line switch, lightning arrester, stay wire, optical fiber cable support
Intermediate pole	2 sets	Intermediate T type wooden pole, cross arm, optical fiber cable support
Light angle pole	3 sets	Termination H or A type wooden pole, cross arm, stay wire, optical fiber cable support
Heavy angle pole	4 sets	Intermediate T type wooden pole, cross arm, stay wire, optical fiber cable support
Strain pole	7 sets	Strain H or A type wooden pole, cross arm, stay wire, optical fiber cable support
Connection to the existing distribution line	1 set	U type cross arm, ball eye, socket eye, clamp, big collars, small collars
Overhead conductor	1 lot	Overhead conductor, AAC 95 mm^2 , 2400 m
Pin insulator	1 lot	Pin type insulator, 22 kV, pre-form tie strap
Disk insulator	1 lot	Disk type, 22 kV, retention type clamp
Lightning arrester	1 lot	Insulator type arrester, 28 kV distribution line, pre-form tie strap
Foundation works	1 set	Foundations for equipment, oil-water separator, oil fence etc. including foundation bolt, anchor bolt etc.
Installation	1 set	Including transportation and corrosion proof painting
Test, adjustment and commissioning	1 set	
Consumables, spare parts	1 set	Spare parts, consumables during commissioning, special tools, etc.
Detailed design	1 set	Design documents and drawings
Manuals	1 set	As built drawing, operation manuals and maintenance manuals
O&M training	1 set	

3. Project Schedule and Cost Estimation

After the conclusion of Grant Agreement (hereinafter referred to as "G/A"), the project will be implemented within a 24 month period; 5.5 months for the period of implementation design up to the contractor contracting, and then 18.5 months for procurement, installation and commissioning.

The estimated cost undertaken by Japanese Grant Aid is confidential and will not be disclosed until the Project contract signing.

The estimated cost undertaken by the Ethiopian Side is 16.7 Million ETB (Approximately equivalent to 82 Million Japanese Yen).

4. Project Evaluation

(1) Relevance

It is judged that the validity of the Project is high because this Project contributes not only to the development and realization of the energy policy of Ethiopia but also is beneficial to the general public.

(2) Effectiveness

The effect expected by implementation of this Project is as follows;

1) Quantitative Evaluation

Outcome Index	Basic Value (2016) (Value at present)	Target Value (2022) (3 years after Project Completion)
Annual Availability (%)	0	70.0
Annual Total Generation Power (MWh)	0	15,943

2) Qualitative Evaluation

In the Aluto Langano area, the early commencement of the geothermal power generation will contribute to the expansion of investment, increase power supply capacity, secure a diversification of base load power resources, and contribute to economic development in the Aluto Langano area.

The power plant of the Project will be connected to the main transmission line and the target annual total power generation will be equivalent to the consumed power capacity used by 240,000 people (equivalent to approximately 70% of the population in the Aluto Langano area).

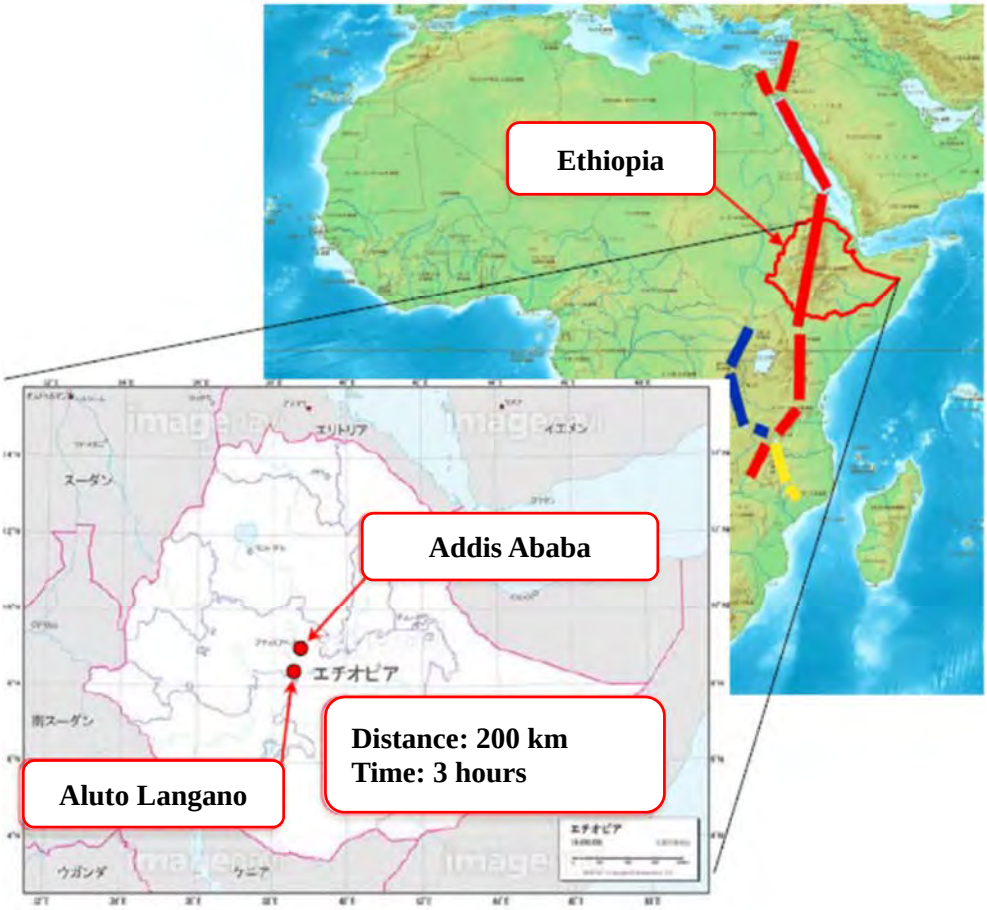
(3) Economic Evaluation

The Financial Internal Rate of Return (hereinafter referred to as "FIRR") of the Project is estimated to be 8.5% based on the conditions of a 15 year project life, plant relocation at every 7 years, and a power selling price of 8.11 USc/kWh (agreed with EEP for the purposes of this evaluation).

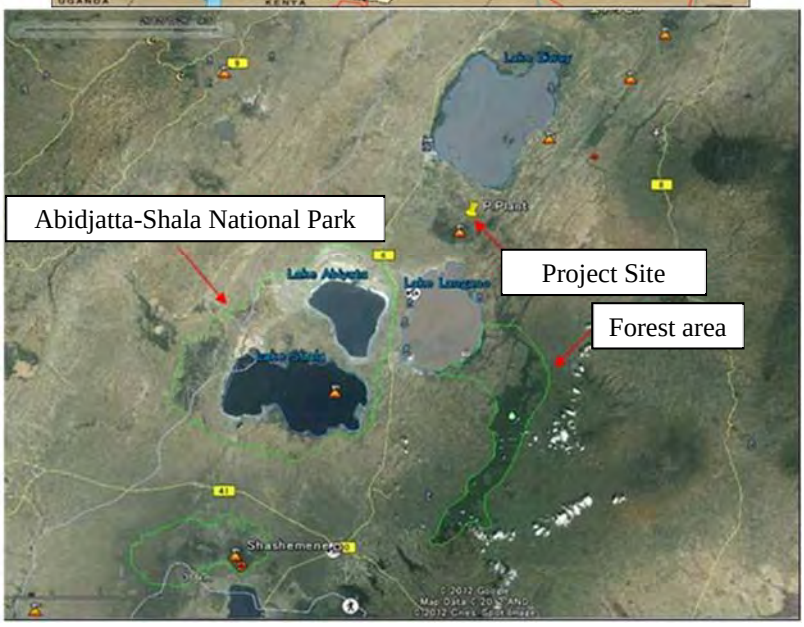
The Economic Internal Rate of Return (hereinafter referred to as "EIRR") of the Project is estimated to be 28.2% based on an alternative project of a diesel power plant project with an equivalent power output capacity.

CONTENTS

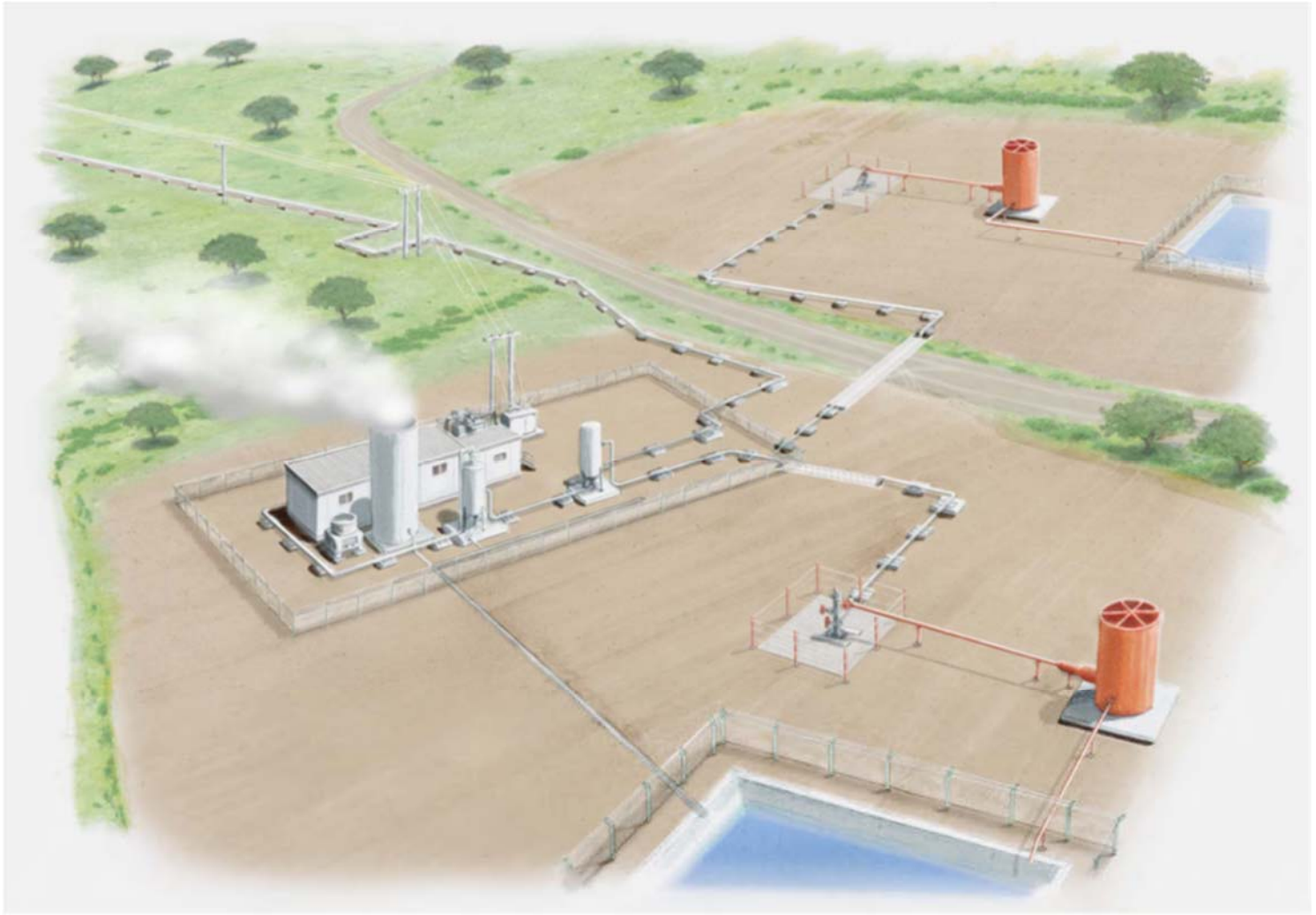
LOCATION MAP



LOCATION MAP (DETAIL)



PERSPECTIVE



LIST OF FIGURES & TABLES

ABBREVIATIONS

Abbreviation	Definition
AFD	French Development Agency
EEA	Ethiopian Energy Agency
EEPCO	Ethiopian Electric Power Corporation
EEP	Ethiopian Electric Power
EELPA	Ethiopian Electric Light and Power Authority
EEU	Ethiopian Electric Utility
ELC	ELC Electroconsult S.p.A.
E/N	Exchange of Notes
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EPA	Environmental Protection Authority
ESIA	Environmental and Social Impact Assessment
EWCA	Ethiopian Wildlife Conservation Authority
FIRR	Financial Internal Rate of Return
G/A	Grant Agreement
GDP	Gross Domestic Product
GSE	Geological Survey of Ethiopia
GTP2	Growth and Transformation Plan II
IAP	Interested and Affected Parties
MOEFC	Ministry of Environment, Forest and Climate Change
MOFEC	Ministry of Finance and Economic Cooperation
MOM	Ministry of Mines
MOWIE	Ministry of Water, Irrigation and Electricity
Power System Expansion M/P	Ethiopian Power System Expansion Master Plan
OFWE	Oromia Forest and Wildlife Enterprise
O & M	Operation and Maintenance
PAHs	Project Affected Households
PAPs	Project Affected Persons
PPA	Power Purchase Agreement
USAID	United States Agency for International Development
WB	World Bank
WEST JEC	West Japan Engineering Consultants, Inc.

Chapter 1 Background of the Project

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1-1 Background of the Project

In the Federal Democratic Republic of Ethiopia (hereinafter referred to as "Ethiopia"), more than 90 percent of the total generated electric power (e.g. 10,464 GWh in 2015/2016)[1] is annually produced by hydroelectric power generation. During dry seasons, the instability of hydroelectric power supply becomes an issue. The 2015/2016 drought was the worst in the last 50 years and rendered some of the hydraulic power generation plants of the country inoperable. Furthermore, differences in supply and demand when comparing the existing facility capacity in 2016 with the peak load prediction for 2020 is expected to be approximately 4,800 MW. The electricity access rate remains approximately 23.3% (e.g. the average access rate in Sub-Saharan Africa is approximately 43%). Therefore, stable power supply is one of the main issues in the Growth and Transformation Plan 2 (hereinafter referred to as "GTP2").

As an alternative base load power supply to hydroelectric power, the potential amount of geothermal resources in Ethiopia is expected to be around 5,000 MW (GTP2). Geothermal power development is expected to contribute to improving both the quality and quantity of Ethiopia's power supply. In order to stabilize the power supply, the development of abundant geothermal resources existing in Ethiopia is considered to be an effective countermeasure. In September 2014, Ethiopian Electric Power (hereinafter referred to as "EEP") commissioned Parsons Brinckerhoff to prepare a 25-year master plan for the expansion of the electric power system (Ethiopian Power System Expansion Master Plan, hereinafter referred to as "Power System Expansion M/P"). According to the domestic electric power development plan (2013 - 2037), by 2037 geothermal power generation of 5,000 MW by 50 units of generation facilities is planned. On the other hand, currently both EEP and Geological Survey of Ethiopia (hereinafter referred to as "GSE") (two parties responsible for the development of geothermal power generation), lack experience in geothermal power development. There are no geothermal plants in operation in Ethiopia. Accordingly it is an issue for agencies such as EEP and GSE to improve their abilities regarding geothermal development.

Although there are 22 main potential geothermal development sites in Ethiopia, drilling of wells and installation of a geothermal plant (a Pilot Plant that started operation in 1998 but is now inactive) has only been implemented in the Aluto Langano area, East Shewa Zone, Oromia Region. Aluto Langano area, located approximately 200 km to the south of Addis Ababa, is one of the most promising areas for commercialization of geothermal power generation. In 2010 - 2016, the Japanese government assisted the production of two (2) exploration wells (LA-9D and LA-10D) using the Program Grant Aid for Environment and Climate Change. The Ethiopian government has also started procuring drilling rigs for the World Bank (hereinafter referred to as "WB") supported project to drill production and reinjection wells. The WB supported production wells, together with the existing wells (LA-9D and LA-10D), plan to provide steam to a large-scale geothermal power generation project that Japan International Cooperation Agency (hereinafter referred to as "JICA") is currently preparing. However, there is concern that the existing wells might be left idle until the power plant is commissioned, because a considerable amount of time is necessary to drill the production wells, then to confirm the expected steam quantity, and then to construct the plant.

In this project, by installing a geothermal wellhead power system that uses these existing wells (LA-9D and LA-10D), it will enable early generation of geothermal power in parallel with the drilling of the production wells. This will allow project cost recovery to be attained from the initial stage of geothermal development. Also, early manifestations of the project development effect can be expected. Risks for production well development for the proposed wellhead power

[1] EEP Generation Operation Data, Ethiopian Fiscal Year 2015: from July 2015 to June 2016

system need not be taken into account because the system plans to use steam of the existing wells LA-9D and LA-10D. Furthermore, the proposed system is a mobile unit type that can be transferred to other geothermal development sites. Utilizing this method of operating a geothermal wellhead power system is expected to facilitate a rapid effect regarding domestic geothermal generating operation in Ethiopia.

The Ethiopia government positions geothermal development in the country as an indispensable part of its GTP2 (2016-2020). Therefore, it is focusing on the promotion of geothermal development by, among other actions, the establishment of a Geothermal Law and the reorganization of the current structure for geothermal business.

In order to promote the development of geothermal resources and power generation projects, the abovementioned structure relating to geothermal development in the country is under review. By the middle of 2017, the GSE will be absorbed and integrated into EEP and a system will be established to consistently promote EEP's business, from the development of geothermal resources to the construction and operation of geothermal power plants. In addition, according to the newly established laws and regulations regarding geothermal resource development, the Ethiopian Energy Agency (hereinafter referred to as "EEA") will be the government agency responsible for the authorization of geothermal resource development.

Based on the above background, the Ethiopian government requested in a letter dated 21 April 2015 (ref No. B-C-3/20/34) to receive Japan Grant Aid for a geothermal wellhead power project that will contribute to the development and promotion of the geothermal power business in Aluto Langano. In response to the request from the Ethiopian government, the Japanese government decided to conduct a Preparatory Survey for the Project for Geothermal Wellhead Power System (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to JICA. JICA sent the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Survey Team") to Ethiopia in July 2016 and January 2017, and the Survey Team produced the Outline Design of the Project.

Table 1-1.1 Organization of the Power Sector in Relation to Geothermal Power Generation

Line Ministry, Executing Agency	Role
Ministry of Mines (MOM)	Policy making and implementation of rules
Geological Survey of Ethiopia (GSE)	Geothermal resource development
Ministry of Water, Irrigation and Electricity (MOWIE)	Policy making and implementation of rules
Ethiopian Energy Agency (EEA)	License issuance concerning EEU investment, regulations such as securing safety and quality, setting of electricity fees, authorization of Power Purchase Agreement (PPA) licensing approval on geothermal resource development
Ethiopian Electric Power (EEP)	Power generation, transmission, PPA
Ethiopian Electric Utility (EEU)	Power distribution

Source: Prepared by the Survey Team

1-2 Natural Conditions

(1) Location and Topography

The project site of the Aluto Langano geothermal field is located at geographic coordinates of latitude 7.793° N, longitude 38.798° E and between two lakes, Ziway and Langano, in the Adami Tulu and Jido Kombolcha woreda (district, an administrative division of Ethiopia) of the East Shewa Zone, Oromia Region. The Aluto Langano geothermal field is located within the central-southern part of the Lake District in the low plains of the Ethiopian Rift Valley and close to lakes Ziway, Langano, Abidjatta and Shala. There is no known surface outflow from these lakes. Two of these lakes, Lake Abidjatta and Lake Shala, are located 30 km southwest of the Aluto

Langano geothermal field, these two lakes are within the environmental protection zone of the Abidjatta-Shala National Park.

The center of the Aluto Volcanic Complex is the basin of a caldera structure of and elevation of about 2,000 m above sea level. (Figure 1-2.1).

The project site area is located on flat land with loose pyroclastic material, dotted by hilly morphologies around the peripheries, composed mainly of volcanic rocks. There are fumaroles seen here and there. Most of the deep geothermal wells to be drilled are at the foot of these mountains. Since the area is plain land, farmers living in the area cultivate annual agricultural cereals and raise cattle. The plain land has some scattered acacia trees whilst, on the mountains, there are several types of shrubs and bushes.

Source: Google map

Figure 1-2.1Proposed Geothermal Project Site

(2) Meteorology and Climatology

The closest meteorological observation station to the project site of Aluto Langano is Adami Tulu. The mean monthly temperature and precipitation in Adami Tulu are listed in Table 1-2.1, Table 1-2.2, Table 1-2.3, and Table 1-2.4 for reference. Mean annual temperature is around 22.5 °C and maximum mean monthly temperature is 28.2 °C; minimum mean monthly temperatures range from 10.3 °C to 16.1 °C, with little difference from month to month.

Months of May to August are the wet season with high levels of rainfall, while December to March is the dry season with low levels of rainfall. The annual precipitation is around 693.9 mm with December having the lowest rainfall (0 mm) and July the highest (137.6 mm).

Table 1-2.1 Mean Monthly Maximum and Minimum Temperature (2013～2015)

St.	Year	Items	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Adami Tulu	2013	Mean	23.2	24.6	25.2	24.4	22.8	22.1	20.2	20.5	21.3	22.3	22.6	21.2	22.5
		Max.	28.9	31.8	29.6	31.2	29.0	27.3	23.8	24.5	26.8	28.0	28.9	28.4	28.18
		Min.	11.3	10.6	12.2	13.2	15.0	14.5	13.6	13.4	11.8	10.2	9.9	6.2	11.83
	2014	Mean	22.5	23.4	24.8	24.1	23.6	23.4	21.4	20.8	21.0	21.8	22.0	21.5	22.5
		Max.	29.9	29.7	31.7	30.9	29.5	29.3	26.0	25.1	21.8	27.2	28.4	28.1	28.13
		Min.	9.2	11.9	12.6	11.4	14.2	14.2	14.5	13.7	12.7	11.0	9.1	7.6	11.84
	2015	Mean	21.7	24.2	24.8	25.5	14.3	23.4	22.0	22.1	22.3	24.6	23.6	22.9	22.6
		Max.	29.0	31.9	32.4	32.6	30.8	28.4	27.9	26.9	28.2	33.1	32.0	31.0	30.35
		Min.	8.0	9.1	11.4	13.3	16.0	16.7	15.7	15.3	14.6	12.7	12.4	12.8	13.17
Ave.			22.5	24.1	24.9	24.7	20.3	23.0	21.2	21.1	21.5	22.9	22.7	21.9	22.6

Source: Adami Tulu Meteorological Station

Table 1-2.2 Monthly and Mean Annual Rainfall / Precipitation (2013～2015)

Unit (mm)

Station	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Adami Tulu	2013	0.0	0.0	75.5	43.4	79.1	128.4	250.2	88.6	64.6	50.9	2.9	0.0	783.6
	2014	0.0	62.3	5.6	37.2	160.7	24.4	15.0	154.2	74.4	228.0	0.0	0.0	761.8
	2015	0.0	0.0	28.7	0.0	81.7	111.1	147.5	100.8	66.5	0.0	0.0	0.0	536.3
Ave.		0.0	20.8	36.6	26.9	107.2	88.0	137.6	114.5	68.5	93.0	1.0	0.0	693.9

Source: Adami Tulu Meteorological Station

Table 1-2.3 Mean Monthly and Mean Annual Wind Speed (2013～2015)

Unit (m/s)

Station	Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Adami Tulu	2013	1.13	1.17	1.12	1.16	1.42	1.89	1.50	1.51	1.00	0.94	1.21	1.07	1.26
	2014	1.08	1.06	1.32	3.61	1.20	1.80	1.70	1.26	0.96	0.91	1.05	0.76	1.39
	2015	1.13	1.01	1.15	1.28	1.36	1.90	1.94	1.54	0.98	1.02	1.14	1.11	1.30
Ave.		1.11	1.08	1.20	2.02	1.33	1.86	1.71	1.44	0.98	0.96	1.13	0.98	1.32

Source: Adami Tulu Meteorological Station

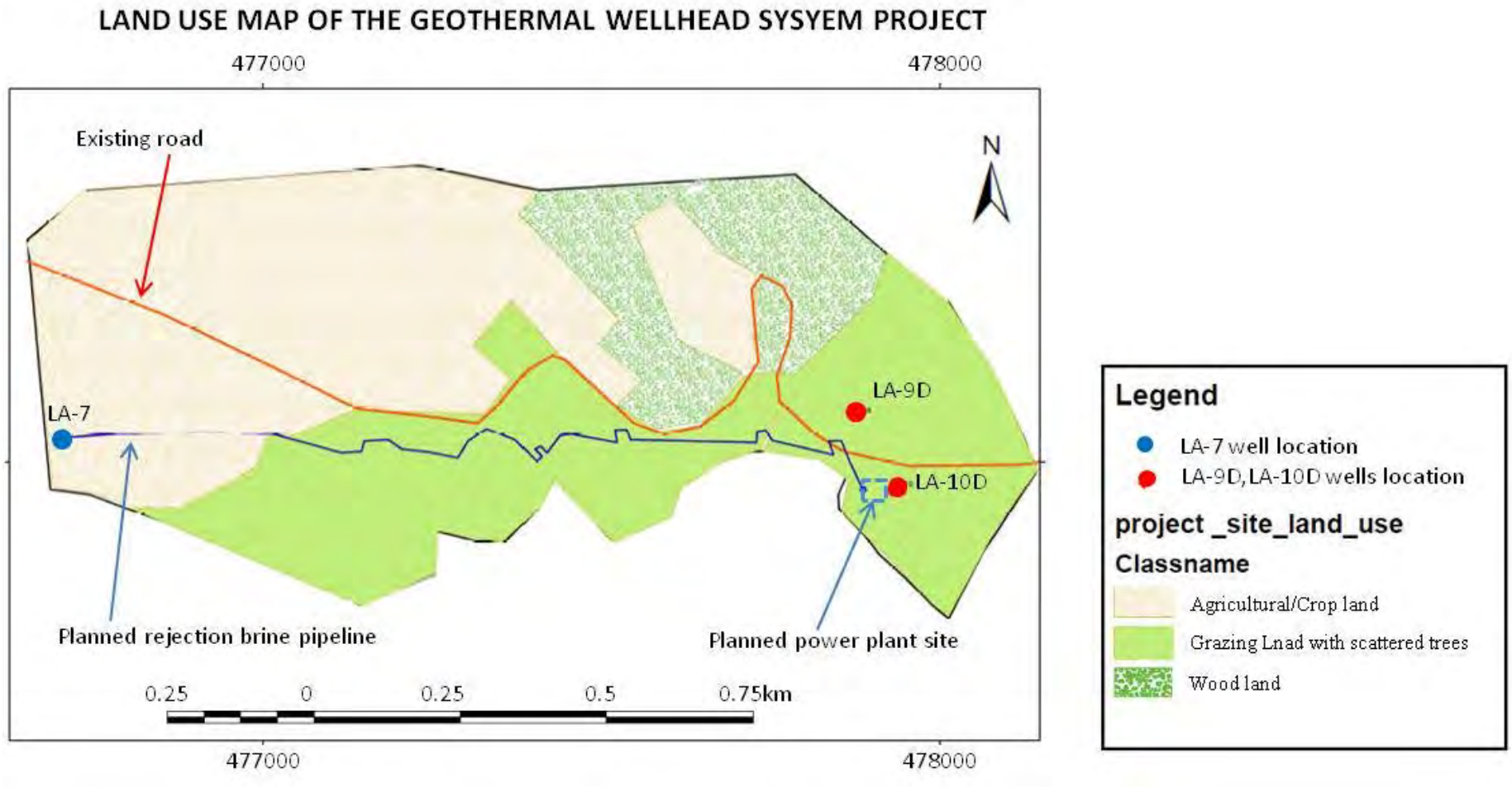
Table 1-2.4 Wind Direction (2013～2015)

Station	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Adami Tulu	2013	NE	NE	NE	ENE	SSW	SSW	SSW	SW	Calm	NE	NE	NE
	2014	NE	NE	NE	NE	S	SW	SW	SW	SW	SW	NE	NE
	2015	NE	NE	NE	NE	NE	SW	SW	SSW	SW	NE	NE	NE

Source: Adami Tulu Meteorological Station

(3) Land Use

Generally, the Aluto Langano geothermal field is composed of different land use/land cover classes. The expected land cover/land use categories are bush land, grass land, cultivated grass land and wooded grassland. Specific to the planned geothermal wellhead power system project area the land use/cover categories are of agricultural/crop land, grazing land with scattered trees and scattered settlements. The land use/land cover map of the specific project is demonstrated in Figure 1-2.2 below which was created from the site reconnaissance.



Source: Prepared by the Survey Team

Figure 1-2.2Land Use in Project Site

(4) National Parks and Protected Areas

The only national park located near the project site is the Abidjatta-Shala National Park, located some 40 km south of the project site, which serves as a flamingo and pelican sanctuary. It will not be affected by the proposed drilling of geothermal wells.

(5) Fauna and Flora

1) Flora

The geothermal field is within pasture and farmland. There are no survey data for animals and plants in the project area. Based on the field visit and information from the local community and the Woreda Agricultural Office for natural resource development and protection process, the Aluto Langano geothermal field is composed of some exotic and indigenous plant species. In observations during the field survey, grass and shrubs/bushes were seen around the mountains/hills in the proposed project area, dotted with acacia (Figure 1-2.3). Some of the plant species with their common/local name and scientific names are provided in Table 1-2.5 below.

Source: Prepared by the Survey Team

Figure 1-2.3Plant Status of the Project Site

Table 1-2.5 Common Flora in Aluto Langano Geothermal Field

No.	Common Name	Local Name	Scientific Name	IUCN Red List
1	Fig	Warka	*Ficus vasta*	CD
3	Olive	Weira	*Olea africana*	-
4	Acacia	Girar	*Acacia sp.*	-
5	Croton	Bisana	*Croton macrostachys*	-
6	Sand olive	Hopbush or Kitkita	*Dodonaea viscosa*	-
7	Giant heath	Asta	*Erica arborea*	-
8	Yellow wood	Zigba	*Podocarpus grlacilior*	LC
9	Wild date palm	Zenbaba	*Phoenix reclinata*	-
10	Giant St. John's Wort	Amija	*Hypericum revolutum*	-

IUCN: International Union for Conservation of Nature and Natural Resources
CD: Conservation Dependent (IUCN Red List version 2.3)
LC: Least Concern -: No registration
Source: Prepared by the Survey Team by field survey and questionnaire to Adami Tulu District Agricultural and Rural Development Office

2) Fauna

According to the information gained from the local community, the Adami Tulu Jido Kombolcha Woreda Agriculture Office and the Environmental and Social Impact Assessment (hereinafter referred to as "ESIA") report, the main fauna species living on the mountainous/hill sides around the project area are the following.

There are mammalian faunas such as Spotted hyena (Crocuta crocuta), Greater kudu (Tragelaphus strepsiceros), Anubis baboon (Papio anubis), Black backed jackal (Canis aureus, C. mesomelas), Bush duiker (Sylvicapra sp.), and Vervet monkey (Cercopithecus aethiops).

There are bird fauna such as Ibis (Bostrychia sp.), Goose (Cyanochen sp.), and African black (Dendrocygna sp, Anas sparsa).

Examples of wildlife species (mammals and birds) of fauna living on the mountainous/hill sides around the project area are given in the following tables (Table 1-2.6 and Table 1-2.7).

Table 1-2.6 Common wildlife in the Aluto Langano Geothermal Field (around the project area on the mountainous/hill sides)

No.	Common Name	Scientific Name	IUCN Red List
1	Spotted hyena	*Crocuta*	LC
2	Greater kudu	*Tragelaphus strepsiceros*	LC
3	Anubis baboon	*Papio anubis*	LC
4	Jackal, common / golden	*Canis aureus, C. mesomelas*	LC
5	Bush duiker	*Sylvicapra sp.*	LC
6	Vervet monkey	*Cercopithecus aethiops*	LC
7	Crested porcupine	*Hystrix cristata*	LC
8	Leopard	*Panthera pardus*	VU
9	Bush pig	*Potamochoerus larvatus*	LC
10	Abyssinian hare	*Lepus habessinicus*	LC
11	Bushbuck	*Tragelaphus scriptus*	LC
12	Warthog	*Phacochoerus africanus*	LC
13	Duiker	*Sylvicapra grimmia*	LC

IUCN: International Union for Conservation of Nature and Natural Resources
(Note) LC: Least Concern, VU: Vulnerable
Source: Prepared by the Survey Team by field survey and questionnaire to Adami Tulu District Agricultural and Rural Development Office

Table 1-2.7 Common Types of Birds in the Project Area

No.	Common Name	Scientific Name	IUCN Red List
1	Ibis	*Bostrychia sp.*	LC
2	Goose	*Cyanochen sp.*	VU
3	Duck, African black	*Dendrocygna sp, Anas sparsa*	LC
4	Flamingo	*Phoenicopterus sp.*	LC
5	Marabou stork	*Leptoptilos crumeniferus*	LC
6	Great white pelican	*Plelecanus sp.*	LC
7	Francolin	*Francolinus sp.*	LC
8	Guinea fowl	*Acryllium sp.*	LC
9	Black headed gull	*Larus ridibundus*	LC
10	Heron	*Egretta sp.*	LC
11	Egrets	*Bubulcus sp.*	LC
12	Cormorants	*Phalacrocorax sp.*	LC
13	Crane	*Grus sp*	LC
14	Pigeon	*Treron sp.*	LC
15	Dove	*Streptopelia sp.*	LC

IUCN: International Union for Conservation of Nature and Natural Resources

(Note) LC: Least Concern, VU: Vulnerable

Source: Prepared by the Survey Team by field survey and questionnaire to Adami Tulu District Agricultural and Rural Development Office

1-3 Environmental and Social Considerations

1-3-1 Environmental Impact Assessment

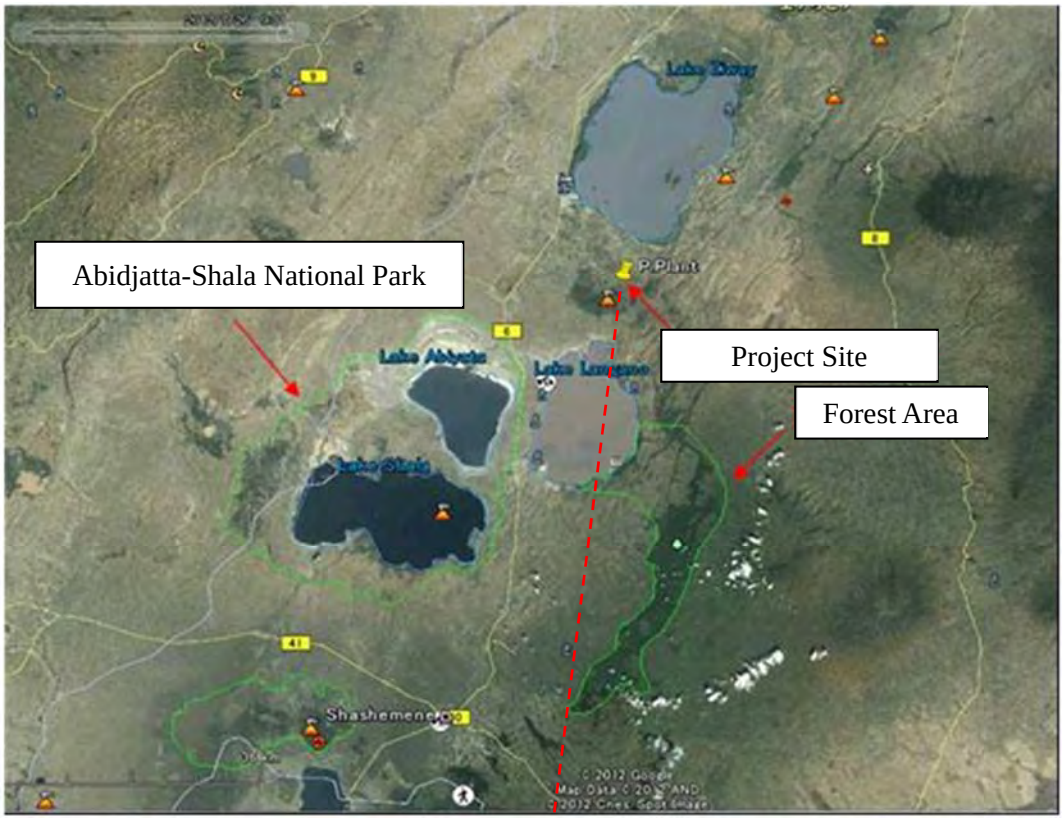
1-3-1-1 Project Components

(1) Project of the Site

The Aluto Langano geothermal field is located within the central-southern part of the Lake District, about 200 km southeast of Addis Ababa, in the low plains of the Ethiopian Rift Valley and close to lakes Ziway, Langano, Abidjatta and Shala (Figure 1-3-1.1). Lakes Abdjataa and Shala are located 30 km southwest of the Aluto Langano geothermal field. These two lakes are within the environmental protection zone of the Abidjatta-Shala National Park (Figure 1-3-1.2).

Source: Study on Economic Partnership Projects in Developing Countries in FY2009, Study on Geothermal Power Development Project in the Aluto Langano Field, Ethiopia

Figure 1-3-1.1 Aluto Langano Geothermal Field



Source: Google Earth

Source: Prepared by the Survey Team

Figure 1-3-1.2 Project Site

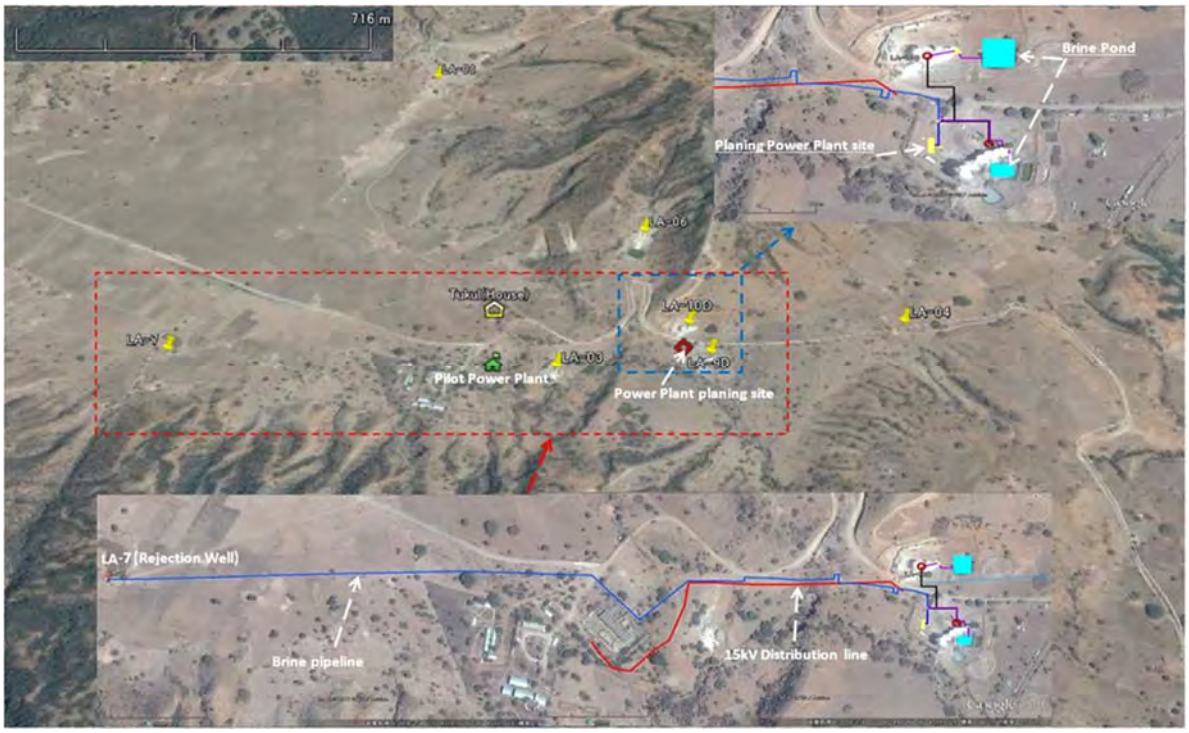
(2) Project Components

The project components of the geothermal project layout are shown in Table 1-3-1.1, and Figure 1-3-1.3.

Table 1-3-1.1 Project Components

Item	Specifications and Land Required
Power plant	
Location of the wellhead power plant	LA-9D well pad in Aluto Langano geothermal area
Type of the power plant	Single-flash cycle backpressure steam turbine.
Number of unit	1 unit
Rated capacity	5 MW at generator terminal
Usage of land (for power plant)	Approx., 30 m x 40 m=1,200 m^2 (LA-9D well pad)
Non-condensable gases (NCG) in steam	7% in weight (H_2S in NCGs 5 mol%)
Brine flowrate	Rated: 66 t/h (Approx. 43 t/h LA-9D and LA-10D use case)
Wells to be used	Production wells: LA-9D and LA-10D, Reinjection well: LA-7
Elevation	LA-9D: 1,960 m, LA-10D: 1,960 m, LA-7: 1,896 m
Water	No water is available. (All equipment must be air cooled.)
Steam gathering and reinjection system	
Two-phase flow piping	Piping from the two production wells (LA-9D and LA-10D) to the separator including valves, instrumentation, thermal insulation, support, etc.
Separator station	Bottom-outlet cyclone type separator, brine accumulator (if necessary), level control valve, brine relief valve, piping brine flow meter, other valves, instrumentation, thermal insulation, support, etc.
Steam piping	Piping, pressure control valve (or safety valve), bypass valve of the PCV for warming-up of the system, rupture disk, steam flow meter, other valves, instrumentation, thermal insulation, support, etc.
Brine reinjection pipeline	8 inch piping from the separator to LA-7, Length: approx. 1,700 m and land use approx. 1,700 m x 5 m=8,500 m^2
Foundation	Foundations of the piping, vessels and equipment, anchor bolts, base plates, bolts and nuts for installation, supports and culverts, etc.
Turbine exhaust silencer	It shall include piping, valves, instrumentation, thermal insulation, and support. It also works as the silencer of the steam pressure control valve (or safety valve).
Distribution line	
15kV distribution line	Approx. 700 m
Pole	Approx.16 poles, Length:12 m, Diameter at pole base: 260 mm

Source: Prepared by the Survey Team



Source: The Survey Team created using Google Earth

Figure 1-3-1.3 Layout of the Project Facility

1-3-1-2 Socio-Economic Conditions

(1) Population

According to the census projection of 2009, the population in the three kebele (neighbourhood, smallest administrative unit of Ethiopia) adjacent to project site, Golba Aluto, Abeyi Deneba and Aluto are 3,092, 7,941 and 2,150 respectively; hence, the total population in the three kebele is 13,183. The number of household heads in the three kebele is 605, 732 and 381, respectively.

Currently, the total population size in the three adjacent kebele is about 13,183. The number of females exceeds the male population except in Abeyi Deneba Kebele.

The average household size recorded in these kebele is about 7.7.

Table 1-3-1.2 Demographic Characteristics in the Project Area Kebele

Kebele	Population Size			Household Size	
	Male	Female	Total	Number	Average
Golba Aluto	1,270	1,822	3,092	605	5.1
Abeyi Deneba	4,191	3,750	7,941	732	10.8
Aluto	846	1,304	2,150	381	5.6
Total	6,307	6,876	13,183	1,718	7.7

Source: Woreda Administrative Office

(2) Ethnic Composition

In the project area, no settlements of indigenous people or ethnic minorities who need particular consideration have been identified. The major ethnic group in the woreda is the Oromo, mixed with few other ethnic groups like Amhara and Gurage. In the kebele surrounding the project area, the Oromo ethnic group comprises 99%.

(3) Settlement Pattern and Household Income

The settlement pattern of the population is of a permanent type and most of the population in the project area is of sedentary cultivators supporting their livelihood with traditional agricultural production and rearing of cattle. The farming techniques they practice are still of the traditional type of cultivation system, mainly using oxen. The common annual crops grown in the project areas are maize, wheat, barley, teff, millet, soya bean, and lentils.

(4) Social Services

1) Education

At present, each kebele in the project area has 2 primary schools from the grades 1 to 8, with two exceptions of Lekesho and Dulolo primary school which has only from the grade 1 to 4. There are a total of 2,017 students in the three kebele. The number of male students slightly exceeds the number of female students in the six primary schools.

Table 1-3-1.3 Education Status of Project Area Kebele

No.	Kebele	Name of School	Number of Students				Total No. of Students
			Grade 1- 4		Grade 5- 8		
			M	F	M	F	
1	Golba Aluto	Harawa Aluto	90	61	69	38	258
		Hulo Aluto	127	97	34	43	301
2	Abeyi Deneba	Sedisho	228	203	145	135	711
		Lekesho	111	146	-	-	257
3	Aluto	Aluto	122	108	50	45	325
		Dulolo	85	80	-	-	165
Total			763	695	298	261	2,017

Source: Woreda Education Bureau

2) Health

There are 7 health centers, 13 health officers, 43 health posts and 105 health extension workers in the woreda. The nearest clinic is in a town located 13 km away from the project area (Adami Tulu town). According to the information gathered from the Woreda Health Office, Amniotic Fluid Index (hereinafter referred to as “AFI”) and Pneumonia are the most prevalent and common diseases in the woreda. The top common diseases in the woreda are shown below.

Table 1-3-1.4 Top Common Diseases in the Woreda

No.	Common Diseases	No. of Cases	Percent
1	AFI	7,143	20.99
2	Pneumonia	6,323	18.58
3	Acute upper respiratory infection	5,557	16.33
4	Diarrhea	4,853	14.26
5	Infection of the skin	2,367	6.95
6	Trauma (Injury, etc.)	1,915	5.62
7	Malaria (Confirmed with PF)	1,685	4.95
8	UTI	1,615	4.75
9	Other unspecified infections	1,348	3.96
10	Helminthiasis	1,221	3.59
Total		34,027	100.00

Source: Woreda Health Office

(5) HIV/AIDS

There is no official concrete data on HIV/AIDS in Ethiopia.

In the project area according to the information gathered from the Adami Tulu Jido Kombolcha Woreda HIV/AIDS Office, the prevalence rate among examined patients is 0.8%.

(6) Cultural and Historical Heritage

According to the July 2016 study of, the project area has no known sites of culturally, historically, archaeologically, geological or topographical importance. However, if there are any accidental or "chance findings" during project implementation the contractor shall immediately inform EEP Project Office and the Project Office shall report to the Environmental Health Safety and Quality (hereinafter referred to as "EHS&Q") of EEP. The Office will then report it to the Authority for Research and Conservation of Cultural Heritage (ARCCH) for further investigation.

1-3-1-3 Environmental and Social Consideration System / Organization in Ethiopia

(1) Institutional Framework of Environmental Management in Ethiopia

1) Ministry of Environment, Forest and Climate Change (MOEFC)

The institution responsible for environmental management in Ethiopia is the MOEFC. The MOEFC was re-established under Proclamation No. 803/2013 as an autonomous public institution of the Federal Government of Ethiopia entrusted with the mandate over the protection and conservation of natural resources in Ethiopia.

The MOEFC has the following major duties and responsibilities.

- To prepare environmental protection policy and laws; and, upon approval, follow up their implementation.
- To prepare directives and systems necessary for evaluating the impact of social and economic development undertakings on the environment; monitor and supervise their implementation; and
- To prepare standards that help in the protection of soil, water and air as well as the biological systems they support, and follow up their implementation.

2) Ministry of Water, Irrigation and Electricity (MOWIE)

The MOWIE is the regulatory body for the energy sector. Based on the delegation from, the former Environmental Protection Authority (hereinafter referred to as "EPA") the draft ESIA document of this Project will be submitted to the MOWIE for review purposes. The Ministry will then review the draft ESIA report and finally give approval for the implementation of the Project. The Ministry will also monitor the environmental performance of the development project during the operation phase.

(2) Environment-related Laws and Regulations

1) Environmental and Social Regulatory Framework

In relation to the framework of resettlement and land acquisition, the Constitution of Ethiopia (Proclamation No. 1/1995) provides the basic principles on the expropriation of private property and compensation.

The Constitution states that all persons who have been displaced, or whose livelihood has been adversely affected as a result of state programs, have the right to commensurate monetary or alternative means of compensation including relocation with adequate State assistance. Article 40.3 of the Constitution provides for public ownership of both rural and urban land as well as all natural resources. It further states that land is the common property of Ethiopian people and cannot be subject to sale or to other means of exchange.

Proclamation No. 455/2005 or the "Expropriation of Landholding for Public Purposes and Payment of Compensation Proclamation" and Council Ministers Regulation No. 135/2007 or "Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes," provide detailed procedure on the expropriation process and payments of compensation for those affected.

Major regulations, guidelines and proclamations applicable to the electric power energy development project are listed in the table indicated below.

No.	Title	No.	Date of issue
1	Environmental Impact Assessment Proclamation	299	31 Dec.,2002
2	Environmental Pollution Control Proclamation	300	3 Dec.,2002
3	Environmental Protection Organs Establishment Proclamation	295	31 Oct.,2002
4	Expropriation of Landholdings for Public Purposes and Payment of Compensation Proclamation	455	15 Jul, 2005
5	Rural Land Administration and Land Use Proclamation, Proclamation	456	15 Jul, 2005
6	Ethiopian Water Resource Management Proclamation	197	Mar, 2000
7	Solid Waste Management Proclamation	513	12 Feb, 2007
8	Environmental Impact Assessment Procedural Guideline Series 1		Nov, 2003
9	Draft EMP for the Identified Sectoral Developments in the Ethiopian Sustainable Development & Poverty Reduction (ESDPRP)		01 May, 2004
10	Investment Proclamation	280	02 Jul, 2002
11	Council of Ministers Regulations on Investment Incentives and Investment Areas Reserved for Domestic Investors	84	07 Feb, 2003
12	The FDRE Proclamation, "Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes"	455	2005
13	Council of Ministers Regulation, "Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes"	135	2007
14	Oromya Regional Administration Council Directives, "Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes"	5	2003
15	Investment (Amendment) Proclamation	373	Oct, 2003

2) Environmental Assessment System

The key policy of the Environmental Impact Assessment (hereinafter referred to as "EIA") system in Ethiopia is set forth in the Environmental Policy of Ethiopia approved by the Council of Ministers in 1997. The goals of the Environmental Policy are, to improve the health and quality of life of the people, and to promote sustainable development through proper management of natural and cultural resources so as to bequeath rich environments to future generations. The EIA Guideline was issued in 2000, and the EIA Proclamation, Proclamation No. 299/2002, was enacted in 2002. The proclamation provides legal basis for implementing an EIA on projects, both public and private, that may possibly affect the environment. The EIA Procedural Guideline was established in 2003. Concrete implementing methods and procedures of EIAs are set forth in the EIA Procedural Guidelines. Proclamation No. 299/2002 stipulates that an EIA must be implemented for all projects and activities, both public and private.

The EIA procedural Guidelines published in 2003 classify projects into the following three environmental review categories based on project scale, scope and location as well as the level of environmental impact as shown in Table 1-3-1.5 below.

Table 1-3-1.5 The EIA Categories According to the Environmental Impact of the Projects

Category	EIA	Content
Schedule 1	Require full scale EIA	• When there is sufficient ground for detail assessment. Projects which may have significant environmental impacts, and therefore require detailed field review and a full environmental impact study. • All projects in environmentally sensitive areas.
Schedule. 2	Require a preliminary assessment (PA)	• Projects with limited impacts. • Projects in which the need of EIA is unclear, and • Proposals with inadequate information.
Schedule 3	No EIA required	Projects which would have no impact and do not require an EIA

Source: Prepared by the Survey Team

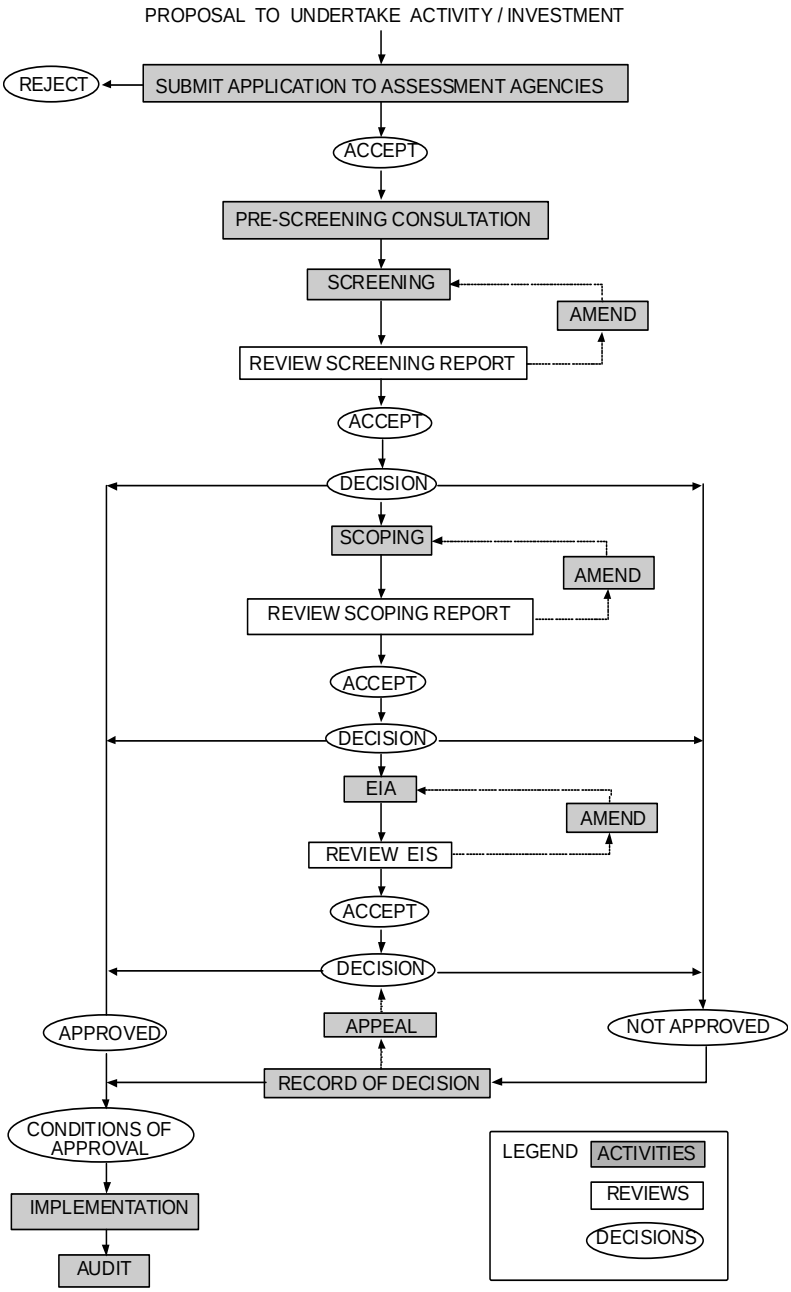
As an initial step, the EPA will require the project proponent to submit a screening report so that the regulatory body delegated by EPA can carry out its screening report of the project. Based on the results of the review, the project will be classified into one of the above-stated categories. A project falling under the first category requiring a full-scale EIA also needs implementation of scoping exercise to define the magnitude of work when undertaking the EIA. The EIA includes survey results, environmental impact forecasts and evaluation, environmental impact mitigation measures, an environmental management plan and an environmental monitoring plan.

Following the provisions of the EIA Guidelines, the implementation procedures of a project requiring a full-scale EIA will have to follow the following steps:

- The proponent submits an application for EIA implementation to the competent authority (EPA) in accordance with the EIA Guideline.
- After acceptance of the application, the proponent carries out screening consultation and submits a screening report to the EPA.
- After approval of the screening report, the proponent carries out scoping and submits a scoping report to the EPA. The EPA will examine the contents of the scoping report, and require amendment if the EIA contents are determined to be insufficient and unsatisfactory.
- After approval of the scoping report, the proponent carries out the EIA and submits an EIA report to the EPA.
- The EPA will examine the contents of the EIA, and may require re-survey and/or amendment if the EIA contents are determined to be insufficient and unsatisfactory, or approve the EIA if its contents are determined to be sufficient and satisfactory.

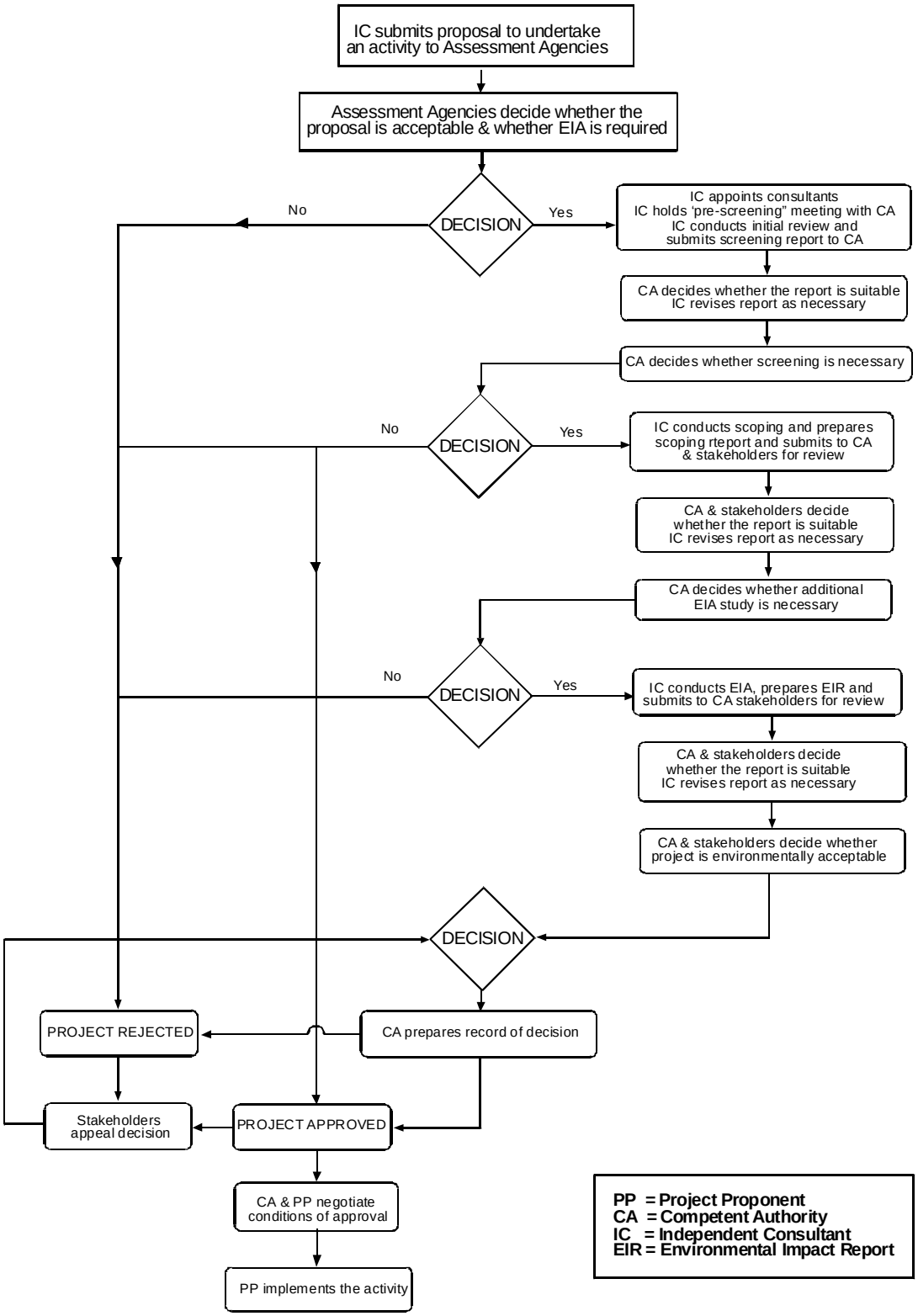
Accountability and residents' participation in the EIA are included as one of the requirements of Section 3.1.3 of the EIA Guidelines which also requires information disclosure to interested and affected parties (hereinafter referred to as "IAP") and stakeholders by conducting consultation at various stages in the EIA process. Although methods for meeting these requirements are not specified in the Guidelines, the proponent must submit a concrete plan for residents' participation.

Based on the provisions of the EIA Guidelines, the implementation procedures for a project requiring a full-scale EIA are shown in Figure 1-3-1.4, and Figure 1-3-1.5 below:



Source: Environmental Impact Assessment Guideline Document, Ethiopia EPA

Figure 1-3-1.4 EIA Application Process



Source: Environmental Impact Assessment Guideline Document, Ethiopia EPA

Figure 1-3-1.5 EIA Implementation Procedure

3) Institution Related to the Land Acquisition and Resettlement

The Constitution guarantees the right of citizens to private property but not for land ownership. Land is recognized as public common property with usufruct rights. Farm land can be used by the citizens freely as long as the possessor of rural land use right. Proclamation No.456/2005 or the "Rural Land Administration and Land Use Proclamation" provides the rights for rural land use. The law also prescribes the governmental responsibility that the regional governments have an obligation to prepare an adequate legislative framework based on the central governmental policy. For farm land, the regional government is responsible for granting and managing rural land use rights.

Principles on land acquisition for the public purpose are provided in the Ethiopian Constitution (1995) and detailed procedure such as the expropriation process and compensation standards are prescribed in Proclamation No. 455/2005 or the "Expropriation of Landholding for Public Purposes and Payment of Compensation Proclamation". Regulation No. 135/2007, on the "Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes, Council Ministers" also provides further details such as compensation standards for each expropriated asset.

According to Regulation No.135/2007, land expropriation is implemented by the local governments, woreda, or urban administration exclusively for public purpose and the Project Affected Persons (hereinafter referred to as "PAPs") should be adequately compensated.

Proclamation No. 455/2005 has provision for displacement compensation. According to Article 8 of the proclamation, a rural landholder whose landholding has been permanently expropriated shall, in addition to the compensation payable under Article 7 of the proclamation, be paid displacement compensation which shall be equivalent to ten times the average annual income he secured during the five years preceding the expropriation of the land.

4) Gaps between Ethiopian Legislations and JICA Guidelines (2010) and Policies on Environmental Assessment

From the above discussions, it can be concluded that the JICA Environmental Guidelines and the legislation in the country do not have major contradiction, except perhaps on certain procedural adjustments during project implementation such as public consultation and public disclosure.

5) Geothermal Power Plant Development Projects

Annex III (APPENDIX III : SCHEDULE OF ACTIVITIES) of the EIA Guidelines contains a list of activities that require an EIA. There is no specific description on the development of geothermal power plants in the classification of the energy industry. This shows that all activities in the energy industry require an EIA.

6) EIA of the Project of Geothermal Wellhead Power System

Ethiopian Electric Power Corporation (hereinafter referred to as "EEPCO") prepared an ESIA report and Abbreviated Resettlement Action Plan for the drilling of four deep geothermal wells at Aluto Langano in November 2010 for the Aluto Geothermal Power Plant Expansion Project Phase III financed by the WB.

EEP has learned of this project just before the JICA's study and the environmental and social considerations study recently conducted by the JICA survey team. EEP is scheduled to be revise the environmental and social considerations study report and submit to MOWIE for review and approval in August 2017.

(3) Environmental Standards Related to Pollution Control

1) Regulations on Standards

Provisional environmental standards, including those for air quality, water quality and noise have been set in the Guidelines for Ambient Environment Standards for Ethiopia in August 2003. Similarly, provisional standards for the control of industrial pollution have been in place in Ethiopia since November 2003. These standards were prepared by the EPA in collaboration with and with the assistance of the United Nations Industrial Development Organization (UNIDO).

2) Hydrogen Sulfide (H_2S)

(a) Environment Standards

For hydrogen sulfide closely associated with geothermal development, the guideline values are stipulated in the Guidelines for ambient environment standards. The guideline value is the same as the WHO guideline value. Hydrogen sulfide guideline values are shown in Table 1-3-1.6 below.

Table 1-3-1.6 Hydrogen Sulfide Guideline Values

Substance	Guideline Value	Averaging Time
Hydrogen sulfide (H_2S)	150 ($\mu g/m^3$)	24hr

Source: Guideline Ambient Environment Standards for Ethiopia (EPA, August 2003)

(b) Workplace Environment Standards

The International Finance Corporation's (IFC) Environmental, Health and Safety Guidelines for Geothermal Projects' maximum allowable concentration of H_2S (TLVs: Threshold limit values) are shown in Table 1-3-1.7.

Table 1-3-1.7 Maximum Allowable Concentration of H_2S Geothermal Projects (Exposure time: 8hr)

Parameter/Pollutant	Maximum value
Hydrogen sulfide (H_2S)	14 (mg/m^3)

Source: International Finance Corporation Environmental, Health and Safety Guidelines for Geothermal Projects, July 1 1998

3) Water Quality

(a) Environmental Standards

The water quality standards relevant to geothermal development are shown in Table 1-3-1.8.

Table 1-3-1.8 Environmental Quality Standards for Water

Parameters	Unite	Limit Value	Remark
Temperature	^{o}C	±3	
pH	-	6 - 9	-
Total Suspended Solids (SS)	mg/L	50	
Biochemical oxygen demand (BOD_5)	mg/L	<5	20 ^{o}C
Dissolved oxygen (DO)	mg/L	>6	
Nitrate (NO_3)	mg/L	50	
Ammonium (NH_3)	mg/L	0.02	NH_3 un-ionized
Arsenic (As)	mg/L	0.05	
Fluoride (F)	mg/L	1	
Chloride (Cl)	mg/L	250	
Mercury (Hg)	mg/L	0.001	
Sulphate	mg/L	200	

Source: Guidelines for Ambient Environment Standards for Ethiopia (EPA, August 2003)

(b) Effluents Standards

The industrial effluent standards have been formulated to control inland water pollution by industries. There are no surface water bodies such as rivers or lakes close to the geothermal project and pollution to water bodies due to the brine water that will be generated from the plant operation will not exist. Allowable effluent limits that can be discharged from geothermal development into the environment are shown in Table 1-3-1.9.

Table 1-3-1.9 Standards of Effluents Discharged to Lands

Parameters	Unite	Limit Value	Remark
pH	-	5.5-9.0	-
Temperature	^{o}C	40	-
Biochemical Oxygen Demand (BOD_5)	mg/L	500	20 ^{o}C
Total Dissolved Solids (TDS)	mg/L	2,100	
Fats, Oils and Grease	mg/L	30	
Mercury (as Hg)	mg/L	0.001	
Arsenic (as As)	mg/L	0.25	
Boron (as B)	mg/L	5	
Chloride (as Cl)	mg/L	1,000	
Fluoride (as F)	mg/L	20	

Source: Standards for Industrial Pollution Control in Ethiopia (EPA, September 2003)

4) Noise

The environmental standards for noise are established for zone types such as residential, commercial and industrial, and for the times between day and night.

Ethiopia has regulations concerning noise emission levels at the industrial areas, commercial areas and residential areas but does not have specific standards in relation to geothermal plants. The nose limits in the industrial areas, commercial areas and residential areas in Ethiopia are indicated in Table 1-3-1.10 below.

Table 1-3-1.10 Noise Standards

Area Code	Category of area	Limits in dB (A) Leq	
		Day time 6:00am. to 9:00pm.	Night time 9:00pm. to 6:00am.
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45

Source: 1) Guidelines for Ambient Environment Standards for Ethiopia (EPA, August 2003)
2) Standards for Industrial Pollution Control in Ethiopia (EPA, September 2003)

5) Solid Waste

Solid waste handling and management are outlined in the Solid Waste Management Proclamation No.513.2007 (EPA, Feb.2007).

The proclamation was established for the management, transportation and disposal of construction and industrial solid waste.

1-3-1-4 Study of Alternative Plans for the Project

Alternative plans for the power plant site locations and transmission line routes were identified in order to maximize the benefits of the project while minimizing negative impact on the environment and reducing project costs.

(1) Alternative Sites of the Power Plant

The survey team analyzed the following three power plant alternative sites.

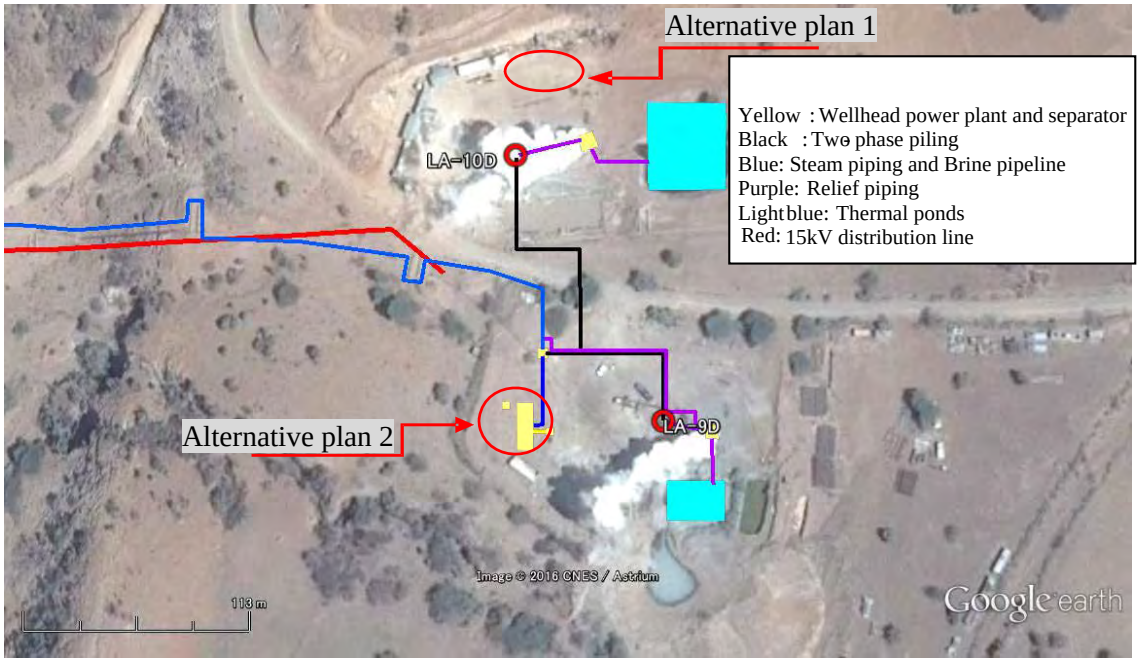
- Alternative Plan 1: Locate on the LA-10D production well pad
- Alternative Plan 2: Locate on the LA-9D production well pad
- Alternative Plan 3: Do not implement the project

The technical, economic and environmental aspects of the alternative plans are shown in Table 1-3-1.11. Alternative Plan 3 will of course mean zero negative impact on the natural and social environment. However, the two wells that have already been drilled will be left unutilized until additional wells are drilled and construction of the planned geothermal power plant is completed. Between Alternative Plans 1 and 2, there is no difference with regard to environmental impact. Alternative Plan 1 would require slightly longer pipelines and transmission lines, and the cost of this alternative will obviously be more. Meanwhile, the pipelines and transmission lines for Alternative Plan 2 will be slightly shorter. In view of the above, Alternative Plan 2 is recommended.

Table 1-3-1.11 Alternative Plans for Power Plant Site Location

Item	Alternative Plan 1	Alternative Plan 2	Alternative Plan 3 (Not to implement the project)
Location of power plant site	Within LA-10D production well pad	Within LA-9D production well pad	N/A
Plan overview	Power plant (5 MW), steam collection system, etc.	Same as Alternative Plan 1	N/A
Technical aspect	Effective utilization of the existing production wells, and supply of electric power	Same as Alternative Plan 1	The existing production wells will not be utilized and electric power will not be supplied.
Land acquisition	The hot water pipeline will used about 0.455 ha of agricultural land.	Same as Alternative Plan 1	No impact
Economic comparison	The pipelines and transmission lines will be slightly longer than those for Alternative Plan 2, and cost is expected to be greater.	The pipelines and transmission lines will be slightly shorter than those for Alternative Plan 1, and will cost less.	N/A
Environmental and social impact	By locating power generating facilities on a well pad where the land has already been prepared, no additional land acquisition will be required. The impact of noise and H_2S is expected to be identical between the two plans, as the nearest house is 650 meters away. The hot water pipeline is to be installed along the existing pipeline route. 910 meters of the planned route will pass through farmland, and 0.455ha of agricultural land will be used.		No impact

Source: Prepared by the Survey Team



Source: Prepared by the Survey Team using Google Earth

Figure 1-3-1.6 Alternative Plans for Power Plant Site Location (○: Alternative Plans)

(2) Alternative Plans for Transmission Line Route

The alternative plans for the transmission line route is indicated in Table 1-3-1.12.

- Alternative Plan 1: A 15 kV overhead transmission line will be installed alongside the existing pipeline, and will run along the slope to reach the side of the pilot plant transformer.
- Alternative Plan 2: On the south side of Alternative Plan 1, a 15 kV overhead transmission line will be installed to run along the slope to reach the side of the pilot plant transformer.
- Alternative Plan 3: No plan to install a transmission line.

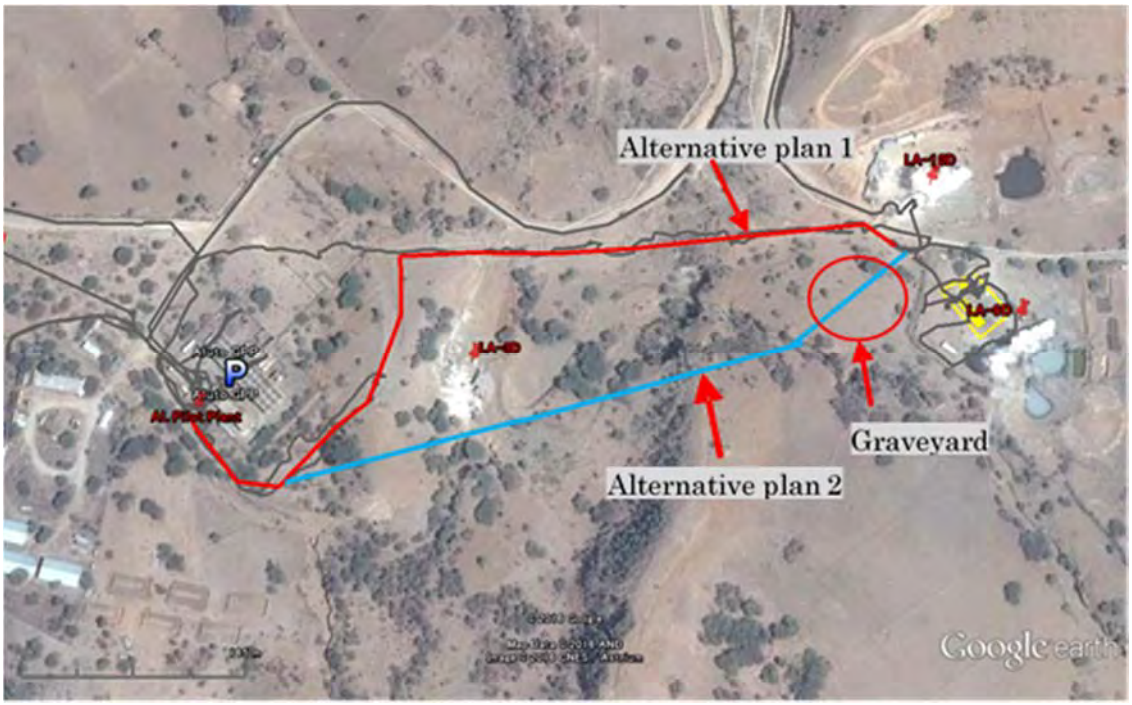
Alternative Plan 3, the non-implementation of the project will have no negative impact on the natural and social environments. But it will also mean that no generated electric power can be delivered to the area of demand.

In terms of environmental and social impact, Alternative Plan 2, with the shortest overhead distribution line, is economical. However, this plan will present difficulties in material transportation, transmission line installation and some other work, as there is a graveyard and a highly eroded area along the route. From technical, social and environmental perspectives, the transmission line route of Alternative Plan 1 is preferable.

Table 1-3-1.12 Alternative plans for transmission line route

Item	Alternative Plan 1	Alternative Plan 2	Alternative Plan 3 (Not to implement the project)
Transmission line route	The line runs alongside the existing pipeline.	The line runs along the slope on the south side of Alternative Plan 1.	N/A
Plan overview	A 15 kV overhead transmission line to connect to the pilot plant transformer (about 700 meters overall length, supported by roughly 16 wooden poles)	Same as Alternative Plan 1	N/A
Technical comparison	There is a bank built on the south side of the pilot plant, as a river forms there in the rainy season. An overhead distribution line will be installed to run in front of the bank and will be connected to the 15 kV switchgear at the outlet of the main transformer.	There will be difficulties in material transportation, transmission line installation, and some other work, as there is a graveyard and a highly eroded area along the route.	Generated electric power cannot be supplied.
Economic comparison	The line will be several tens of meters longer than that for Alternative Plan 2 and will cost slightly more.	Although the line will be shorter by several tens of meters than that for Alternative Plan 1, material transportation and installation work will cost more than Alternative Plan 2.	N/A
Land acquisition	The routes pass through grassland dotted with trees. As the right to use the land is held by the EEP, there is no need to acquire additional land.		No impact
Environmental and social impacts	There is no need for land acquisition or resettlement of residents. The route runs through bushland or grassland used for grazing, and involves no alteration of ecologically important areas.	Although there is no need for land acquisition or resettlement of residents, the route runs through a graveyard. In addition, the route includes some areas where erosion is significant, and could result in the collapse of power poles.	No impact

Source: Prepared by the Survey Team



Source: Prepared by the Survey Team

Figure 1-3-1.7 Alternative Plans for Transmission Line Route

1-3-1-5 Scoping

Scoping for the environmental impact study was based on the site survey results and the project characteristics shown in Table 1-3-1.13 below. In addition, the evaluation was carried out using the rating method in JICA guidelines.

Table 1-3-1.13 Scoping of Impact Items

Item		Evaluation		Item
		Construction stage	In-service period	
Social Environment	Involuntary resettlement of residents	D-	D	Implementation of the project involves no resettlement of residents. The land is government-owned, and the right of use is held by the EEP and the Adami Tulu district government.
	Local economic conditions, such as employment and livelihoods	B+	B+	**Construction stage and In-service period:** A positive impact is expected on the local economy. The living standards of the residents are expected to rise due to increased employment opportunities, local procurement of materials and equipment for construction, and the local purchase of consumable goods for workers.
	Use of land and local resources	B-	D	**Construction stage:** The hot water reinjection pipeline is planned to be constructed on grassland (roughly 790 m × 5 m) and farmland (roughly 910 m × 5 m). The transmission line will be roughly 700 meters in overall length, and about 16 wooden poles will be installed. By

Item		Evaluation		Item
		Construction stage	In-service period	
				locating the power generating facilities on one of the existing production well pads, no additional land will be used. **In-service period:** Geothermal fluids will be used as a local resource. No impact is expected, as there are no hot spring facilities in the project area. The intake of geothermal fluids will be conducted at an impermeable layer approx. deeper than 2,000 meters underground, after inserting a steel pipe (water shielding pipe) down to the intake point, and the hot water from the steam will be reinjected deep underground.
	Social capital and societal structures, such as local decision-making bodies	D	D	No impact is expected, as there are no public facilities or other facilities related to local decision-making bodies in the planned project area.
	Existing social infrastructure and services	D	D	Construction and operation activities are expected to have no impact on social infrastructures and social services.
	The poor	C	C	Although no resettlement of residents is required, farmland will be used, and the poor may be among the holders of rights to use the farmland.
	The indigenous, and ethnic minorities	D	D	In the project area, no settlements of indigenous people or ethnic minorities who need particular consideration have been identified.
	Disproportionate distribution of benefits and damage	B-	D	**Construction stage:** Appropriate consideration should be given when hiring local labor to avoid the disproportionate distribution of benefits and damage regarding employment opportunities. **In-service period:** This project is meant to supply electric power as a public service, and the disproportionate distribution of benefits and damage during the in-service period is unlikely.
	Cultural heritage	D	D	The project area has no known registered sites of culturally, historically or archaeologically important heritage, or important landmarks.
	Conflicts of interest within the area	D	D	In the planned project area and the residents in the surrounding area, there is no opposition to the project from residents, and no conflicts of interest within the area.

Item		Evaluation		Item
		Construction stage	In-service period	
	Water usage or water rights, and communal rights	D	D	**Construction stage:** Impact is unlikely, as the small amount of water needed for construction will be drawn from the existing water pond provided for well drilling. In addition, there is no river or lake in the project area. In Ethiopia, all water resources are government-owned, and no water rights or communal rights exist. **In-service period:** Impact is unlikely, as the power plant system does not use water and the employees will use the existing pilot plant, where a water storage tank that collects rainwater has been installed.
	Public hygiene	D	D	**Construction stage:** Impact is unlikely, as there will be few construction workers, and they will use accommodations in the nearest town. **In-service period:** Impact is unlikely, as there will be few employees. They will use the existing pilot plant, and commute from EEP accommodations in the nearest town.
	Hazards, and risk of infectious diseases such as HIV/AIDS	D	D	**Construction stage:** Construction scale is small, with many workers from outside the area engaged in the construction of the power plant facilities, there may be an increased risk in the transmission and spread of HIV/AIDS infections. **In-service period:** During the in-service period of the power plant, no impact is likely, as there will be few outside workers employed and few operators will be needed.
Natural Environment	Protected areas (National Park)	D	D	There is no national park or conservation or protected area in the project area. Roughly 40 km southwest of the project area is Abidjiatta-Shalla National Park, which is designated as a national park and as a flamingo and pelican sanctuary.
	Topographical and geological features	D	D	**Construction stage:** The eventual power plant construction work is expected to cause topographical alteration to the land. Since there are no important topographical or geological features to be preserved at the planned project site, no impact is foreseen. **In-service period:** No significant impact on topographical and geological features is likely during the in-service period of the power plant, as there will be virtually no new topographical or geographical alteration involved.

Item		Evaluation		Item
		Construction stage	In-service period	
	Soil erosion	B-	B-	**Construction stage:** Almost no site development is required, as the power plant will use a production well pad where the land has already been prepared. However, the construction of pipeline foundations and ponds will create bare ground, where soil erosion may occur during rainfall. **In-service period:** Although there will be no new civil engineering or other such work, soil erosion may occur if preventive measures and maintenance are inadequate.
	Groundwater	D	D	**Construction stage:** Intake of groundwater for construction work is not expected. There are no wells in this area. No impact of construction work on groundwater is likely. **In-service period:** Intake of groundwater for use in the power plant is not expected. Groundwater will not be affected, as reinjection wells and production wells will have steel pipes (water shielding pipes) inserted deep underground below the impervious stratum, gaps between well walls and pipes will be filled with cement, and collection and reinjection of geothermal fluid will be conducted deep (approx. 2,000 m) underground.
	Lake and river conditions	D	D	There are no rivers or lakes near the project area. The construction work is not expected to have impact on any water body.
	Fauna, flora, and biological diversity	B-	B-	**Construction stage:** Project construction will impose no impact on fauna and flora, as the project area is grassland with scattered trees and farmland, and the power plant will be constructed on the LA-9D production well pad. However, some plants may have to be removed for installation of the hot water reinjection pipeline and 15 kV transmission line. **In-service period:** The hot water reinjection pipeline and 15 kV transmission line may cause some impact.
	Landscape	D	D	There are no landscape resources and distant landscapes as viewed from the viewpoints in the project site, impact on the landscape is not expected.
Pollution Control	H_2S	D	B-	**Construction stage:** H_2S impact is not expected, as there is no emission of H_2S. **In-service period:** Since geothermal steam that contains NCGs (including H_2S) will be emitted from the top of the silencer, there may be some environmental impact in the immediate vicinity of the power plant.

Item		Evaluation		Item
		Construction stage	In-service period	
	Water quality	D	D	Water pollution is not expected, as there are no water bodies such as rivers or lakes around the project area. Effluents from the project is not expected.
	Soil contamination	D	D	**Construction stage: S**ubstances that may contaminate the soil are not likely to be used or handled. **In-service period:** Geothermal hot water is not likely to contaminate the soil, as all of it will be reinjected deep underground. Soil pollution is not expected.
	Waste	B-	D	**Construction stage:** During construction, industrial waste (construction waste) and turned up soil is likely to be generated. **In-service period:** Generation of industrial waste is assumed to be small.
	Noise and vibration	B-	B-	**Construction stage:** Noise generated from the operation of construction machinery may have some impact on the nearby residents. There are private homes and other such structures along the route used to transport materials to and from the construction sites, and there may be some impact on these homes or structures. **In-service period:** Noise and vibration generated by the silencer and generators may affect residents near the planned project area.
	Offensive odors	D	B-	**Construction stage:** During the construction phase, no materials that generate offensive odors are used, and so no impact is expected. **In-service period:** The offensive odor of H_2S discharged from cooling tower is likely to have an impact in the neighborhood of the power plant.
	Accidents	B-	B-	**Construction stage:** If safety management is inadequate, there may be accidents during construction, including traffic accidents. **In-service period:** If safety management and maintenance management are inadequate, there may be accidents caused by leakage of high-concentrations of H_2S gas, releases of high-temperature steam or the dispersion of hot water.

Note: A: A significant impact is assumed. B: Some degree of impact is assumed.
C: The degree of impact is unidentified, and future investigation for clarification is needed.
D: As the impact will be minimal, future investigation is unnecessary.
+: Positive impact -: Negative impact
Source: Prepared by the Survey Team

1-3-1-6 TOR for Environmental and Social Considerations Study

Based on the scoping results above, the TOR for EIA study has been defined as shown in Table 1-3-1.14.

Table 1-3-1.14 TOR for Environmental and Social Considerations Study

Item	Study Item	Methods
Social Environment		
Use of land and local resources	Agricultural land to be used by the project	• Site Visit • Socio-economic study by local consultant
The poor	Agricultural land and income situation of the affected households	Same as above
Disproportionate distribution of benefits and damage	Employment opportunities and labor force of project site employment	• Site Visit • Employment study on the labor force potential within and around the project site community by local consultant
Natural Environment		
Soil erosion	• Soil erosion situation • Soil erosion prevention measures	• Site Visit • Review of existing literature and data
Fauna, flora, and biological diversity	Type and diversity of flora and fauna to growth and living in the project site and surrounding area	• Site Visit • Review of existing literature and data • Interview to the relevant institutions
Pollution Control		
H_2S	• Current H_2S concentrations at project site • Environment and workplace standards • Environment conditions of project site • H_2S concentration around the power plant the during period of plant operation.	• Site Visit • Review of existing literature and data • Prediction of H_2S concentration in the vicinity of the power plant and residence
Noise	• Environment and workplace standards • Current noise level at project site • Environment conditions of project site • Noise level around the power plant during period of plant operation.	• Site Visit • Review of existing literature and data • Confirmation of the present situation noise level • Prediction of noise levels
Odor	• Current H_2S concentrations at project site • Environment conditions of project site • H_2S concentration around the power plant during period of plant operation.	• Site Visit • Confirmation of the present situation H_2S concentration • Prediction of H_2S concentration in the vicinity of the power plant and residence
Wastes	• The amount of civil surplus soil and construction industry waste • Waste treatment method	• Review of existing literature and data • Confirm the industrial waste generated from the project plan

Source: Prepared by the Survey Team

1-3-1-7 Survey Results Regarding Environmental and Social Considerations

The results of surveys conducted for each impact item based on the above TOR are as shown in Table 1-3-1.15.

Table 1-3-1.15 Survey Results

Item	Survey Results
Social Environment	
Use of land and local resources	The project hot water reinjection pipeline of about 1,700 m is to be installed along the existing hot water reinjection piping route. In the planned route, 910 meters will pass through farmland, and 710 m will pass through grass land. In Ethiopia all the land is government-owned. EEP holds the land use right of the hot water reinjection pipeline route. Roughly 0.5 hectares (910 m × 5 m = 4,550 square meters) of farmland will be needed for the installation of the hot water reinjection pipeline for this project, and this is part of a farmland used by a total of eight households. Compensation for agricultural land and crops will be paid by the EEP. The EEP has provided compensation for houses (Tukul), farmland and crops when acquiring land for the well drilling base. The EEP will pay compensation in accordance with the laws concerning compensation and after consulting with the Adami Tulu local government, the heads of local communities (kebele) and the PAPs. Impact from the use of grassland is expected to be minimal because the area to be used is minimal (roughly 790 m × 5 m = 4,000 square meters), the land use rights are owned by EEP, and there are vast pasturelands extending around the area. In summary, the project affected agricultural area is about 0.25% to 6.67% of the affected household total agricultural land, which is less than 20% the impacts on community residents is expected to be small. With regard to those who used the farmland along the route of the geothermal hot water pipeline, their status regarding assets and the areas of farmland to be affected are shown in the table below. With regard to those who hold the rights to use the farmland along the route of the geothermal hot water pipeline, their status regarding assets and the areas of farmland to be affected are shown in the table below.  Source: Prepared by the Survey Team Agricultural land to be used for a new rejection pipeline

Item: Survey Results

Composition of the affected households and means of livelihood

No.	Name of household head	No. of persons in household	No. of Children	No. of adults +60 years of age	No. of students	Source of income	Size of agricul-tural land (ha)	Type of production
01	A	8	6	--	3	Farming	10	Maize, Barley, Teff, Wheat
02	B	18	15	--	8	Ditto	1.5	Ditto
03	C	9	7	1	5	Ditto	2	Ditto
04	D	15	13	2	6	Ditto	4	Ditto
05	E	8	2	-1	6	Ditto	2	Maize, Teff, Barley, Wheat & Millet
06	F	10	5	1	7	Ditto	3	Maize, Barley, Wheat & Millet
07	G	10	5	--	3	Ditto	3	Maize, Barley, Wheat & Soya Bean
08	H	11	6	--	3	Ditto	3	Maize, Barley, Teff, Wheat, Millet & Soya bean

Source: Prepared by the Survey Team

Income Status of the PAPs

No.	Name of household head	Size of agricultural land (ha)	Affected farmland (m)	Uses of property (housing, economic activity, other)	Employme nt status of all adults	Income of household (Ethiopian Birr Per Year)	Percentage of affected land in total farmland
01	A	10	50 x 5	Economic activity	Farmers	100,000.	0.25
02	B	1.5	200 x 5	Ditto	Ditto	20,000	6.67
03	C	2	150 x 5	Ditto	Ditto	20,000	3.75
04	D	4	200 x 5	Ditto	Ditto	25,000	2.5
05	E	2	150 x 5	Ditto	Ditto	20,000	3.75
06	F	3	50 x 5	Ditto	Ditto	30,000	0.83
07	G	3	50 x 5	Ditto	Ditto	30,000	0.83
08	H	3	60 x 5	Ditto	Ditto	30,000	1.0

Source: Prepared by the Survey Team

Item	Survey Results
The poor	Social and livelihood characteristics of households affected by the project's use of farmland, including family composition and income are shown in the table below. The affected households have 8 to 18 family members, and their main source of income is agricultural crops from farming. Except for one household bringing in 100,000 Birr, the annual household income is 20,000 to 30,000 Birr, with no significant differences between households. No low-income households that need special consideration were identified.
Disproportionate distribution of benefits and damage	The construction of this project will take one to two years. There may be a risk of disproportionate distribution of benefits and damage regarding employment opportunities for workers to be hired for construction work. In the existing power plants, several local residents have been employed for jobs that do not require particular skills (such as security, cleaning, and grass cutting). When drilling wells LA-9D and LA-10D, a dozen local residents were employed. According to the EEP, all employment opportunities are displayed on a bulletin board, and the hiring of applicants is decided while considering the balance between communities, and circumstances of living and income. This is done in a conference consisting of the heads of the three neighboring local communities (*kebele*) and the project manager. For this project, hiring will be conducted in this same manner. The disproportionate distribution of benefits and damage is unlikely as long as information is shared and a conference on hiring takes place.
Natural Environment	
Fauna, flora, and biological diversity	a. Impact on fauna There are no protected species, indigenous species or species included in the IUCN Red List of Threatened Species to be found in the project implementation area. The power plant facilities are expected to impose no impact on animals or plants, as the facilities will be located on the existing well pad and no vegetation will be removed. The grassland and farmland areas to be altered by the installation of the hot water reinjection pipeline will be minimal, with 790 meters × 5 meters of grassland and 910 meters × 5 meters of farmland used. The overall length of the transmission line will be roughly 700 meters, and there will be roughly 16 power poles installed. No more than roughly a dozen trees will be felled for installation of the hot water reinjection pipeline and transmission line. As this is a small facility and there is vast grassland with tree groves around the project area, impact is expected to be minimal. The project area consists of grassland, which is mainly used for grazing, and groves of low trees, around 2 to 5 meters in height, with similar environments broadly distributed around it. In addition, there are no environmental features specific to the project area. Therefore, the impact of the power plant and pipelines on animals is expected to be minor. b. Impact on flora Most of the vegetation in the project area is grassland, and groves of trees around 2 to 5 meters in height consisting of few varieties, with Acacia sp. which is used for grazing being dominant. Although pipeline and transmission line construction will involve the felling of a dozen or so trees, the impact on plants is considered to be minor as environments homogeneous with the project area extend around it and the project area has no distinctive environmental features.

Item	Survey Results
Soil erosion	The soil in the project area consists mainly of volcanic ejecta, including acidic and basic lava mixtures. As a result of field confirmations, it is known that the soil is dry and prone to erosion due to its weak cohesive properties. Therefore, throughout this area, including the project area, soil erosion naturally occurs and many erosion ditches are observed. Construction of pipeline foundations, access roads, etc. will create bare ground. If this ground is left exposed over a long period of time, the soil will erode during rainfall.  Source: Prepared by the Survey Team Erosion grooves (Gully) which are naturally occurring

Pollution Control

H_2S

a. Environment standard

For H_2S, the guideline values are stipulated in the Guidelines for Ambient Environment Standards. Hydrogen sulfide guideline values are indicated in the table below.

Hydrogen Sulfide Guideline Values

Substance	WHO Guideline Value	Averaging Time
Hydrogen sulfide (H_2S)	150 ($\mu g/m^3$)	24 hr

Source: Guidelines Ambient Environment Standards for Ethiopia (EPA, August 2003)

b. Human health effects

The limits on effect on human health due to H_2S exposure is shown in the table below.

Human Health Effects at Various Hydrogen Sulfide Concentrations

Exposure		Effect / observation	Reference
(mg/m^3)	ppm		
0.011	0.05	Odour threshold	Amoore & Hautala, 1983
2.8	2	Bronchial constriction in asthmatic individuals	Jappinen et al, 1990
5	3.6	Increased eye complaints	Vanhoorne at al, 1995
7 or 14	5 or 10	Increased blood lactate concentration, decreased skeletal muscle citrate synthase activity, decreased oxygen uptake	Bhambhani & Singh,1991 Bhambhani et al., 1996,1997
5～29	3.6～20	Eye irritation	IPCS, 1981
28	20	Fatigue, loss of appetite, headache, irritability, poor memory, dizziness	Ahlhorg, 1951
>140	100	Olfactory paralysis	Hirach & Zavala, 1999
>560	400	Respiratory distress	Spolyar, 1951
≧700	500	Death	Beauchamp et al., 1984

Source: Concise International Chemical Assessment Document No.53 Hydrogen Sulfide:Human Health Aspects (2003)

c. Current H_2S concentrations and conditions of surrounding area

The area surrounding the planned power plant site is grassland with dotted with trees, with no houses. The nearest house is roughly 650 meters from the planned power plant site.

The current levels of H_2S were checked in the area around the planned power plant site and at the site of the nearest house, and all measurements were below detectable levels. For H_2S odor in the area around the planned power plant site (LA-9D and LA-10D), it was noticeable only at downwind sites.

d. Prediction of H_2S concentrations during the in-service period

Input data for the emission point source shown in in table below.

Steam Flow	NCGs in Steam	H_2S Content of NCG	Emission source height	Exhaust gas temperature	Temperature
40 t/h	7 wt%	4 mol%	10 m	93 deg. C	23 deg. C

Source: Prepared by the Survey Team

H_2S concentrations were predicted by using a plume diffusion model and diffusion parameters (Pasquill stabilities). The predicted 24-hour mean of maximum ground level H_2S concentrations is less than 0.1 ppm at the site of the nearest house, which satisfies the guidelines.

As the predicted H_2S concentrations in the area around the power plant are less than 1 ppm, the impact of H_2S on workers and the surrounding natural environment is estimated to be insignificant.

No complaints regarding H_2S were reported from residents in the surrounding area during operation of the existing pilot power plant and testing of the wells.

Noise and vibration

a. Environmental standards

The environmental standards for noise are established for the various zones classified as residential, commercial and industrial, and by the time division of daytime and nighttime.

The environmental noise level limits are shown in the table below.

Noise Standards

Area Code	Category of area	Limits in dB (A) Leq	
		Day time 6:00am. to 9:00pm.	Night time 9:00pm. to 6:00am.
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45

Source：1) Guidelines on Ambient Environment Standards for Ethiopia (EPA, August 2003)
2) Standards for Industrial Pollution Control in Ethiopia (EPA, September 2003)

b. Current noise levels and conditions of the surrounding area

The area around the planned power plant site is grassland with few scattered trees and there are no houses within the project site. The nearest house is roughly 650 meters from the planned power plant site.

Three locations have been selected to measure background noise level at the site and two at the points nearest houses/villages. The results of the measurement are indicated in the table below.

Current Noise Levels

Site	Power Plant Site	Settlement site 1	Settlement site 2
Noise Level (dB)	44	41	39

Source: Prepared by the Survey Team

c. Impact during the construction stage

The biggest source of noise and vibration during construction of the power plant, pipelines and transmission lines is the operation of heavy machinery and vehicles transporting generators and other equipment and materials. For power plant construction, a well pad where the ground has already been prepared will be used, and the heavy machinery needed for foundation work will be limited to backhoes, cranes and the like. The traffic of vehicles transporting equipment and materials including portable generators, and vehicles used to transport construction workers are expected to amount to several vehicles per day. As there is no house near the planned power plant site or the road, the impact of noise and vibration during construction on residents living in the surrounding area is expected to be minor.

d. Prediction of noise during the in-service period

Major sources of noise during the in-service period of the power plant are the power generation facilities and silencers. Noise one meter from an existing equivalent facility is 73 dB. With 73 dB as the sound source, predictions of noise levels at the nearest house, 650 meters away from the planned power plant site, were studied. The results suggested 41.8 dB, which is 0.8 dB greater than the current maximum noise of 41 dB around the house. This value satisfies the environmental criteria for houses in Ethiopia. Thus, the impact of noise from power plant operations on residents in the surrounding area is expected to be minor.

Offensive odors

a. Current conditions

The area around the planned power plant site is a geothermal field, and there is some H_2S odor present in the natural environment. During the field survey, H_2S odor was sensed occasionally, depending on the direction of wind.

b. Impact during the in-service period

The 24-hour mean of predicted H_2S concentrations generated by the power plant when it is put into service came to less than 0.1 ppm in the area around the nearest house. In this area, the wind blows from the northeast from October to May, and from the southwest or south-southwest from June to September. Since the nearest house is located to the west of the planned power plant site, it will rarely be downwind throughout the year and, therefore, the impact of odor is expected to be insignificant.

Wind Direction in the Adami Tulu Meteorological Weather

Station	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Adami Tulu	2013	NE	NE	NE	ENE	SSW	SSW	SSW	SW	Calm	NE	NE	NE
	2014	NE	NE	NE	NE	SW	SW	SW	SW	SW	SW	NE	NE
	2015	NE	NE	NE	NE	NE	SW	SW	SSW	SW	NE	NE	NE

Source: Adami Tulu Meteorological Station

Waste

Construction of the power plant, pipelines and other relevant facilities will generate small amounts of waste soil as well as concrete, wood, scrap metal, etc. from civil engineering work. Waste soil and concrete will be used to back-fill the pond used for drilling well LA-9D and for repairing roads in the vicinity. The small volume of wood (wooden crates for equipment) and scrap metal created is in demand locally, and will be collected for reuse or recycling.

Other

Accidents

- Grazing takes place in the area around the power plant, where increased traffic during the construction period may raise the likelihood of traffic accidents. During construction of the pilot plant and well drilling, vehicles related to the EEP observed the speed limit and prioritized passage of livestock and other animals. No accidents occurred during the in-service period of the pilot plant or during drilling of the wells.
- Installation of pipelines and transmission lines includes a section on a mountain slope. If safety management is inadequate, there may be a risk of accidents. During the in-service period, inadequate safety management may entail a risk associated with the leakage of highly concentrated H_2S gas, a blast of high-temperature steam, dispersion of hot water, or the like.
- At the time of tender, the EEP shall confirm that the health, safety, and social environment management plan, submitted by the construction management consultant and contractors, is in accordance with the environmental and social safety guidelines for constructors. The construction management consultant and contractor will implement safety management in accordance with this plan to avoid or reduce the risk of workers or residents getting involved in an accident.
- In accordance with labor laws, safe working environments shall be prepared by providing workers with personal protective equipment and mandating its use.
- Near the wells, a hot water reservoir provided with permeation prevention measures shall be provided to temporarily store hot water that may flow out from the production wells in case of an accident. The reservoir shall hold the water until the flow is stopped by a valve.
- Procedures to follow when rescuing those affected by high-concentrations of H_2S gas shall be prepared.
- Fences shall be installed around the construction sites (particularly material yards), production wells, and hot water reservoir. Security guards will be allocated to prevent theft and accidents.

1-3-1-8 Impact Assessment

Based on the study results above, the impacts of the project are evaluated and compared to the evaluations results obtained during the scoping phase (Table 1-3-1.16).

Table 1-3-1.16 Impact Assessment Based on the Environmental and Social Considerations Study

Item	Evaluation at Scoping		Assessment based on survey and prediction results		Reason
	Construction stage	In-service period	Construction stage	In-service period	
Social Environment					
Involuntary resettlement of residents	D	D	D	D	Same as the scoping (hereinafter "-")
Local economic conditions, such as employment and livelihoods	B+	B+	B+	B+	-
Use of land and local resources	B-	D	B	D	**Construction stage:** The hot water reinjection pipeline is planned to be constructed on grassland (roughly 4,000 m^2) and farmland (roughly 4,550 m^2). Construction of the power plant related facilities will involve some alterations of land use. Only a small area of land is required, and social impact on community residents is expected to be limited.
Social capital and societal structures, such as local decision-making bodies	D	D	D	D	-
Existing social infrastructure and services	D	D	D	D	-
The poor	C	C	D	D	The residents affected by the project have not been identified as poor.
The indigenous, and ethnic minorities	D	D	D	D	-
Disproportionate distribution of benefits and damage	B-	D	D	D	**Construction stage:** All employment opportunities are displayed on a bulletin board, and the hiring of applicants is decided while considering the balance between communities, and circumstances of living and income. This is done in a conference consisting of the heads of the three neighboring local communities (*kebele*) and the project manager. The disproportionate distribution of benefits and damage is unlikely as long as information is shared and a conference on hiring takes place.

Item	Evaluation at Scoping		Assessment based on survey and prediction results		Reason
	Construction stage	In-service period	Construction stage	In-service period	
Cultural heritage	D	D	D	D	-
Conflicts of interest within the area	D	D	D	D	-
Water usage or water rights, and communal rights	D	D	D	D	-
Public hygiene	D	D	D	D	-
Hazards, and risk of infectious diseases such as HIV/AIDS	D	D	D	D	-
Natural Environment					
Protected areas (National Park)	D	D	D	D	-
Topographical and geological features	D	D	D	D	-
Soil erosion	B-	B-	B-	B-	**Construction stage:** Almost no site development is required, as the power plant will use a production well pad where the land has already been prepared. However, the construction of pipeline foundations and ponds will create bare ground, where soil erosion may occur during rainfall. **In-service period:** Although there will be no new civil engineering or other such work, soil erosion may occur if preventive measures and maintenance are inadequate.
Groundwater	D	D	D	D	-
Lake and river conditions	D	D	D	D	-
Fauna, flora, and biological diversity	B-	B-	D	D	**Construction stage:** The power plant facilities are expected to impose no impact on animals or plants, as the facilities will be located on the existing well pad and no vegetation will be removed. The grassland and farmland areas to be altered by installation of the hot water reinjection pipeline will be minimal, with 790 meters × 5 meters of grassland and 910 meters × 5 meters of farmland used. The overall length of the transmission line will be roughly 700 meters, and there will be roughly 16 power poles installed. No more than roughly a dozen trees will be felled for installation of the hot water reinjection pipeline and transmission line. As this is a small facility and there is vast grassland with tree groves around the project area, impact is expected to be minimal.

Item	Evaluation at Scoping		Assessment based on survey and prediction results		Reason
	Construction stage	In-service period	Construction stage	In-service period	
					In-service period: The project area consists of grassland, which is mainly used for grazing, and groves of low trees, around 2 to 5 meters in height, with similar environments broadly distributed around it. In addition, there are no environmental features specific to the project area. Therefore, impact of the power plant and pipelines on animals is expected to be minor.
Landscape	D	D	D	D	-
Pollution Control					
H_2S	D	B-	D	B-	**Construction stage:** H_2S impact is not expected, as there is no emission of H_2S. **In-service period:** Although geothermal steam that contains NCGs (including H_2S) will be emitted from the power plant, the predicted H_2S concentration satisfies the guidelines (less than 0.1 ppm) at the site of the nearest house. The impact of H_2S on the surrounding environment is estimated to be significant.
Water Quality	D	D	D	D	-
Soil contamination	D	D	D	D	-
Wastes	B-	D	B-	D	**Construction stage:** During construction, industrial waste (construction waste) and excavated soil is likely to be generated. **In-service period:** Generation of industrial wastes is expected to be minor.
Noise and vibration	B-	B-	D	B-	**Construction stage:** For power plant construction, a well pad where the ground has already been prepared will be used, and the heavy machinery needed for foundation work will be limited to backhoes, cranes and the like. The traffic of vehicles transporting equipment and materials including portable generators, and vehicles used to transport construction workers are expected to amount to several vehicles per day. As there is no house near the planned power plant site or the road, the impact of noise and vibration during construction on residents living in the surrounding area is expected to be minor. **In-service period:** Noise and vibration generated by the silencer and generators may affect residents near the planned project area. Predictions of noise levels at the nearest house were studied and the results suggested 41.8 dB, This value satisfies the environmental criteria for houses in Ethiopia. Thus, the impact of noise from power plant operations on residents in the surrounding area is expected to be minor.

Item	Evaluation at Scoping		Assessment based on survey and prediction results		Reason
	Construction stage	In-service period	Construction stage	In-service period	
Offensive odors	D	B-	D	B-	**Construction stage:** During the construction phase, no materials that generate offensive odors will be used, and so no impact is expected. **In-service period:** The offensive odor of H_2S discharged from cooling tower is likely to have an impact in the neighborhood of the power plant. In this area, the wind blows from the northeast from October to May, and from the southwest or south-southwest from June to September. Since the nearest house is located to the west of the planned power plant site, it will rarely be downwind throughout the year and, therefore, the impact of odor is expected to be insignificant. In addition, the area around the planned power plant site is a geothermal field, and there is some H_2S odor present in the natural environment. During the field survey, H_2S odor was sensed occasionally, depending on the direction of wind.
Other					
Accidents	B-	B-	B-	B-	**Construction stage:** If safety management is inadequate, there may be accidents during construction, including traffic accidents. **In-service period:** If safety management and maintenance management are inadequate, there may be accidents caused by leakage of high-concentrations of H_2S gas, releases of high-temperature steam or the dispersion of hot water.

Note:
A: A significant impact is assumed.
B: Some degree of impact is assumed.
C: The degree of impact is unidentified, and future investigation for clarification is needed.
D: As the impact will be minimal, future investigation is unnecessary.
+: Positive impact
-: Negative impact

Source: Prepared by the Survey Team

1-3-1-9 Proposed Mitigation Measures, and Costs of Implementing Mitigation Measures

Table 1-3-1.17 shows negative environmental impacts of the proposed project and the mitigation measures proposed to minimize said impacts based on survey outcomes.

Table 1-3-1.17 Mitigation Measures, Responsible Organization and Costs

No.	Item	Possible impact	Mitigation measures	Implementing organization	Responsible organization	Costs (USD)
Construction stage						
1	Land use and natural resources	Impact of the use of farmland for the project on community residents	•Compensation for agricultural crops •Compensation for cultivated crops based on agreement with the affected individuals.	EEP	EEP	4,651 USD
2	Soil erosion	Construction of the power plant and related facilities will create bare ground, where soil erosion may occur during rainfall.	•Appropriate planning for felling and disturbance of vegetation in the project area •Installation of drainage channels around the power plant and ponds •Designs that consider the topographical features of the site.	Contractor	EEP	Included in the construction costs
3	Waste	During construction of the power plant, pipelines, and other related facilities, small amounts of waste soil from civil engineering work, as well as concrete, wood, scrap metal, etc. will be generated.	•Waste soil from civil engineering work and concrete will be used to back-fill the pond used for drilling well LA-9D and for road repair around the site. •Small amounts of wood (crates for equipment) and scrap metal are in demand locally, and will be collected for reuse or recycling. •Domestic waste (plastic bottles, cans and bottles) will be sorted and stored in a temporary storage yard and will be disposed in landfills in the existing facility premises.	Contractor/ EEP	EEP	Included in the construction costs

No.	Item	Possible impact	Mitigation measures	Implementing organization	Responsible organization	Costs (USD)
4	Accidents	If safety management is inadequate, accidents during construction work, traffic accidents, etc. may occur.	• At the time of tender, the EEP shall confirm that the health, safety, and social environment management plan submitted by the construction management consultant and contractors should be based on the environmental and social safety guidelines for constructors. • In accordance with labor laws, a safe working environment shall be prepared by providing workers with personal protective equipment, and by mandating its use. • Fences will be installed around the construction sites (particularly material yards), production wells, and hot water reservoir, and security guards will be allocated to prevent theft and accidents.	EEP	EEP	Included in the construction costs
In-service period						
1	Soil erosion	Soil erosion may occur if erosion prevention measures and maintenance are inadequate.	Periodic inspections shall be conducted, and if soil erosion is detected. Corrective measures shall be taken at an early stage.	EEP	EEP	Included in the operating cost
2	H_2S and offensive odors	After the power plant is put in service, H_2S contained in the NCGs will be constantly emitted. This may have some impact on the area around the power plant.	The height of the silencers through which NCGs containing H_2S are emitted shall be 10 meters.	Manufacturer	EEP/Consultant	Included in the facility cost

No.	Item	Possible impact	Mitigation measures	Implementing organization	Responsible organization	Costs (USD)
3	Noise	Noise and vibration from silencers, generators and other equipment may have some impact on people living in the surrounding area.	Specifications for silencers, generators and other equipment shall satisfy the environmental standard of 45 dB or less at a distance of 200 meters from the noise source.	Manufacturer	EEP/Consultant	Included in the facility cost
4	Accidents	If safety management and maintenance is inadequate, accidents associated with leakage of highly concentrated H_2S, blasts of high-temperature steam, or the dispersion of hot water may occur.	•Near the wells, a hot water reservoir with permeation prevention measures shall be provided to temporarily store hot water that may flow out from production wells during an accident, until the hot water is stopped by a valve. •Maintenance and operation manuals shall be prepared. •Based on the labor laws, a safe working environment shall be provided by equipping the workers with personal protective gear, and mandating its use.	EEP	EEP	Included in the operating cost

Source: Prepared by the Survey Team

1-3-1-10 Environmental Management and Monitoring Plan

(1) Environmental Management and Monitoring Plan

Based on the results of the mitigation measures studies, the monitoring plan for each item is shown in Table 1-3-1.18.

Table 1-3-1.18 Monitoring Plan

Environmental monitoring parameters		Monitoring site	Methods	Frequency	Responsible body	Cost (USD)
Construction phase						
Noise	Noise level	Construction site and nearest residence/community site	Measurement by the noise meter	• Daily (Construction implementation area) • Once/week (nearest residence/community)	Contractor/ EEP	Including the construction costs
Wastes	Waste management	Construction site	Type and quantity of the generated amount waste (Weight or volume), and site investigation.	Once/month	Contractor/ EEP	Including the construction costs
Soil erosion	Soil erosion situation	Project site	Site observation and photographic recording	Once/month	Contractor/ EEP	Including the construction costs
Land use	Living conditions (household income) and compensation situation of agricultural crops	Residents affected	Interviews with affected people	4 times/year	EEP	2,500 USD
Disproportionate distribution of benefits and damage	Employment of local residents and regional employment	Contractor	Confirmation from contractors on employment contract and payments	4 times/year	EEP	2,500 USD
Accidents	Occurrence and frequency of accidents and the training to be provided to prevent accidents	Contractor	Confirmation of the occurrence of accidents using the accident report and through interviewing the contractors and employees.	Biannually	EEP	1,500 USD
In-service period						
Air pollution	H_2S	Power plant site (east, north, south, west) of 4 point, and the nearest residence/community site	H_2S measurement meter (use of measuring instrument that can measure up to 0.01 ppm)	Once/month (First year), then 4 times/year	EEP	Including the operating cost

Environmental monitoring parameters		Monitoring site	Methods	Frequency	Responsible body	Cost (USD)
Noise	Noise Level	Power plant site (East, north, south, west) of 4 point, and the nearest residence/community site	Measurement by the noise meter	Once/month (First year), then 4 times/year	EEP	Including the operating cost
Soil erosion	Soil erosion situation	Areas around power plant and related facilities	Site visits to check the occurrence soil erosion and photographic recording	Once/month	EEP	Including the operating cost
Accidents	Occurrence and frequency of accidents and the training to be provided to prevent accidents	Confirmation of the occurrence of accidents using the accident report and through Interviewing the contractors and employee	Confirmation of the accident report and the training record	Biannually	EEP	Including the operating cost

Source: Prepared by the Survey Team

(2) Monitoring implementation system

The EEP has an EHS&Q Department, which takes charge of formulating and administering policies on quality control, EIAs and management, health, and safety. Under the EHS&Q Department, the Environmental and Social Office has also been established. Duties and responsibilities of this office are to carry out regular monitoring to ensure proper implementation of the proposed mitigation measures during the construction and operation of projects related to the generation of power. However, during the visit it was confirmed that this office has no capacity or experience in relation to the monitoring of geothermal power plants, and has no appropriate monitoring devices useful for monitoring purposes. During the visit they requested to have some support from the Japanese government to improve their technological skills and enhance their means of monitoring. They specifically requested to receive the following type of support:

- The inclusion of an environmental engineer in the technical support team of the office
- The provisions of technical guidance and training for monitoring by JICA's specialists to enable them to properly carry out environmental monitoring on the proposed project.
- Support in the form of environmental monitoring devices (sound level meters and H_2S measuring instruments)

1-3-1-11 Consultations with Stakeholder

Venue: Project site of Aluto Langano geothermal field

Date/time: July 28, 2016 1:00 p.m. - 4:00 p.m. (three hours)

Participants:

About 80 participants from Abeyi Deneba, Golba Aluto and Aluto kebele within the age range of 10 to 60 years old, with a male to female ratio of 1:4, participated.

Notice of meeting, deciding time and language:

Notice of the meeting was communicated through word of mouth to the kebele leader and local residents in advance.

The time and place for the meeting has been decided to be held was at the project site and the language that will be used during the meeting was agreed to be in the local language (Oromiffa).

Contents of meeting:

- Agenda
  - Introduction of the assessment team,
  - Explanation of purpose of the meeting,
  - Briefing on the Geothermal Wellhead Power System Project
  - Positive and negative impacts of the Project,
  - Discussion on mitigation measures,
  - Discussion on the procedures and modality of compensation, grievance procedures, etc.
- Briefing on the project and possible impact on the environment

A briefing on the Geothermal Wellhead Power System Project was conducted and the assessment team discussed with the participants the components of the Project and their possible impact on the environment.

- It explained that the erection of a power station near the newly drilled wells near LA-9D is one of the project's components. The location selected for the power station is already owned by the Aluto Langano Geothermal Expansion Project and there will not be any land acquisition for the erection of the power station.
- It is planned to construct a 700 meter length transmission line from the power station to the existing power plant. The transmission line passes through grazing land. There will be temporary impact on the grazing land during construction period.
- The third component of the project is construction and laying of reinjection pipe from the proposed power station area to LA-7. There will be some impacts on farm lands owned by farmers living around LA-7.

The question raised by the community during the meeting and the responses provided by EEP and the survey team are summarized in Table 1-3-1.19.

Source: Prepared by the Survey Team

Figure 1-3-1.8 Stakeholder Consultation with Project Site Residents

Table 1-3-1.19 Question Raised and Responses Provided to the Participants

Questions from Community	Response	Environmental Measurement
1) For cooperation to the project and pound around existing wells		
• The Geothermal Wellhead Power System Project will greatly contribute to the country's socio-economic development therefore the community will support the implementation of the Project. • The location where the power station to be erected is near the two newly drilled geothermal wells. There are two ponds near the wells and they create danger to the surrounding community as well as cattle because water ponds have no fences. Therefore the project office shall make fence around the water pond.	It was explained that the project has a plan to make fences around the water ponds and around the power station compound and geothermal wells.	The project office agreed to make fences around the water ponds and around the power station compound and geothermal wells.
2) Compensation for crops		
Participants of the meeting raised the problem of delay in compensation payment.	It was explained that compensation payment will be paid to affected farmers before the start of the construction in accordance with the compensation laws of the country. The project office with the Woreda Administration will facilitate the valuation of the lost asset and payment of compensation will be made effective before the construction starts.	Payment of compensation before start of construction in accordance with the compensation laws of the country
3) Benefit of power		
This project is not aimed to supply electric power to the community in the Aluto area. The community therefore stressed the need to supply power to the community.	There is massive rural electrification program by the government and this area will benefit from this electrification program.	This problem will be addressed through the rural electrification program that is being promoted by the government.
4) Social environment		
The surrounding communities has not benefitted from Aluto Langano Geothermal Expansion Project by providing basic facilities such as electric power, water supply, roads, grinding mill and school to the surrounding community.	The project office will make effort to benefit the community around the project area by conducting need assessment and making recommendations to the head office to provide such facilities to the community	The lack of these facilities should have to be mainly addressed by the national and local governments. But the Geothermal Development Project will also contribute its part to address this problem.

Source: Prepared by the Survey Team

1-3-2 Land Acquisition and Resettlement

1-3-2-1 Necessity of Land Acquisition and Resettlement

(1) Necessity of Land Acquisition and Resettlement

Regarding the necessity of land acquisition / resettlement, it is necessary to compensate for agricultural crops that are expected to be lost due to the losses of the farmland for the following reasons.

- According to the Constitution, land is government-owned. The Constitution does not allow private ownership of land. Land cannot be sold or exchanged by other means.
- The land where the project is located is owned by EEP which is a public organization and has the right to use the land.
- The project hot water reinjection pipeline which is about 1,700 m is planned to be constructed along the existing hot water reinjection piping and no additional land acquisition will be required to construct the new hot water reinjection pipe.
- Roughly 0.455 hectares (910 m × 5 m) of farmland will be used for installation of the hot water reinjection pipeline for this project. Compensation for the loss of farmland usage right and crops will be paid by the EEP.

(2) Study of Alternative Plans for Land Acquisition and Resettlement

1) Alternative plans

Alternative plans 1: Use of existing hot water reinjection pipeline

Alternative plans 2: Construction of new hot water reinjection pipeline

2) Analysis of the alternative plans

The existing hot water reinjection piping is too old to be technically rehabilitated and used it. It is therefore necessary to install a new hot water reinjection pipeline of about 1,700 m along the existing hot water pipeline.

Item	Alternative plans 1	Alternative plans 2
Hot water reinjection pipe	Use existing hot water reinjection pipeline.	Establishment of approximately 1,700 m hot water reinjection pipeline.
Route	Use of existing hot water reinjection piping.	Installation of the new reinjection pipe along the existing hot water piping which is also the shortest route.
Technical aspect	•There are places where existing piping is buried in soil and heat insulation material might have already been lost. •Since piping is old, there is a problem with the soundness of piping against high temperature and high pressure operation. •By sharing the hot water reduction piping with the two power plants the frequency of accidents and operational failure due to malpractice and poor management of the existing facilities will increase.	•Can operate safely. •Measures can be taken to install the pipe on the top of the soil.
Environmental and social impact.	•There will be no impact on the agricultural land. •There will be no compensation for agricultural crops. •There will be restoration costs for the existing hot water pipes.	•The use of agricultural land will be minimized and the impact on farmland will be kept to a minimum. •Compensation will be paid for the loss of agricultural crops.

Source: Prepared by the Survey Team

1-3-2-2 Legal Framework on Land Acquisition and Resettlement

(1) Legal Framework in Ethiopia

The Legal framework for land acquisition and resettlement in Ethiopia is shown in 1-3-1-3 (2) 3). The following are the main provisions of the regulations relevant to land acquisition and resettlement.

The principles on land acquisition for the public purposes are provided in the Ethiopian Constitution (1995) and, detailed procedures, such as the expropriation process and the compensation standards, are prescribed in Proclamation No. 455/2005 or the "Expropriation of Landholding for Public Purposes and Payment of Compensation Proclamation". Regulation No. 135/2007, on the "Payment of Compensation for Property Situated on Landholdings Expropriated for Public Purposes, Council Ministers" also provides further details such as compensation standards for each expropriated asset.

According to Regulation No.135/2007, land expropriation is implemented by the local governments, woreda, or urban administration, exclusively for public purposes and the PAPs should be adequately compensated. Proclamation No. 455/2005also provides for compensation for displacement.

According to Article 8 of the Proclamation, a rural landholder whose landholding has been permanently expropriated shall, in addition to the compensation payable under Article 7 of the proclamation, be paid displacement compensation which shall be equivalent to ten times the average annual income he/she will accrued during the consecutive five years preceding the expropriation of the land. Calculation of the amount of compensation is carried out by organizations and individuals who are professional in this type of work, but in the absence of trained personnel, the woreda or urban administration. The woreda administration is the one who will have the evaluation committee. The power company only facilitates the valuation of affected crops to calculate compensation for the PAPs.

(2) JICA Policies on Resettlement

The key principles of JICA policies on involuntary resettlement are summarized below.

- Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
- When, population displacement is unavoidable, effective measures should be taken to minimize the impact and compensate for losses.
- People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.
- Compensation must be based on the full "replacement cost" as much as possible.
- Compensation and other kinds of assistance must be provided prior to displacement.
- For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the WB Safeguard Policy, OP 4.12, Annex A.
- In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.
- Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
- Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

The above principles are complemented by WB OP 4.12, although it is stated in the JICA Guidelines that "JICA confirms that projects do not deviate significantly from the WB's Safeguard Policies". Additional key principle based on WB OP 4.12 is as follows:

- Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.
- Eligibility of benefits include; the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.
- Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land based. Provide support for the transition period (between displacement and livelihood restoration).
- Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.
- For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time

schedule for implementation; and, detailed financial plan, etc.

(3) GAP Analysis between the JICA Guidelines and Laws of Ethiopia

Table 1-3-2.1 GAP Analysis between the JICA Guidelines and Laws of Ethiopia

Aspect	JICA Guidelines /WB OP 4.12	Country Laws	Gaps between JICA Guidelines and Government Laws	Policies applied to the Project
Avoid involuntary resettlement	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	Not mentioned in Ethiopian law, though in Ethiopia, land belongs to the State and people can only own usufruct rights over land. (FDRE Constitution)	In the Government law the option of avoiding involuntary resettlement is not mentioned.	The project hot water reinjection pipeline is designed to use land having a width of 5 m along the existing hot water pipeline, thereby avoided involuntary resettlement and minimizing the use of farmland.
Minimize involuntary resettlement	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	In Ethiopian law on expropriation, compensation of properties is considered. According to the proclamation (Article 8) a rural landholder whose landholding has been permanently expropriated shall, in addition to the compensation payable under Article 7 of the proclamation, be paid displacement compensation which shall be equivalent to ten times the average annual income he/she will accrue during the five years preceding expropriation of the land.	The initial effort to minimize involuntary resettlement is not described.	The project hot water reinjection pipeline is designed to use land with a width of 5 m along the existing hot water pipeline, thereby avoided involuntary resettlement and minimize use of farmland. Compensation will be made for any loss caused by the project as described in this ARAP based on legislations of the country and JICA guidelines.

Aspect	JICA Guidelines /WB OP 4.12	Country Laws	Gaps between JICA Guidelines and Government Laws	Policies applied to the Project
3.Mitigate adverse social impacts	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living by creating income opportunities and increasing their production levels to pre-project levels. (JICA GL)	Article 44 No. 2 of the FDRE Constitution states that: "[a]ll persons who have been displaced or whose livelihoods have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance." Section 13 of the responsibilities of woreda and urban administrations include "pay or cause the payment of compensation to holders of expropriated land in accordance with this Proclamation, and provide them with rehabilitation support to the extent possible" (Proclamation 455/2005)	Mitigation measures for adverse social impacts are required by Ethiopian law.	The project hot water reinjection pipeline is designed to use land with a width of 5 m along the existing hot water pipeline, thereby minimize use of farmland. Compensation will be based on the farmland and crop losses and the compensation should be paid before land acquisition. Assistance and supports are provided to PAPs to fully restore at least to the same level of livelihood if not to a better level.

Aspect	JICA Guidelines /WB OP 4.12	Country Laws	Gaps between JICA Guidelines and Government Laws	Policies applied to the Project
Replacement costs	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	A rural landholder whose landholding has been permanently expropriated shall in addition to the compensation payable under Article 7 of the proclamation, be paid displacement compensation which shall be equivalent to ten times the average annual income accrued during the five years preceding the expropriation of the land (Article 8, Proclamation 455/2005). According to Section 7 and Regulation No 135/2007, the compensation for farmland and crops is as follows. For farmland: 1) If farmland is required for public purposes the local governments will provide equal to or great than agricultural land to support relocation of PAPs. 2) Monetary compensation is desired to compensate loss of agricultural land by an amount equivalent to ten times the average annual income they will accrue during the five years preceding the expropriation of the land For corps: Compensation will have to be calculated by multiplying yield per hectare by the market value of the crop under consideration. (Proclamation 455/2005 and Council Of Ministers Regulation No 135/2007)	No significant gap is observed.	Compensation for the project's use of agricultural land is based on the law and JICA guidelines: 1) Compensate for agricultural land by equivalent to ten times the average annual income accrued during the five years preceding the expropriation of the land. 2) Cash compensation of agricultural crops by equivalent to average of last 3 years market value for the mature and harvested crop price.
Compensation and other kinds of assistance	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	The Expropriation Law (Proclamation 455/2005), states that compensation shall be paid to the expropriated person before he or she will be relocated.	No significant gap is observed.	Based on the JICA GL Compensation and other kinds of assistance will be provided prior to displacement.

Aspect	JICA Guidelines /WB OP 4.12	Country Laws	Gaps between JICA Guidelines and Government Laws	Policies applied to the Project
Resettlement plan	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	Not mentioned in Ethiopian law	It is customary to prepare RAP for large scale projects but this is not indicated as a requirement in any Ethiopian law.	Since this project will not trigger large scale resettlement an ARAP (Plan to compensate for the crop losses) will be prepared in accordance with JICA GL by EEP.
Consultations with residents	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	Not mentioned in Ethiopian law	Although it is not indicated in the Ethiopian law, it is the usual practice to carry out intensive consultations with stakeholders and more specifically with the PAPs especially for large scale projects	The residents/PAPs public consultation was conducted at the project site on July 28, 2016. In the future, EEP will continue to consult and follow up to ensure if the PAPs are adequately compensated.
Method of consultation with residents	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	Not mentioned in Ethiopian law. However, in general the language of the local residents is used	Method of consultation with residents are not adequately explained in Ethiopian law.	The first of consultation was held in Oromiffa, the local language of the local residents and in future consultations the same language will be used.
Residents participation	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	This is not mentioned in Ethiopian law.	In Ethiopian law the need for resident participation is not clearly stated.	Promote affected people participation based on JICA guidelines in the process of ESIA and ARAP development process.
Grievance procedures	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	Grievance procedure is indicated in Article 11 of the Land Expropriation Act. (Proclamation No. 455/2005)	Mechanism at the project level (i.e. field and headquarters levels) is not specified.	Grievance procedures mechanism is established in the government law and the JICA guidelines.

Aspect	JICA Guidelines /WB OP 4.12	Country Laws	Gaps between JICA Guidelines and Government Laws	Policies applied to the Project
Identify affected people and cut-off date	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	Not mentioned in Ethiopian law, though landholders are defined. (Proclamation 455/2005)	In the Ethiopian law it is not clear whether the displaced persons entitled to compensation will have to be decided based on the cut-off date or not.	An initial baseline survey (including socio-economic survey) will be conducted based on WB OP 4.12. A cut-off date for this project is the 28th of July 2016.
Eligibility of benefits	Eligibility of benefits includes the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Not mentioned in Ethiopian law.	Eligibility of benefits are not clearly stated in Ethiopian law.	Follow the OP 4.12 and principles. Eligibility to benefits includes both formal and informal owners of land and owners of other assets affected by the Project.
Type of compensation	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	Compensation provides for cash or, as much as possible, providing usable substitutes similar to local agricultural land (Article 44 No.2, FDRE Constitution, Section 7. Proclamation 455/2005 and Council Ministers Regulation No. 135/2007),	No significant gap is observed.	In this project, compensation will be on a monetary basis because the affected persons wish to be compensated in terms of monetary value for the losses of the agricultural land.

Aspect	JICA Guidelines /WB OP 4.12	Country Laws	Gaps between JICA Guidelines and Government Laws	Policies applied to the Project
Support for the transition	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	Not mentioned in Ethiopian law.	Only compensation for land and assets are mentioned in Ethiopian law.	Since full compensation is by cash transfer payment as opted by all PAPs, there will be no need for support during transition period.
Vulnerable groups	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP 4.12 Para.8)	Not mentioned in Ethiopian law.	Special resettlement / rehabilitation assistance for the vulnerable is not described in Ethiopian law.	No vulnerable groups were found in this project hence would not apply.

Source: Prepared by the Survey Team

1-3-2-3 Scope of Land Acquisition and Resettlement

(1) Census Survey

This project's planning establishes a new 1,700 m hot water reinjection pipeline along the existing hot water pipeline. The new hot water reinjection pipeline is planned to use roughly 0.455 hectares (910 m × 5 m) of agricultural land. EEP has received the land usage rights for the construction area and the surrounding area from the Adami Tulu Woreda Office before the construction of the existing pilot power plant. The local residents are grazing and cultivating crops around the existing facilities site whose land usage right is owned by EEP. The project hot water reinjection pipeline is designed along the existing hot water pipeline to use land with usage right held by EEP.

The results of the census show that there will be 8 households affected by the project. The household size range is from 8 to 18 people.

Table 1-3-2.2 Project Affected Households (PAHs) and Household Composition

House Hold number	Name of house hold head	No. of persons in household	No. of Children	No. of adults +60 years of age	No. of students
01	A	8	6	-	3
02	B	18	15	-	8
03	C	9	7	1	5
04	D	15	13	2	6
05	E	8	6	-	2
06	F	10	7	1	5
07	G	10	8	-	3
08	H	11	9	-	3

-: None
Source: Prepared by the Survey Team

(2) Asset Inventory

The assets affected by the project are crops.

Table 1-3-2.3 shows the affected agricultural land area and land use type. Agricultural area affected by the Project is about 0.25% to 6.67% of the affected household total agricultural land and the impacts on the livelihood of PAPs will therefore be minimal. In addition, all the Project Affected Households (hereinafter referred to as "PAHs") own other agricultural land within the vicinity and are not totally dependent on the affected land. They do not, therefore, need to change their residence nor need replacement of farming lands as a result of project implementation.

Table 1-3-2.3 Agricultural Land Area of Affected Households and Affected Farmland Area by the Project

House hold number	Name of household head or business owner	Size of agricultural land (ha)	Type of production	Affected crops in meter/(ha)	Percentage of affected crops in agricultural land (%)
01	A	10	Maize, Barley, Teff, Wheat,	50 x 5 (0.025 ha)	0.25
02	B	1.5	Ditto	200 x 5 (0.1 ha)	6.67
03	C	2	Ditto	150 x 5 (0.075 ha)	3.75
04	D	4	Ditto	200 x 5 (0.1 ha)	2.5
05	E	2	Maize, Teff, Barley, Wheat &Millet	150 x 5 (0.075 ha)	3.75
06	F	3	Maize, Barley, Wheat & Millet	50 x 5 (0.025 ha)	0.83
07	G	3	Maize, Barley, Wheat & Soya Bean	50 x 5 (0.025 ha)	0.83
08	H	3	Maize, Barley, Teff, Wheat, Millet & Soya bean	60 x 5 (0.03 ha)	1.0

Source: Prepared by the Survey Team

(3) Socio-Economic Baseline of PAP

Table 1-3-2.4 below shows the results of household surveys of affected households.

The 8 affected households' main source of income is agricultural crops from farming. Except for one household having an annual income of 100,000 Birr, the annual income of the rest of the PAPs is between 20,000 and 30,000 Birr.

Table 1-3-2.4 Affected Agricultural Land Area by Project and Income Situation of PAPs

House hold number	Name of household head or business owner	Affected crops In Meter/(ha)	Size of agricultural land (ha)	Employment status of all adults	Income of household Ethiopian Birr Per Year
01	A	50 x 5 (0.025 ha)	10	Farmers	100,000
02	B	200 x 5 (0.1 ha)	1.5	Ditto	20,000
03	C	150 x 5 (0.075 ha)	2	Ditto	20,000
04	D	200 x 5 (0.1 ha)	4	Ditto	25,000
05	E	150 x 5 (0.075 ha)	2	Ditto	20,000
06	F	50 x 5 (0.025 ha)	3	Ditto	30,000
07	G	50 x 5 (0.025 ha)	3	Ditto	30,000
08	H	60 x 5 (0.03 ha)	3	Ditto	30,000

Source: Prepared by the Survey Team

(4) Vulnerable Groups

Results of the survey on 8 affected households reveal that there are no disabled people and there are no households headed by socially vulnerable persons.

1-3-2-4 Measures of Compensation and Support

(1) Compensation for crops

The area of agricultural land used for hot water rejection pipeline in this project is about 0.455 ha (about 910 m x 5 m = about 4,550 m^2). This agricultural land is currently in use by 8 households whose names are indicated in the table above. The EEP will pay compensation in accordance with law after having made consultations with the Adami Tulu local government, the heads of local communities (kebele) and the PAPs.

(2) Livelihood Restoration

WB Operational Policy (OP 4.12) on Involuntary Resettlement No. 12 states that: [Payment of cash compensation for lost assets may be appropriate where (a) livelihoods are land based but the land taken for the project is a small fraction of the affected asset and the residual is economically viable;]

(17: As a general principle, this applies if the land taken constitutes less than 20% of the total productive area)

The agricultural area affected by the Project is only about 0.25 to 6.67% of the affected household total agricultural land. Throughout the PAHs, the project is not expected to cause any significant change in their living conditions and livelihood. In addition, if there is a demand from PAPs, EEP prioritizes PAPs for short-term employment during the time of project construction.

(3) Entitlement Matrix

Based on the laws of Ethiopia, JICA guidelines, and WB safeguards policies, compensation and assistance by the project, entitlements, and compensation calculation methods are summarized in Table 1-3-2.5.

Table 1-3-2.5 Entitlement Matrix

Type of Loss	Entitled Person	Type of Impact	Compensation	Responsible Organization
Agricultural Crops	1. Land usufruct right owners	1) Agricultural land of hot water rejection pipeline site.	1) Cash Compensation for 10 years of average crop income during the previous 5 years consecutive by cash.	EEP
	2. Agricultural crop owner	2) Standing crop on the agricultural land on the hot water rejection pipeline site.	2) Cash compensation equivalent to average of last 3 years market value for the mature and harvested crop.	

Source: Prepared by the Survey Team

1-3-2-5 Grievance Redress Mechanism

Grievances and complaints regarding compensation will be dealt based on Article 11 of the Expropriation Laws (Proclamation No.455/2005) and the method of dispute resolution in relocation of resettlement during wells drilling in 2013 as written below.

- First level of Grievance Redress Mechanism: PAPs can raise their grievances to the kebele (community) head. If they are not satisfied with decision of the kebele they can apply to the next highest level of administration (Zonal Administration).
- If all of the above fails the PAPs will present their case to the Courts of Law.

Grievances and complaints should be dealt within 30 days. However, even after this period, they will be dealt with until they are resolved.

The grievance mechanism will continue operating until consensus is reached with all PAPs and compensation payment to all PAPs is satisfactorily completed.

1-3-2-6 Institutional Framework

Institutional framework for implementation of the agricultural crop compensation (ARAP) is as follows:

(1) EHS & Quality

The team is responsible for environmental and social considerations of EEP projects. There are several environmental safeguards experts and social safeguards experts. EEP uses the WB safeguards policies as a benchmark. Preparation and implementation of resettlement plans are carried out by the social safeguards experts.

(2) Aluto Langano Geothermal Project Office

It is the implementation department of this project and prepares ESIA and compensation plan. Also, it will be in charge of the compensation payment for agricultural land.

(3) Property Valuation Committee

Based on the compensation law, a property evaluation committee is established to determine the appropriate compensation amount. The property evaluation committee consists of land acquisition experts of EEP, representatives of the Adami Tulu woreda, and head of kebele. The property evaluation committee should confirm that the appropriate compensation amount is paid before the project is implemented.

(4) Adami Tulu Woreda

It is responsible for land management (land registration, land use, supervising property transactions, etc.) at Adami Tulu woreda.

1-3-2-7 Implementation Schedule

The responsible organization and the interim schedule for the preparation and implementation of the compensation plan (ARAP) are as shown in the table below. However, this implementation schedule requires confirmation of the status of compilation plan of EEP and the progress status of this project.

In either case, we aim to form consensus with all affected people and complete payment of compensation prior to the signing of the Grant Agreement (hereinafter referred to as “G/A”)for the project.

Process	Responsible Organization	2017							
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
Preparation of compensation (ARAP)	EEP	■■■■	■■■■	■■■■	■■■■	■■■■	■■■■		
Approval of compensation	Aluto Langano project office							■■■	
Compensation payment	EEP will transfer the amount of money for compensation in the names of the PAPs and the PAPs will collect the money from the Bank								■■■

1-3-2-8 Cost and Finance

The total amount of compensation for farm land and crops is 5,116 USD (110,000 Birr), and the budget for compensation and implementation costs will be secured by EEP.

1-3-2-9 Monitoring System

Monitoring on the progress of compensation for agricultural crops is conducted monthly by EEP in cooperation with the kebele's head at the project site.

1-3-2-10 Consultation with PAPs

The public consultation was conducted at the project site on July 28, 2016. Consultation was carried out with PAPs and with local officials at woreda and kebele levels. During the field assessment, a number of discussions were conducted with various stakeholders and the PAPs. Public consultations were held with PAPs, community elders and local officials with the following key objectives.

- To inform the PAPs about the project and discuss on the nature and scale of adverse impacts on their livelihood in a more transparent and direct manner and to seek their participation in the project cycle.
- To give PAPs and affected communities a chance to have a say and express their views in the planning and implementation of the project activity that will affect them directly.
- To obtain qualitative as well as quantitative information on viable income generation and livelihood interventions which PAPs could engage themselves, in order to restore their income and livelihood in a self-sustaining manner
- To inform local authorities of all the potential impacts, solicit their views on the project and discuss their share of the responsibility for the overall smooth functioning of the project operations.

1-3-3 Other

1-3-3-1 Draft Monitoring Form

Below are drafts of monitoring forms for the agricultural crop compensation.

Monitoring on land acquisition will be conducted monthly by EEP.

Activities	Expected Date Completion	Responsible Organization.
Approval of ARAP		EEP
Processing compensation fund	31 May 2017	EEP

Progress of Compensation Payment

Components	Planned Total	Unit	Monthly Progress			Progress		Expected Date Completion	Responsible Organization
			Mar	Apr.	May	Till the last month	Up to the month		
Compensation payment									
01		No. of PAPs						31 May 2017	EEP
02		No. of PAPs						31 May 2017	EEP
03		No. of PAPs						31 May 2017	EEP
04		No. of PAPs						31 May 2017	EEP
05		No. of PAPs						31 May 2017	EEP
06		No. of PAPs						31 May 2017	EEP
07		No. of PAPs						31 May 2017	EEP
08		No. of PAPs						31 May 2017	EEP

Below are drafts of monitoring forms for construction and operation phase of the pollution, natural and social environment.

Construction Phase

1. Response /Action to Comments and Guidance from Government Authorities and Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of formal comments made by the public	
Number and contents of response from Government agencies	

2. Pollution

Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards *	Referred International Standards	Measurement Point	Frequency
Noise Level Leq	dB(A)			55 dB	-		• Daily (Construction implementation area) • Once/week (nearest residence/community)

*: Guideline ambient environment standards for Ethiopia (EPA, august 2003)

Wastes

Item	Unit	Steel	Plastic	Scrap	Waste oil	Wood	Measurement Point	Frequency
Type of the generated waste	kg/m^3							Once/month

3. Natural Environment

Monitoring Item	Site observation and photographic recording	Measures to be taken	Frequency
Soil erosion	Details of survey results, such is soil erosion location, range, etc.		Once/month

4. Social Environment

Monitoring Item	Monitoring Results during Report Period	Measures to be taken	Frequency
Land use	Details of survey results, such is interviews with affected people findings		4 times/year
Disproportionate distribution of benefits and damage	Details of survey results, such is confirmation from contractors on employment contract and payments Interviews with affected people findings		4 times/year

5. Other

Monitoring Item	Monitoring Results during Report Period	Measures to be taken	Frequency
Accidents	Details of survey results, such is interviewing the contractors and employee		Biannually

Operation Phase

1. Response /Action to Comments and Guidance from Government Authorities and Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of formal comments made by the public	
Number and contents of response from Government agencies	

2. Pollution

Hydrogen sulfide (H_2S)

Item	Unit	Measured Value (Mean)	Measured Value (Min./Max.)	Country's Standards*	Referred International Standards	Measurement Point	Frequency
H_2S	ug/m^3			$150ug/m^3$	WHO		Once/month (First year), then 4 times/year

*Guidelines on ambient environment standards for Ethiopia (EPA, august 2003)

Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards*	Referred International Standards	Measurement Point	Frequency
Noise Level Leq	dB(A)			55dB			Once/month (First year), then 4 times/year

*Guidelines on ambient environment standards for Ethiopia (EPA, august 2003)

3. Natural Environment

Soil erosion

Monitoring Item	Site observation and photographic recording	Measures to be taken	Frequency
Soil erosion	Details of survey results, such is soil erosion location, range, etc.		Once/month

4. Other

Monitoring Item	Monitoring Results during Report Period	Measures to be taken	Frequency
Accidents	Details of survey results, such is interviewing the contractors and employee		Biannually

1-3-3-2 Environmental Checklist

Table 1-3-3.1 is the environmental checklist of the project based on the JICA guidelines for environmental and social considerations.

Table 1-3-3.1 Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a), (b) Environmental and social considerations study report prepared by JICA survey team has been scheduled to be revised by EEP, and to be submitted to MOWIE for approval prior to project signing (April 2017). (c) Approval of the EIA report, etc. by MOWIE without any preconditions. (d) No additional approval is required.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) Meeting was held on July 28, 2016 1:00 p.m. at the project site. About 80 community members from Abeyi Deneba, Golba Aluto and Aluto *kebele* participated in a meeting organized by the survey team to explain to the stakeholders project impact and the proposed mitigation measures and to receive comments from the stakeholders on the proposed measures. The assessment team has discussed the following positive and negative impacts of the project with the stakeholders and communities representatives of the project area. 1) The erection of power station near the newly drilled wells near LA-9D is one of the project components. The location selected for the power station is already owned by the Aluto Langano Geothermal Expansion Project and there will not be land acquisition for the erection of the power station. 2) It is planned to construct 700 meter length transmission line from the power station to the existing power plant. The transmission line passes through grazing land there will be temporary impact on the grazing land during construction period. 3) The third component of the project is construction and laying of reinjection pipe from the proposed power station area to LA-7. There will be some impacts on farm lands owned by farmers living around LA-7. After having listened the explanation by the survey team the stakeholders and the community representatives expressed their views as follows. 1) The two existing water ponds near the wells have no fence around them

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				and they are potential danger to the surrounding community as well as cattle. They meting participants request for the project office to construct fence around these ponds. During the meeting it was agreed for the project office to construct fence around the ponds to minimize the l danger 2) There are two ponds near the wells and they create danger to the surrounding community as well as cattle because water ponds have no fences. Therefore the project office shall make fence around the water pond. 3) Participants of the meeting raised the problem of delay in compensation payment. In response to For the above issues raised under item 1 and 2 the survey team provided the following explanation: - The project has the plan to construct fences around the water ponds and around the power station compound and geothermal wells. - Compensation payment to the effected farmers will be made prior to project commencement of construction and in accordance with the compensation laws of the country. The project office together with the woreda administration will facilitate valuation of crop losses and payment of compensation before the construction started. (b) All issues discussed and agreed in the meeting will be reflect in the project plan and EIA document.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) JEC has already been scheduled to be reviewed by EEP and to be submitted to MOWIE for approval Alternative plans of the power plant site and transmission line route a haves already been examined in JICA's social and environmental considerations report.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as hydrogen sulfide (H_2S) emitted from geothermal power plants comply with the country's standards? Is there a possibility that the emitted hydrogen sulfide will have the impacts on the surrounding areas, including vegetation? Are any mitigating measures taken? (b) Do air pollutants emitted from the other project facilities comply with the country's emission standards?	(a) Y (b) Y	(a) Environmental standards guideline value of H_2S is a 150 ($\mu g / m^3$). H_2S concentrations were predicted by using a plume diffusion model and diffusion parameters (Pasquill stabilities). The predicted 24-hour mean of maximum ground level H_2S concentrations is less than 0.1 ppm at the site of the nearest house, which satisfies the guidelines. As the predicted H_2S concentrations in the area around the power plant are less than 1 ppm, the impact of H_2S on workers and the surrounding natural environment is expected to be minimal. No complaints regarding H_2S were reported from residents in the surrounding

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				area during operation of the existing pilot power plant and testing of the wells. (b) The existing pilot power plant is not currently functioning due to lack of spare parts. No other facilities that discharge air pollutants in the area exists. Existing facilities are no functional. One cannot therefore tell if these facilities were complying with the country's emission standards when they were functioning.
	(2) Water Quality	(a) Do effluents (including thermal effluent) from the project facilities, such as power generation facilities comply with the country's effluent standards? Is there any possibility that the effluents from the project will cause any areas not to comply with the country's ambient water quality standards? (b) In the case of geothermal power plants, is there any possibility that geothermal utilization will cause water pollution by toxicants, such as Arsenic (As) and Mercury (Hg) contained in geothermal fluids? If the water pollution is anticipated, are adequate measures considered? (c) Do leachates from the waste disposal sites comply with the country's effluent standards and ambient water quality standards? Are adequate measures taken to prevent contamination of soil, groundwater, and seawater by leachates? (d) Is there any possibility that effluent from well excavation would cause water contamination? If water pollution is anticipated, are adequate measures considered?	(a) N/A (b) N/A (c) N/A (d) N/A	(a) The geothermal resource site does not have any water bodies such as rivers or lakes in the project area. (b) Geothermal hot water will be reinjected deep into the underground through the already existing production well. (c) There is no plan to have a waste disposal facility at the project site. (d) This project will use the existing production wells; there is no plan for a new well drilling.
	(3) Wastes	(a) Are wastes generated by the plant operations properly treated and disposed of in accordance with the country's regulations? (b) Are wastes generated by the effluents from well-excavation properly treated and disposed of in accordance with the country's standards?	(a) N (b) N/A	(a) Small amount of waste generated by the facility operation is disposed of in the existing pilot plant facility. (b) There is no plan for a new well drilling.

<table>
<tr><th>Category</th><th>Environmental Item</th><th>Main Check Items</th><th>Yes: Y
No: N</th><th>Confirmation of Environmental Considerations
(Reasons, Mitigation Measures)</th></tr>
<tr><td></td><td>(4) Noise and Vibration</td><td>(a) Do noise and vibrations comply with the country's standards?</td><td>(a) Y</td><td>(a) The environmental noise level limits are shown in table below.
Predictions of noise levels at the nearest house, 650 meters away from the planned power plant site, were studied. The results suggested 41.8 dB, which is 0.8 dB greater than the current maximum noise of 41 dB around the house. This value satisfies the environmental criteria for residential houses in Ethiopia. Thus, the impact of noise from power plant operations on residents in the surrounding area is expected to be minor.
In addition, noise one meter from an existing equivalent facility is 73 dB, This value satisfies workplace standard of EHS (Health and Safety Guidelines for Geothermal Projects, July 1 1998).
Noise Standards
<table>
<tr><th rowspan="2">Area Code</th><th rowspan="2">Category of area</th><th colspan="2">Limits in dB (A) Leq</th></tr>
<tr><th>Day time 6:00am. to 9:00pm.</th><th>Night time 9:00pm. to 6:00am.</th></tr>
<tr><td>A</td><td>Industrial area</td><td>75</td><td>70</td></tr>
<tr><td>B</td><td>Commercial area</td><td>65</td><td>55</td></tr>
<tr><td>C</td><td>Residential area</td><td>55</td><td>45</td></tr>
</table>
</td></tr>
<tr><td></td><td>(5) Subsidence</td><td>(a) Is there any possibility that the extraction of steam will cause subsidence?</td><td>(a) N</td><td>(a) The possibility of ground subsidence is considered to be slight, because geothermal fluids will be collected through the production wells by letting the fluids naturally spout from deep underground (roughly 2,000 m), and then, through the injection wells, the entire amount of hot water will be reinjected deep underground at almost the same depth (roughly 2,000 m) as the collection point. In addition, according to EEP, no ground subsidence has occurred at the existing power plants</td></tr>
<tr><td></td><td>(6) Odor</td><td>(a) Are there any odor sources such as H_2S, and anticipated any effect? Are adequate odor control measures taken?</td><td>(a) N</td><td>(a) The 24-hour mean of predicted H_2S concentrations generated by the power plant when it is put into service came to less than 0.1 ppm in the area around the nearest house. In this area, the wind blows from the northeast from October to May, and from the southwest or south-southwest from June to September. Since the nearest house is located to the west of the planned power plant site, it will rarely be downwind throughout the year and, therefore, the impact of odor is expected to be insignificant.</td></tr>
</table>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no national park or conservation or protected area in the project area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) Is there a possibility that the project will adversely affect downstream aquatic organisms, animals, plants, and ecosystems? Are adequate protection measures taken to reduce the impacts on the ecosystem?	(a) N (b) N (c) N	(a) The existing survey show that, the project sites do not encompass primeval forests, tropical rain forests or ecologically valuable habitats. (b) According to the information obtained from the local community, Adami Tulu Jido Kombolcha Woreda Agriculture Office and ESIA report, the project sites do not encompass protected habitats of endangered species designated by the country's laws or international treaties and conventions. (c) Most of the vegetation in the project area is grassland, and scattered trees around 2 to 5 meters in height consisting of few varieties, with Acacia sp. being dominant which is used for grazing. The power plant facilities are expected to impose no impact on animals or plants, as the facilities will be located on the existing well pad and no vegetation will be removed, due to implementation of the project. Although pipeline and transmission line construction will involve the felling of a dozen or so trees, the impact on plants is considered to be minor for the reason that the area has no distinctive environmental features.
	(3) Topography and Geology	(a) Is there any possibility that the project will cause a large-scale alteration of the topographic features and geologic structures in the surrounding areas?	(a) N	(a) The projects will not cause large scale alteration of the topographic features and geologic structures in the surrounding areas. There are no civil works plan in the project site that will case large scale alteration of the topographic features and geologic structures. The power plant will be constructed at well pad (LA-9D).
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on	(a) N/Y (b) Y (c) Y (d) Y (e) Y (f) Y (g) Y (h) Y (i) Y	(a) There is no resettlement of residents plan for the project. Roughly 0.5 hectares (910 m × 5 m) of farmland will be needed for installation of the hot water reinjection pipeline for this project. In order to minimize the impact of agricultural land use, the geothermal hot water reduction pipe was designed to use land with a width of 5 m along the existing hot water piping, and the use of agricultural land was kept to a minimum. (b) Separate meetings have been conducted with PAPs. In this meeting adequate explanation in local language on the calculation method for compensations were provided and these will continue during implementation.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(j) Y	(c) Census survey and inventory of farmland to be lost is conducted on all PAPs. Project affected agricultural area is about 0.25 to 6.67% of the affected household total agricultural land and PAHs do not rely on livelihood for the farmland used by this project. The agricultural land compensation plan includes compensation with farmland use rights and crops costs, and impact assessment on livelihood. (d) The compensation will be paid prior to the farmland used by the project. It is also stipulated in the laws of Ethiopia. (e) An Abbreviated Resettlement Action Plan was prepared in accordance with JICA guidelines, WB safeguard policies and Ethiopia laws. (f) None of the PAHs of this project are headed by the vulnerable groups. During the construction phase, female PAPs will be provided equal work opportunities to that of the male. (g) All PAHs after consultation have agreed on the use of the proposed agricultural lands to implement the project. (h) The organizational framework was established and Aluto Langano geothermal project office of EEP will play the major role during project implementation. The office has experience in implementing similar well drilling project and in the preparation of ARAPs and it is also responsible for securing and allocate fund to implement the ARAP. (i) Monitoring the implementation of ARAP and the proposed mitigation measures indicated in the EIA will be carried out four times a year. (j) Grievance redress mechanism has been established taking into consideration, the practices of the local community and the prevailing legal provisions of resolving conflicts in redressing issues related to compensation.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water (e.g., surface water, groundwater) used and discharge of effluents by the project will adversely affect the existing water uses and water area uses?	(a) N (b) N	(a) Roughly 0.5 hectares of farmland will be needed for the installation of the hot water reinjection pipeline for this project, and this is part of a farmland used by a total of eight households. The EEP will pay compensation in accordance with JICA guidelines and compensation laws and in consultation with the Adami Tulu woreda administration as well as the heads of local communities (kebele) and affected residents. This project's affected agricultural area is only about 0.25 to 6.67% of the affected household total agricultural land, and social impact on community residents is expected to be limited. In addition, if there is a demand from PAPs, EEP takes priority on PAPs for short-term employment that occurs

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				with construction. (b) There is no river or lake and wells in and around the project area. The reason being small amounts of water that will be needed for the construction will be drawn from the existing water pond provided for well drilling. The power plant system does not use water and the employees will use water from the storage tank of the existing pilot plant installed to collects rainwater
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N/A	(a) The project area has no known registered sites of culturally, historically or archaeologically important heritage, or important landmarks.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) The project is a small-scale geothermal power generation facility, and there will be no serious effect on the aesthetic view of the nearby landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a), (b) In the project area, no settlements of indigenous people or ethnic minorities who need particular consideration have been identified.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) Health and safety of the project will be in accordance with the Occupational Safety and Health Act (OSHA). Furthermore, there is a unit (EHS&Q) within EEP dealing with health and safety issues. The EHS&Q of EEP will carry out inspections and meet regularly to review health and safety performance of projects such as this one. (b) At the time of tender, the EEP shall confirm that the health, safety, and social environment management plan, submitted by the construction management consultant is contractors, and is in accordance with the environmental and social safety guidelines for constructors. The construction management consultant and contractor will implement safety management in accordance with this plan to avoid or reduce the risk of workers or residents getting involved in an accident. (c) Safety training and orientation will be given to the host community and workforce regularly. (d) During well drilling local people were working as security guards, and regularly carried out education. Security guards involved in the project had been building a good relationship with the local residents. Also for this project

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				local people are working as security guards of EEP, and will regularly carry out education.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce the impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce the impacts?	(a) Y (b) Y (c) Y	(a) Impact of the project during construction is expected to be mainly due to noise and waste pollution. The biggest source of noise and vibration during construction of the power plant, pipelines and transmission lines is the operation of heavy machinery and vehicles transporting generators and other equipment and materials. For power plant construction, a well pad where the ground has already been prepared will be used, and the heavy machinery needed for foundation work will be limited to backhoes, cranes and the like. The traffic of vehicles transporting equipment and materials including portable generators, and vehicles used to transport construction workers are expected to amount to several vehicles per day. As there is no house near the planned power plant site or the road, the impact of noise and vibration during construction on residents living in the surrounding area is expected to be minor. However, there is a plan to implement the monitoring of noise. Construction of the power plant, pipelines and other relevant facilities will generate small amounts of waste soil from civil engineering work, as well as concrete, wood, scrap metal, etc. Waste soil and concrete will be used to back-fill the pond used for drilling well LA-9D and for repairing roads in the vicinity. The small volume of wood (wooden crates for equipment) and scrap metal created is in demand locally, and will be collected for reuse or recycling. In the environmental and social considerations study report by JICA's survey team there is a plan to conduct monitoring for waste generation and waste disposal (b) The power plant facilities are expected to impose no impact on animals or plants, as the facilities will be located on the existing well pad and no vegetation will be removed. Most of vegetation in the project area is grassland, and few trees around 2 to 5 meters in height consisting of few varieties, with acacia sp. being dominant which is used for grazing. Although pipeline and transmission line construction will involve the felling of a dozen or so trees, the impact on plants is considered to be minor for the reason that the project area has no distinctive environmental features in biodiversity. (c) There are mitigation measures to check on noise and vibration, and wastes. As a requirement, the levels of noise, vibration and waste during construction

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				and operation phases have to be within the acceptable limits of the approving body (MOWIE), environment and workplace standards.
	(2) Accident Prevention Measures	(a) Does the project have any accident prevention equipment and scheme to store, emit and transport toxic and hazardous materials? Are any pollution preventive measures for drinking water taken for example the facilities discharge liquid wastes to the rivers in an emergency?	(a) Y	(a) Vehicles related to the EEP observe the speed limit and the project will delineate passages of livestock and other animals at the time of the construction and operation phases of the project. At the time of tender, the EEP shall confirm that the health, safety, and social environment management plan, submitted by the construction management consultant and contractors, is in accordance with the environmental and social safety guidelines for constructors. The construction management consultant and contractor will implement safety management in accordance with this plan to avoid or reduce the risk of workers or residents that are thought to be potentially exposed to accident. In accordance with labor laws, safe working environments shall be prepared by providing workers with personal protective equipment and mandating its use. Near the wells, a hot water reservoir provided with permeation prevention measures shall be provided to temporarily store hot water that may flow out from the production wells in case of an accident. The reservoir shall hold the water until the flow is stopped by a valve. Procedures that have to be followed when rescuing those affected by high-concentrations of H_2S gas shall be prepared. Fences shall be installed around the construction sites (particularly material yards), production wells, and hot water reservoir, and security guards will be allocated to prevent theft and accidents.
	(3) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and	(a) Y (b) Y (c) Y (d) Y	(a) Based on the potential impacts indicated in the report of environmental and social considerations prepared by JICA survey team the proponent is expected to develop and implement a monitoring program during the construction and in service period. The plan is expected to be implemented during the construction and operation phases of the project. During the operation phase continuously monitoring and as annual environment audits will need to be undertaken. (b) The methods and frequency of monitoring are explained in the environmental and monitoring plan. The methodology is well advanced. The monitoring plan has the aspects include; H_2S, noise level, waste, soil erosion, induced socio-economic benefits, land use, accidents.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		frequency of reports from the proponent to the regulatory authorities?		(c) EEP has an adequate monitoring framework and has established within it an environmental and social expert group in the EHS&Q department. The main duties and responsibilities of this department is to carry out environmental monitoring during the construction and operation of power plants and also oversee monitoring activities that will be conducted by the proponent. The budget for the monitoring activities is the responsibility of the institutions itself. (d) EEP is expected to submit an annual environment monitoring report to the regulatory body of MOWIE but in practice this has never happened due to lack of capacity
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the power transmission and distribution lines checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) The project will have the components (items) such as electric transmission lines but not electric distribution facilities. The overall length of the transmission line will be approximately 700 meters and about 16 power poles will be installed to support the proposed transmission lines. About a dozen trees will be felled during the installation of the transmission line. However, there is vast grassland and plenty of trees in and around the project site and the impact of felling these few trees will cause insignificant impact on the environment.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) Y	(a) As this is a small facility (i.e. 5 MW) the impact on global warming is expected to be minimal.

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Source: Prepared by the Survey Team

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

(1) Concept of the Project

A geothermal wellhead power system (5 MW) will be installed in the Aluto Langano area and will commence power generation in the early stages of the geothermal resource development, in order to achieve the target of the project and to begin to move Ethiopia away from hydro power dependency. Geothermal power development will also contribute to the energy policy of Ethiopia from the view point of increasing power supply capability to urban areas, reinforcing the base load plants, and developing renewable energy in order to export electricity to neighboring countries.

This project consists of the following.

[1] Steam Gathering System:
Two phase flow is separated into steam and brine at a separator. The separated steam is sent to a turbine for the wellhead power system. The separated brine is sent to a reinjection well.

[2] Wellhead Power System:
Geothermal steam drives the turbine of the wellhead power system, and the generator connected to the turbine generates electricity. The generated electricity is sent to the power line through a step-up transformer.

[3] Substation System (including 15 kV Distribution Line):
The voltage of the generated electricity is boosted to 15 kV at the step-up transformer, and the boosted electricity is sent to the new 15 kV power line and the existing 15 kV distribution line, which is connected to the national grid through the Adami Tulu substation.

(2) Outline of Procured Equipment

Based on the project requirements of the Ethiopian side, the equipment procured in the project will be designed to meet certain objectives; such as a portable plant system for relocation to multiple geothermal fields, rapid plant completion and commencement of generation, a simple plant composition, and the project effect.

The procured equipment is outlined below. The equipment specifications are designed comprehensively taking into consideration the effective utilization of the existing 15 kV distribution line, matching coordination with existing facilities, the project site conditions, the operation and maintenance system, technical capabilities, economic benefits.

Outline of the Procured Equipment

Steam Gathering System:	Two-phase piping (production wells LA-9D/LA-10D - separator), Steam piping, Brine piping, Separator, Scrubber, Pressure control system, Separator level control system, Drain transfer pump, Steam flowmeter, Instrumentation, Portable platform, and Pipe support
Wellhead Power System:	Turbine and auxiliaries, Turbine exhaust silencer, Lube oil system, Gear reducer, Generator and auxiliary equipment, Enclosure, Station service transformer, Medium voltage switchgear, Low voltage switchgear, DC power supply system, Distributed control system, Turbine generator control panel, Generator transformer protection panel, Medium

	voltage cable, Earthing system, Low voltage cable, Control cable, Control room (container), Remote operation system, Fire protection equipment, Conduit pipes, Cable tray, Lighting, and Lightning protection equipment
Substation System: (Including 15 kV DL)	15 kV step-up transformer, 15 kV switchgear, 15 kV cables and accessories, Termination pole with line switches, Intermediate poles, Light angle pole, Heavy angle pole, Strain pole, Connection to existing distribution line, Overhead conductor, Pin insulator, Disk insulator, and Lightning insulator

(3) Environmental and Social Considerations

As for the environmental and social consideration of the project, the following 3 important issues are highlighted to realize the project's implementation. Refer to Section 1-3 of Chapter 1 for the details regarding the survey and study of the environmental and social considerations.

1) Approval of Project EIA

The Project Executing Agency, EEP, should obtain the project EIA approval from the MOWIE. EIA approval will be one of the important conditions for G/A execution and the project implementation.

2) Land Acquisition and Settlement

The Project Executing Agency, EEP, should settle the land acquisition issues regarding the new reinjection pipeline. This land acquisition and settlement is an important issue for the EIA approval from the MOWIE.

3) Environmental Monitoring

The Project Executing Agency, EEP, should carry out the environmental monitoring during the project implementation and after commencement of the operation of the geothermal wellhead power system according to the approved EIA. EEP should submit the environmental monitoring reports to JICA during the project implementation.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

(1) General

Regarding the type of geothermal wellhead power system used for the project, the requirements are that the power system are portable type for relocation, reduce the initial investment, have a high degree of reliability, and be easy to operate and maintain. Corresponding to these requirements, the system will be single flash cycle backpressure turbine generator and skid mounted type generation system.

The steam from existing production wells LA-9D and LA-10D will be supplied to the geothermal wellhead power system. According to the well-discharge tests of LA-9D and LA-10D conducted from November 2015 to June 2016, the estimated production of steam from LA-9D and LA-10D is about 40 - 45 t/h together, and the expected total power output is around 2.6 MW with a back pressure steam turbine. However, the geothermal wellhead power system is designed with a rated capacity of 5 MW. Therefore when the situation allows, additional steam will be supplied by the future wells which will be drilled at Aluto Langano area, and sufficient steam for the rated capacity will be supplied at the relocated geothermal filed.

Electrical and control equipment will be indoor type and installed in a container control room as

a countermeasure against the corrosive conditions of the geothermal gases. The electrical equipment should be designed considering the high altitude (2,000 m abs) of the project site, and the standard voltage class should be selected with a correction factor based on IEC60071-2.

The geothermal wellhead power system evacuates the generated power to the Adami Tule substation and then to the national electricity grid. The generated power voltage is boosted by the step-up transformer at a newly constructed switchyard, and the boosted electricity is transmitted by the new 15 kV distribution line from the wellhead power system to the existing 15 kV distribution line which connects the existing Pilot Plant and the Adami Tulu substation. The operation of the geothermal wellhead power system can be monitored at the existing Pilot Plant by the remote monitoring system (SCADA).

(2) Policy Regarding Natural Conditions

1) Design Temperature Conditions

The design conditions which will be used for the geothermal wellhead power system are the design conditions of the existing Pilot Plant, which is located a distance of 700 m from the geothermal wellhead power system of the project. The average ambient temperature is 18 degrees C, the maximum temperature is 35 degrees C, the minimum temperature is 5 degrees C, and the annual rainfall is 1,000 mm or more. The 15 kV distribution line facilities of the project will be designed with the foregoing temperature conditions, and the equipment should function normally without operation or maintenance obstruction, even with temporary temperature increases due to direct sunlight.

2) Rainfall and Lightning

The annual rainfall at the project site is recorded 1,000 mm or more. The heavy rainy season is from June to September, the small rainy season is from March to May, and the dry season is from October to March. The site construction work should be planned considering the outdoor civil works during the rainy seasons. Lightning occurs during the rainy seasons, therefore the outdoor works such as steel tower installation, pipe welding, and distribution line construction, should be carefully planned and carried out. Protective devices for the distribution line and substation equipment shall be provided in order to protect against intrusion lightning.

3) Wind

The existing pilot plant is designed with a maximum wind velocity at 40 m/sec, and the same wind velocity will be applied to the geothermal wellhead power system and the 15 kV distribution facilities.

(3) Policy Regarding Social Economic Conditions

The noise reduction countermeasures and the height of the turbine exhaust silencer should be carefully designed in order to clear the environmental standards of noise and H_2S concentration at the nearest residential area, located approximately 650 m from the geothermal wellhead power system.

The geothermal wellhead power plant will be installed within the LA-9D wellpad area, and the surrounding area is also the possession of EEP. New land acquisition is not necessary for the power plant. The brine piping will pass through some agricultural lands at the area of about 910 m length from the existing Pilot Plant to the LA-7 reinjection well. Therefore compensation for the agricultural products is required for the piping passing through these sections. The compensation area is 4,550 m^2 (910 m x 5 m).

(4) Policy regarding Construction Circumstances

Local construction companies will be sub-contracted for a portion of the civil work and work regarding the equipment construction; including the steam gathering system, power plant, substation, and distribution line facilities. As for the distribution line facilities, a local sub-

contractor will be utilized since EEU designates the wooden pole specifications and nominates the construction company.

However, Japanese engineers will be dispatched to perform the work requiring high technical skills regarding equipment installation, adjustment and testing activities.

(5) Policy Regarding Equipment Suppliers

Most of the equipment will be procured from Japan or a third country since it cannot be procured in Ethiopia. The main equipment for the project, the geothermal turbine and generator will be procured from a Japanese manufacturer that has a record of successfully providing equipment for geothermal power plants worldwide. The other equipment such as the power plant auxiliaries and the piping for the steam gathering system will be procured from Japan or a third country, with consideration of cost reduction for the project.

Equipment and materials for construction work which are available in Ethiopia, such as aggregates, cement, rebar, and wooden poles, are to be procured locally as much as possible in order to contribute to the development of local industry. Transformers, cables & auxiliaries, and the distribution line will be procured from Japan or a third country with consideration for the operation and maintenance capacity and the easy procurement of spare parts.

(6) Policies Regarding Technical Grade

The steam gathering system, the wellhead power system, and the substation system (including 15 kV distribution line) of the project should be designed in consideration of interface conditions with the existing facility, EEP's technical standards, and EEP's operation and maintenance.

(7) Policies Regarding Construction Method and Schedule

An effective construction method and work schedule should be planned regarding the project site work since modification of the existing reinjection piping, the construction of the new 15 kV distribution line, and the construction of the new reinjection piping will be carried out within the same area or adjacent each other at the same time. It is also necessary to establish a management organization and to adopt a construction method which is familiar to the local engineers and laborers in order to safely and promptly make work progress.

(8) Applicable Codes, Standards and Units

The following international and Japanese standards will be applied for the design of the systems and equipment of the project, and the design coordination with the existing facilities should be considered.

a.	International Electrotechnical Commission (IEC):	Electric products
b.	International Organization for Standards (ISO）:	Industrial products
c.	British Standards (BS):	Industrial products
d.	IEEE Standards (IEEE)	Industrial products
e.	Deutsche Industrie Normen (DIN):	Industrial products
f.	American Society of Mechanical Engineers (ASME):	Machine products
g.	American National Standards Institute (ANSI):	Industrial products
h.	Japanese Industrial Standards (JIS):	Industrial products
i.	Japanese Electrotechnical Committee (JEC):	Electric products
j.	Japan Electrical Manufacturers' Association (JEM):	Electric products

k.	Japan Electric Association Code (JEAC):	Electric products
l.	Japanese Electric Wire & Cable Makers' Association Standards (JCS):	Electric wire & cables
m.	Technical Standards related to Electrical Work:	Electrical work

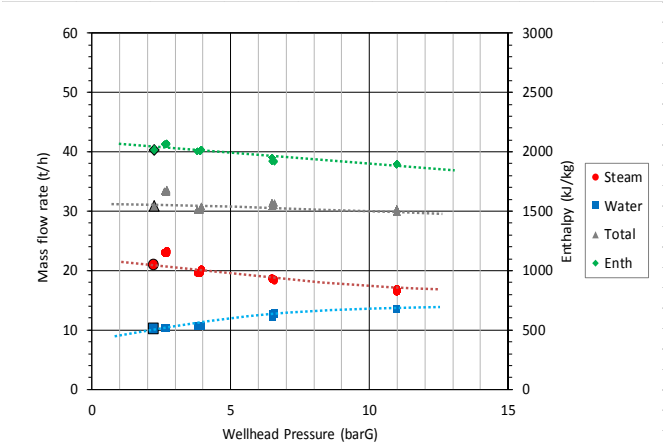
2-2-2 Basic Plan of Procurement Facilities

(1) Basic Plan and Design Conditions

The basic plan and the design conditions of the geothermal wellhead power system are shown in Table 2-2-2.1 and the general layout plan is shown in Figures 2-2-2.1, 2-2-2.2, and 2-2-2.3.

Table 2-2-2.1 Basic Plan and Design Conditions

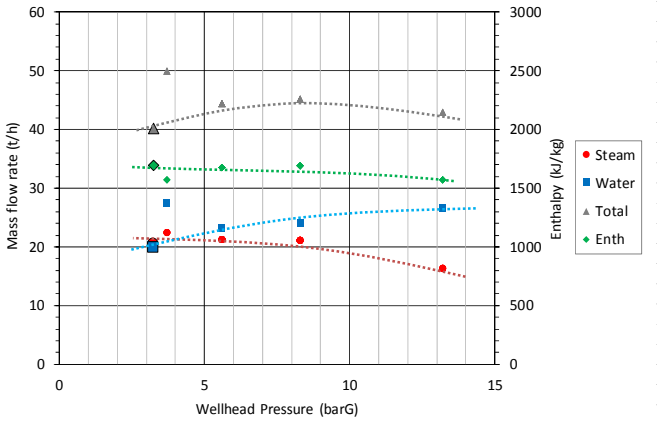
<table>
<tr><th>Items</th><th>Design Conditions</th></tr>
<tr><td>Type</td><td>Single flash cycle back pressure turbine</td></tr>
<tr><td>Number of Unit</td><td>1 Unit</td></tr>
<tr><td>Gross Output
(@ generator end)</td><td>Rated: 5,000 kW (maximum)
Using only production wells LA-9D and LA-10D:
2,600 kW</td></tr>
<tr><td>Main Steam Pressure and Temperature</td><td>Rated: 900 kPa (abs), saturated temperature (approx. 175 deg. C)
Using only production wells LA-9D and LA-10D:
Contractor (turbine manufacturer) to determine the appropriate steam conditions according to the well production characteristics and the turbine characteristics</td></tr>
<tr><td>Main Steam Flow</td><td>Rated: 66 t/h (including NCG)
Using only production wells LA-9D and LA-10D:
Contractor (turbine manufacturer to determine according to the well production characteristics and the turbine characteristics
(Reference data: approximately 43 t/h including NCG)</td></tr>
<tr><td>Brine Flow</td><td>Rated: 60 t/h
Using only production wells LA-9D and LA-10D:
Contractor (turbine manufacturer) to determine the brine flow according to the well production characteristics and the turbine characteristics
(Reference data: approximately 35 t/h including NCG)</td></tr>
<tr><td>NCG (Non-condensable Gases)</td><td>7 wt%</td></tr>
<tr><td>Wells to be used</td><td>Production wells: LA-9D and LA-10D
Reinjection well: LA-7</td></tr>
<tr><td>Well characteristics</td><td>LA-9D:
<table>
<tr><th>No.</th><th>Wellhead Pressure (barG)</th><th>Steam Flow (t/h)</th><th>Brine Flow (t/h)</th><th>Total Flow (t/h)</th><th>Specific Enthalpy (kJ/kg)</th><th></th></tr>
<tr><td>1</td><td>2.65</td><td>22.8</td><td>10.3</td><td>33.1</td><td>2,062</td><td>6", 2015/1112</td></tr>
<tr><td>2</td><td>11.00</td><td>16.5</td><td>13.5</td><td>30.0</td><td>1,890</td><td>3", 2015/11/20</td></tr>
<tr><td>3</td><td>6.50</td><td>18.8</td><td>12.1</td><td>30.9</td><td>1,955</td><td>4", 2015/11/27</td></tr>
<tr><td>4</td><td>3.80</td><td>19.7</td><td>10.6</td><td>30.3</td><td>2,033</td><td>5", 2015/12/04</td></tr>
<tr><td>5</td><td>2.25</td><td>20.8</td><td>10.1</td><td>30.0</td><td>2,019</td><td>6", 2016/5/27</td></tr>
</table>
(Note): Steam flow does not include NCG.</td></tr>
</table>



LA-10D:

No.	Wellhead Pressure (barG)	Steam Flow (t/h)	Brine Flow (t/h)	Total Flow (t/h)	Specific Enthalpy (kJ/kg)	
1	3.70	22.4	27.6	50.0	1,574	6", 2015/12/15
2	13.20	16.3	26.7	43.0	1,571	3", 2015/12/21
3	8.30	21.1	24.1	45.2	1,693	4", 2015/1229
4	5.60	21.3	23.2	44.5	1,676	5", 2016/1/05
5	3.25	20.5	19.7	40.2	1,691	6", 2016/4/1

(Note): Steam flow does not include NCG.

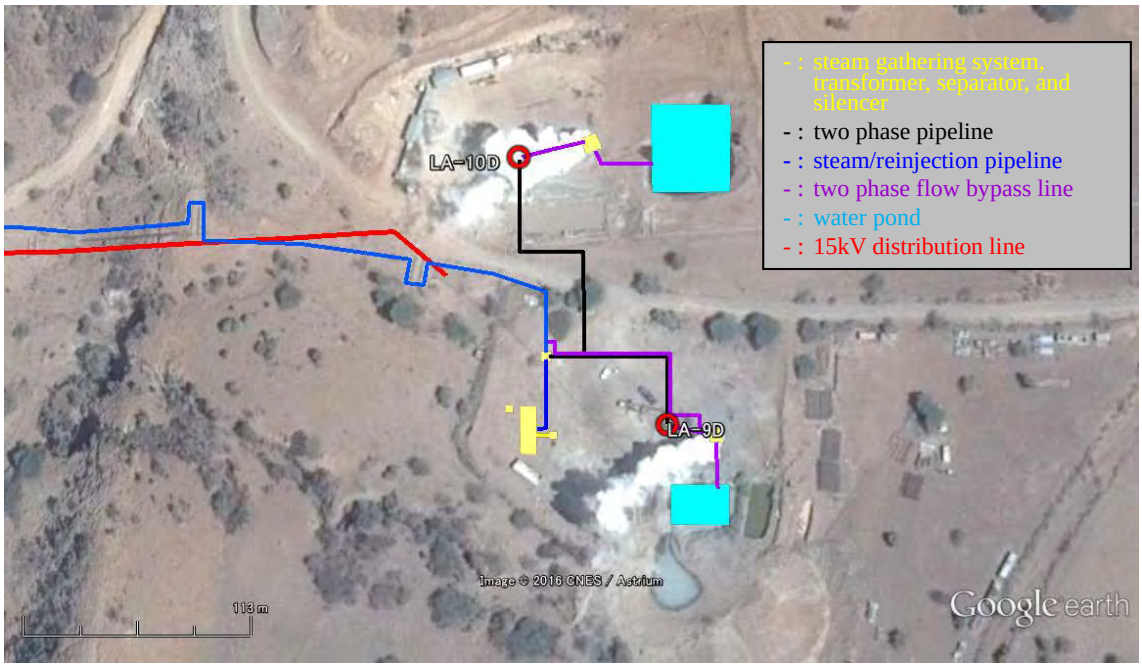


NCG Contents

Concentration in Steam (wt%)	NCG Contents (mol%)		
	CO_2	H_2S	Others
7	94	5	1

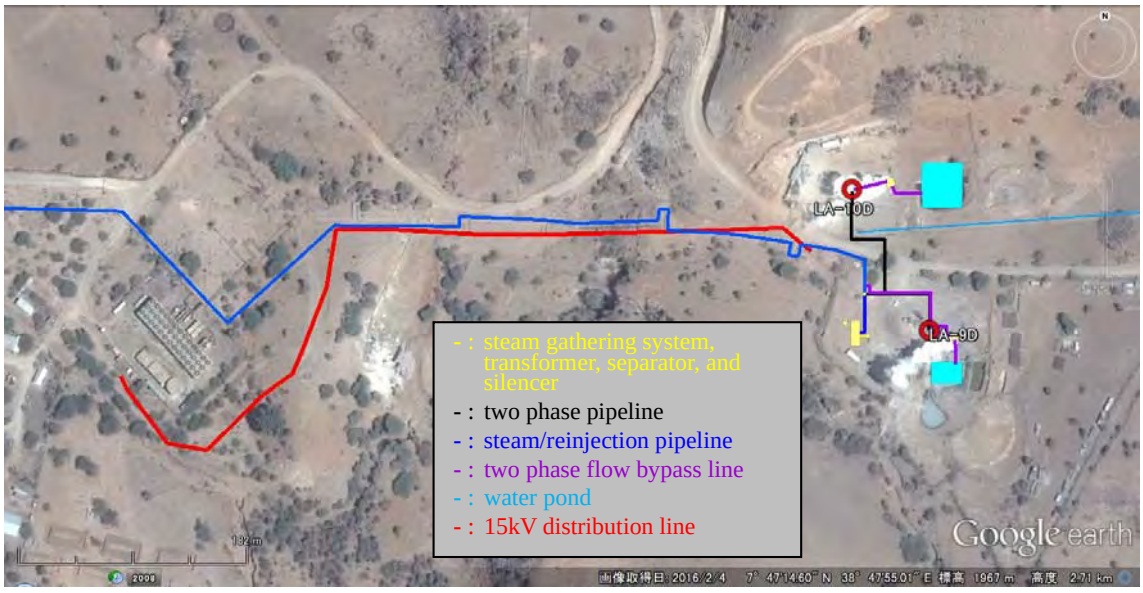
<table>
<tr><td>Brine Contents</td><td>
<table>
<tr><th>pH</th><th>TDS (mg/L)</th><th>Na (mg/L)</th><th>Cl (mg/L)</th><th>T-SiO_2 (mg/L)</th></tr>
<tr><td>9</td><td>4,200</td><td>1,100</td><td>750</td><td>970</td></tr>
</table>
</td></tr>
<tr><td>Plant Location</td><td>Aluto Langano area, LA-9D well pad</td></tr>
<tr><td>Altitude</td><td>LA-9D: 1,960 m, LA-10D: 1,960 m, LA-7: 1,896 m,
Existing Pilot Plant: 1,904 m</td></tr>
<tr><td>Atmospheric Temperature</td><td>Av. 18 deg. C, Max. 35 deg. C, Min. 5 deg. C,
(as per Pilot Plant specifications)</td></tr>
<tr><td>Atmospheric Pressure</td><td>80 kPa</td></tr>
<tr><td>Wind Velocity</td><td>40 m/s</td></tr>
<tr><td>Rain Fall</td><td>Annual 1,000 mm,
Heavy rainy season: June - September,
Small rainy season: March - May
Dry season: October - March</td></tr>
<tr><td>Cooling Water</td><td>None; all equipment should be air-cooled type.</td></tr>
<tr><td>Power Evacuation Voltage</td><td>15 kV</td></tr>
<tr><td>Grid Frequency</td><td>50 Hz</td></tr>
<tr><td>Noise</td><td>Nearest residence (650 m from Wellhead Power Plant)
Day time (06:00 to 21:00): 55 dB
Night time (21:00 to 06:00): 45 dB</td></tr>
</table>

Source: Prepared by the Survey Team



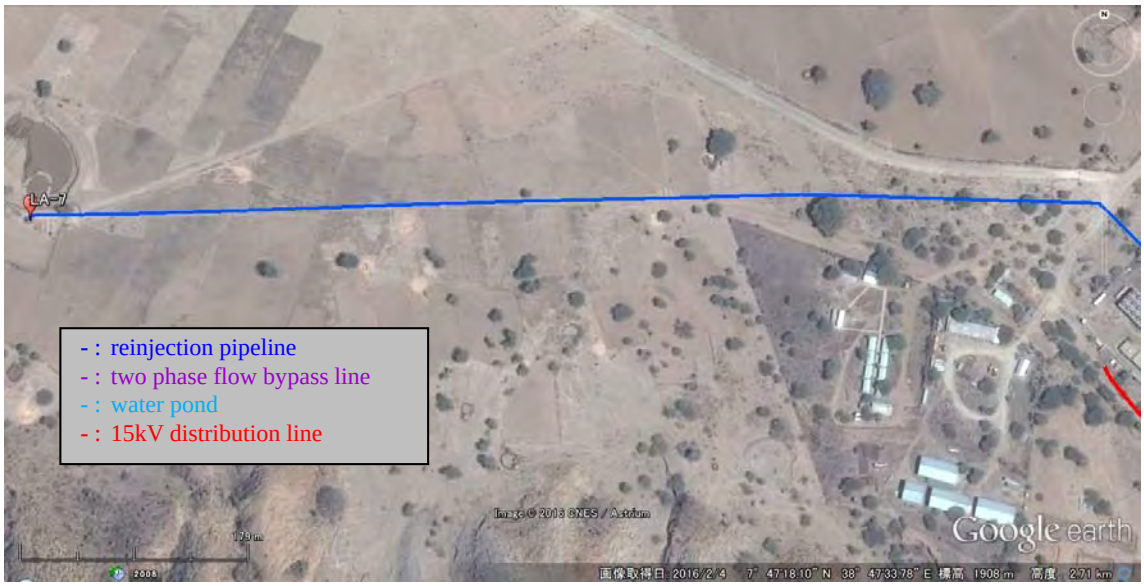
Source: Prepared by the Survey Team using Google Earth

Figure 2-2-2.1 Plot Plan of Geothermal Wellhead Power System (LA-9D and LA-10D)



Source: Prepared by the Survey Team using Google Earth

Figure 2-2-2.2 Reinjection Line and 15 kV Distribution Line (From LA-9D to Pilot Plant)



Source: Prepared by the Survey Team using Google Earth

Figure 2-2-2.3 Reinjection Line Route (from Pilot Plant to Reinjection Well LA-7)

The electrical conditions for the power plant, the substation and the distribution line are specified in Table 2-2-2.2.

Table 2-2-2.2 Electrical Conditions

Items	15 kV Distribution Line	Power Plant Descriptions	
Frequency	50 Hz	50 Hz	50 Hz
Number of Phases	3	3	3
Withstand Voltage	16.5 kVac	440/253 Vac	125 Vdc
Rated Voltage	15 kV ac	400/230V ac	110V dc
Lightning Impulse Withstand Voltage	125 kVac	6000 Vac	2500 Vac
Frequency Withstand Voltage	50 kVac	2000 Vac	500 Vac
Grounding	Direct grounding	N/A	N/A
Line to Ground Insulation Distance	Min 500 mm	N/A	N/A
Phase to Phase Insulation Distance	Min 900 mm	N/A	N/A
Conductor Height			
General	5.0 m	N/A	N/A
Road	6.0 m	N/A	N/A
Water	5.5 m	N/A	N/A

Source: Prepared by the Survey Team

(2) Power System Study

Table 2-2-2.3 shows the maximum actual load from 2012 to 2015 of the substations surrounding Adami Tulu substation, and also the maximum demand forecast for 5 years from 2016 to 2021 at each substation.

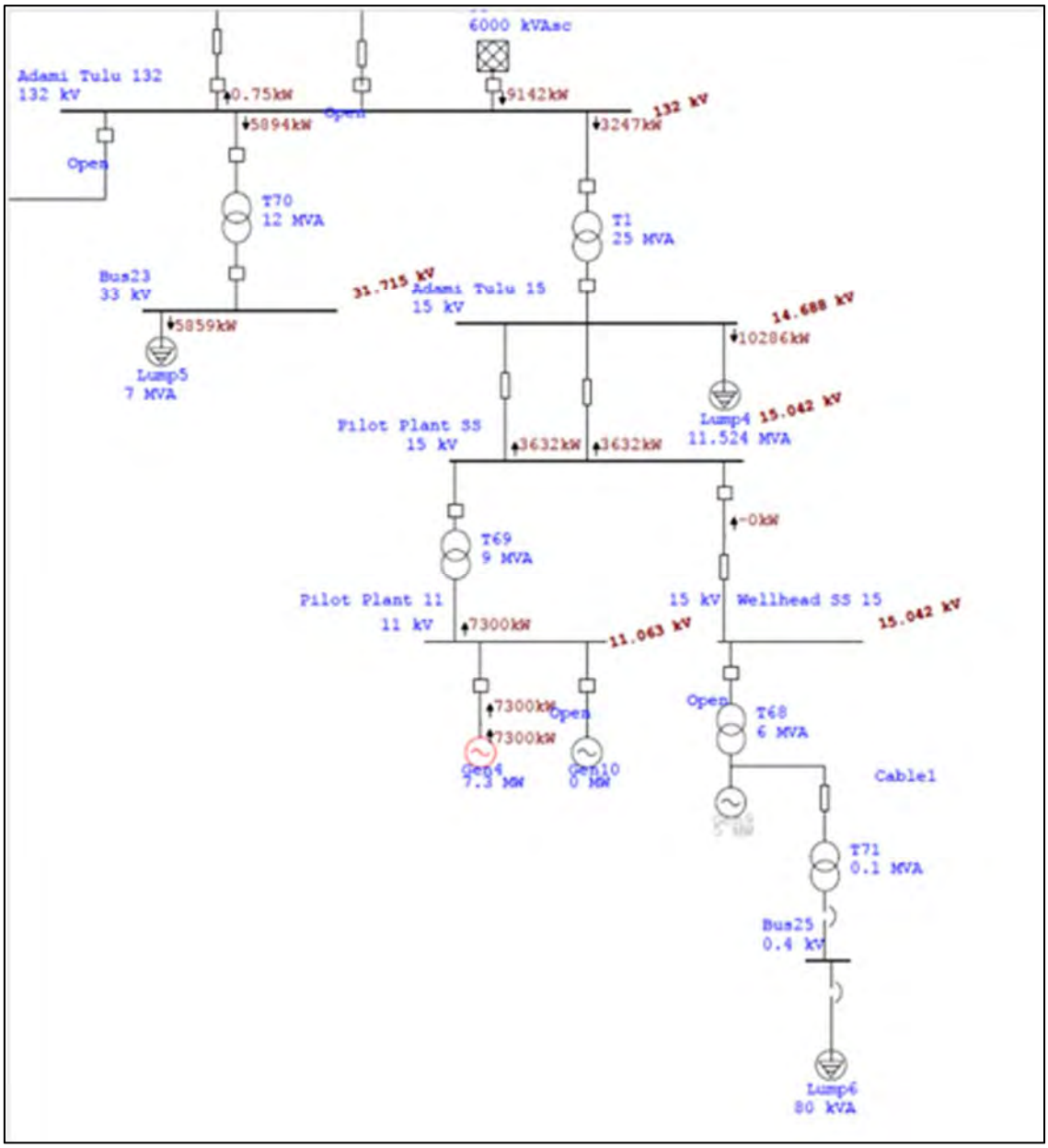
The generated power by the wellhead power system (3 MW) and the existing Pilot Plant (7.3 MW) will be able to be consumed in the Adami Tulu area, since the assumed demand for electricity of the 15 kV distribution line will be 10.91 MW in the year 2019 (the year of start of the commercial operation). This power system analysis has been conducted under the following conditions 1) power flow at 132 kV bus of Adami Tulu substation is only for power supply to Adami Tulu area, and 2) all generated power from the pilot plant and the wellhead power system will be consumed in the Adami Tulu area.

The result of the power system analysis is shown in Figures 2-2-2.4, 2-2-2.5, and 2-2-2.6, and the existing 15 kV distribution system and 15 kV equipment of Adami Tulu substation are usable for the power supply from both the pilot plant and the wellhead power system.

Table 2-2-2.3 Demand Record for the Past 5 Years and Demand Forecast for the Next 5 Years

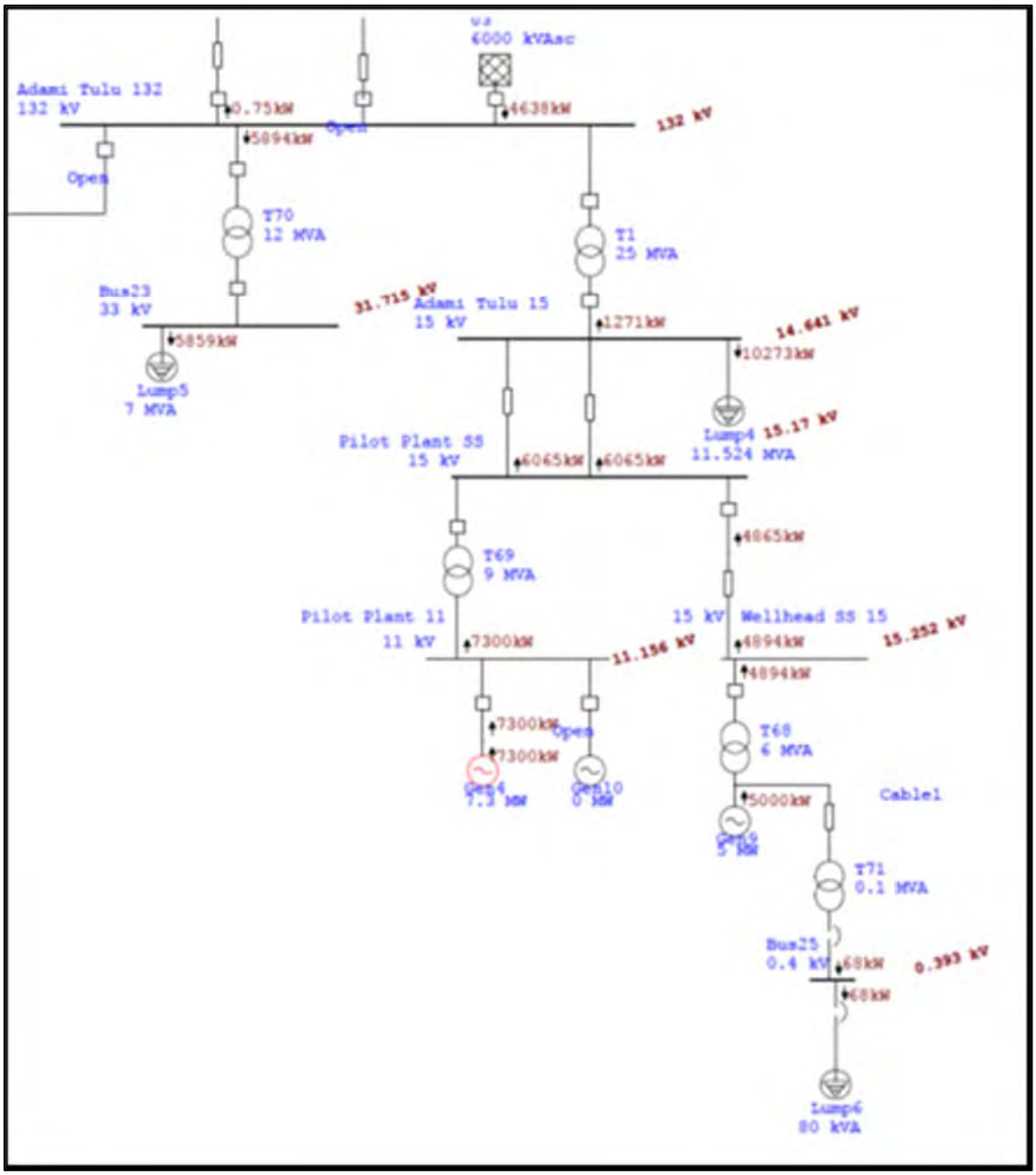
No.	Substation Name	Voltage (kV)	New EEPCO Zone	Year (MW)									
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Adami Tulu	15	South Eastern	6.68	7.09	7.50	8.27	8.94	9.57	10.18	10.91	11.76	12.57
		33	South Eastern	0.00	0.00	0.00	0.00	0.00	1.35	1.49	1.64	1.82	1.99
		132	South Eastern	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.23	0.44	0.66
2	Butajira	15	Western AA	3.42	3.72	4.54	5.25	5.90	6.50	7.09	7.75	8.49	8.90
		33	Western AA	2.02	2.20	2.68	3.10	3.48	3.84	4.19	4.58	5.01	5.25
		132	Western AA	0.00	0.00	0.06	0.14	0.27	0.39	12.91	14.11	15.46	16.81
3	Assela	15	South Eastern	9.82	10.42	11.02	12.15	13.13	14.06	14.96	16.03	17.28	18.47
		132	South Eastern	0.00	0.00	0.00	0.00	0.00	1.35	1.49	1.64	1.82	1.99
4	S.Shemen	15	Southern	18.75	19.41	22.95	25.98	28.68	31.21	33.68	36.50	39.73	43.47
		132	Southern	0.00	0.00	0.00	0.00	0.00	2.70	2.98	3.29	3.63	3.97
		132	Southern	0.00	0.97	2.40	4.70	6.84	8.86	8.64	8.53	8.53	8.53
5	Alaba	15	Southern	3.38	3.50	4.14	4.68	5.17	5.63	6.07	6.58	7.16	7.84
		132	Southern	0.00	0.00	0.00	0.00	0.00	1.35	1.49	1.64	1.82	1.99
		132	Southern	0.00	0.00	0.09	0.23	0.44	0.64	0.62	0.62	0.62	0.62
6	Awash	15	South Eastern	5.69	6.04	6.95	7.04	7.61	8.15	8.67	9.29	10.01	10.71
		132	South Eastern	0.00	0.00	0.00	0.95	2.31	4.48	6.55	8.63	8.63	8.62
	Awash 7kl	15	SEMERA	3.84	3.88	3.91	3.95	3.99	4.02	4.06	4.10	4.13	4.17
7	Koka	15	South Eastern	2.90	3.08	3.26	3.59	3.88	4.16	4.42	4.74	5.11	5.46
		132	South Eastern	0.00	0.64	1.60	3.13	4.56	5.91	5.76	5.69	5.69	5.68
8	Elala	15	South Eastern	6.89	7.31	7.74	8.53	9.22	9.87	10.50	11.25	12.13	12.97

Source: EEP Strategy and Investment Transmission Substation Office



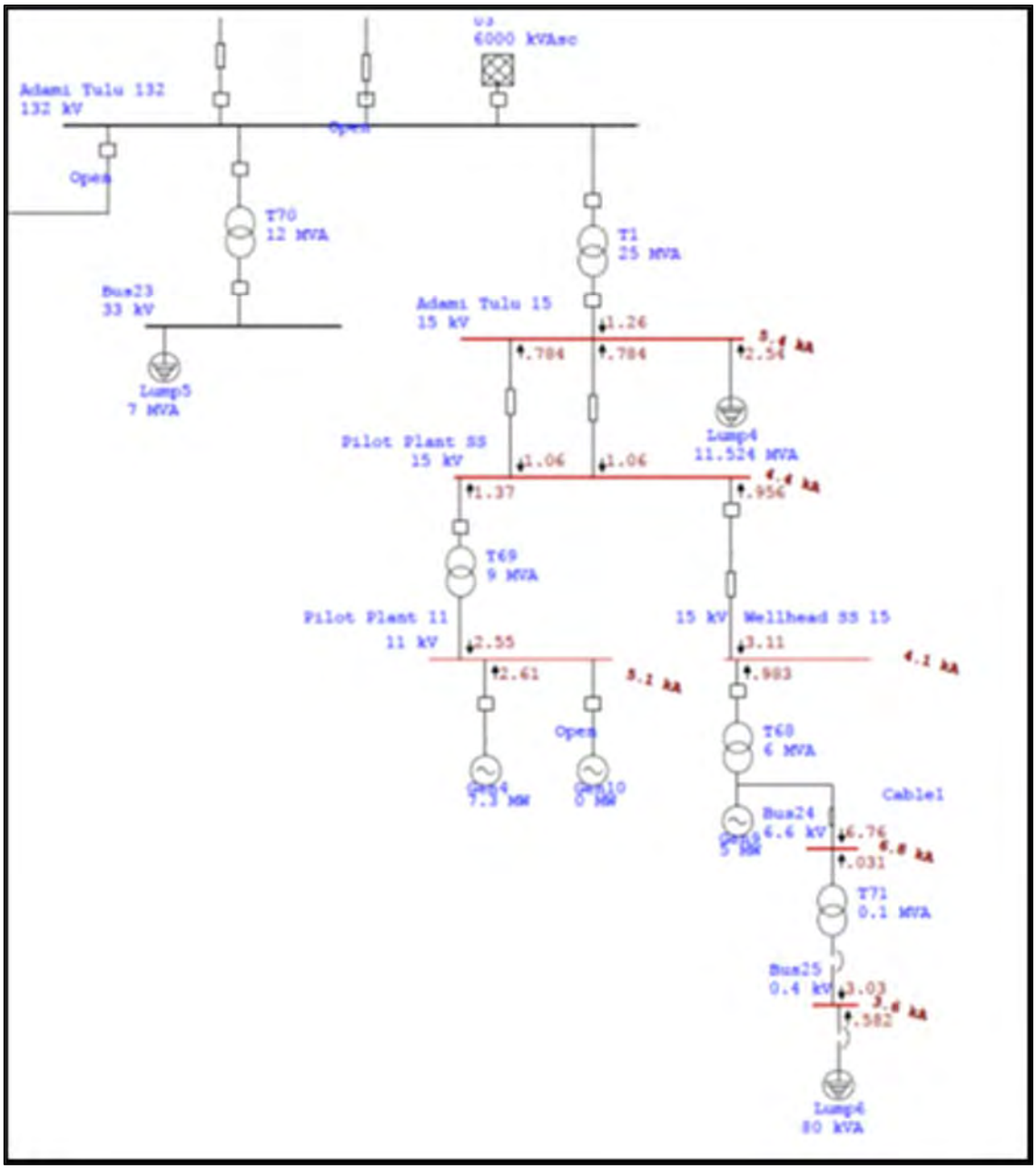
Source: Prepared by the Survey Team

Figure 2-2-2.4 Power Flow at Year Commencement of Commercial Operation (2019) without Wellhead Power System



Source: Prepared by the Survey Team

Figure 2-2-2.5 Power Flow at Year Commencement of Commercial Operation (2019) with Wellhead Power System



Source: Prepared by the Survey Team

Figure 2-2-2.6 Short Circuit Calculation at Year Commencement of Commercial Operation (2019) with Wellhead Power System

Table 2-2-2.4 Specifications of Circuit Breakers

Unit	Short Circuit Current	CB Specifications	Result
Adami Tulu Substation	5.4 kA	15 kA	Good
Pilot Plant (15kV)	4.5 kA	38 kA (1000 MVA, 15 kV)	Good
Pilot Plant (11kV)	5.4 kA	26 kA (500 MVA, 11 kV)	Good
Wellhead Power System	4.2 kA	Accordance with the calculation	N.A.

Source: Prepared by the Survey Team

(3) Overall Plan

This project consists of the steam gathering system, the wellhead power system and the substation system (including 15 kV distribution line). The equipment procured in the project is listed in the following Table 2-2-2.5, and the components of each piece of equipment of the system are described in the following sub-clauses 1), 2) and 3).

Table 2-2-2.5 Procured Equipment List

Equipment No.	Component No.	Equipment Name	Unit	Quantity
1		**Steam Gathering System**		
	1-1	Two-phase piping	set	1
	1-2	Steam piping	set	1
	1-3	Brine piping	set	1
	1-4	Separator	set	1
	1-5	N.A.		
	1-6	Scrubber	set	1
	1-7	Pressure control system	set	1
	1-8	Separator level control system	set	1
	1-9	Drain transfer pump	set	1
	1-10	Steam flowmeter	set	1
	1-11	Instrumentation	set	1
	1-12	N.A.		
	1-13	Portable platform	sets	2
	1-14	Pipe supports	set	1
2		**Wellhead Power System**		
	2-1	Turbine and auxiliaries	set	1
	2-2	Turbike exhaust silencer	set	1
	2-3	Lube oil system	set	1
	2-4	Gear reducer	set	1
	2-5	Generator and auxiliary equipment	set	1
	2-6	Enclosure	set	1
	2-7	Station service transformer	set	1
	2-8	Medium voltage switchgear	set	1
	2-9	Low voltage switchgear	set	1
	2-10	DC power supply system	set	1

Equipment No.	Component No.	Equipment Name	Unit	Quantity
	2-11	Distributed control system	set	1
	2-12	Turbine-Generator control panel	set	1
	2-13	Generator transformer protection panel	panels	2
	2-14	Medium voltage cable	set	1
	2-15	Earthing system	set	1
	2-16	Low voltage cable	set	1
	2-17	Control cable	set	1
	2-18	Control room (Container)	set	1
	2-19	Remote operation system	set	1
	2-20	N.A.		
	2-21	Fire protection equipment	set	1
	2-22	N.A.		
	2-23	Conduit pipes	set	1
	2-24	Cable tray	set	1
	2-25	Lighting	set	1
	2-26	Lightning protection equipment	set	1
3.		**Substation System**		
	3-1	15 kV step-up transformer	set	1
	3-2	15 kV switchgear	set	1
	3-3	15 kV cables and accessories	set	1
	DL1-1	Termination pole with line switches	sets	2
	DL1-2	Intermediate pole	sets	2
	DL1-3	Light angle pole	sets	3
	DL1-4	Heavy angle pole	sets	4
	DL1-5	Strain pole	sets	7
	DL1-6	Connection to the existing distribution line	set	1
	DL2-1	Overhead conductor	lot	1
	DL3-1	Pin insulator	lot	1
	DL3-2	Disk insulator	lot	1
	DL3-3	Lightning arrester	lot	1

Source: Prepared by the Survey Team

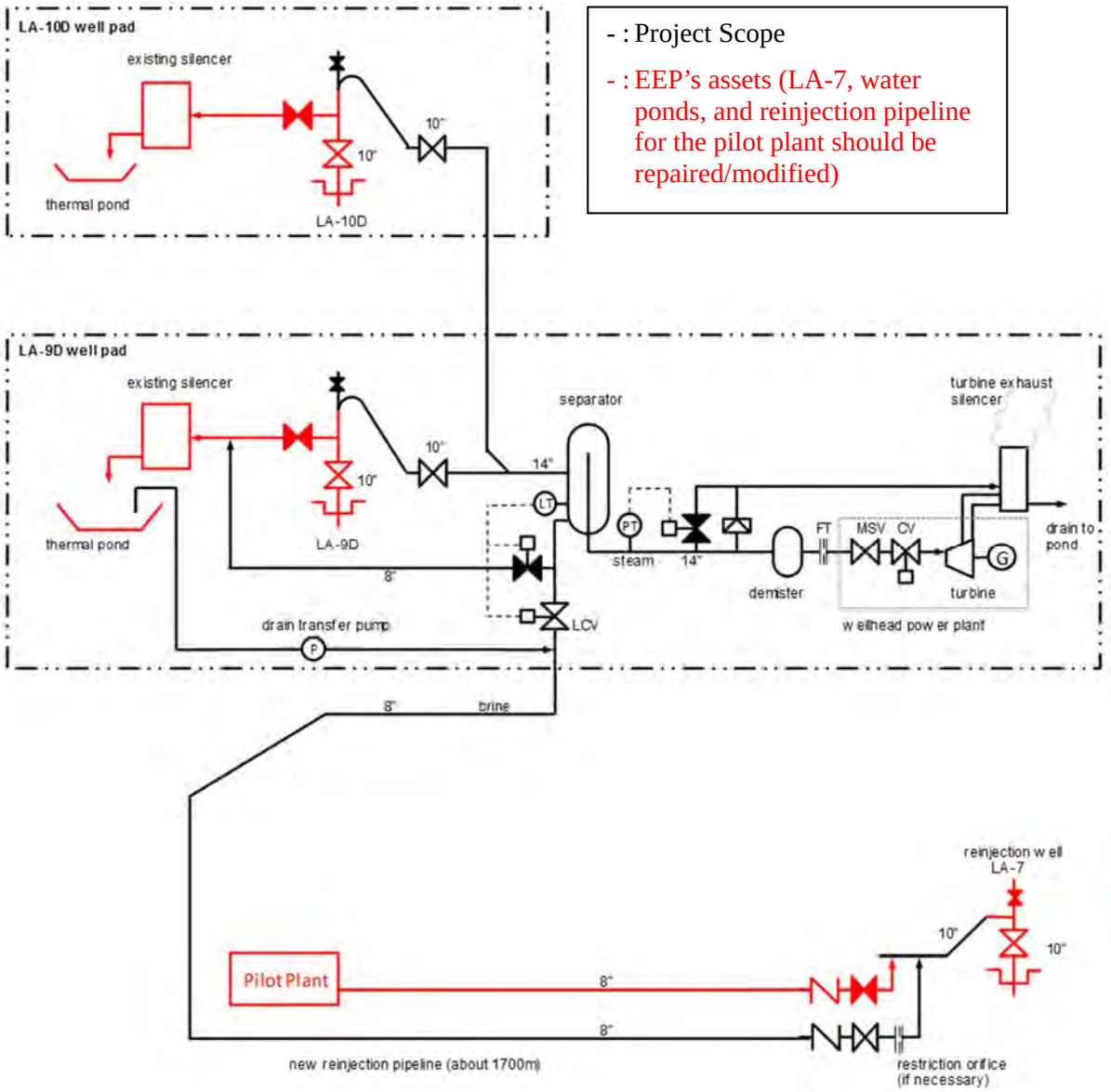
1) Steam Gathering System

Table 2-2-2.6 shows the steam gathering system configuration. Figure 2-2-2.7 shows the steam gathering system's overall piping and instrument diagram. Figure 2-2-2.8 shows the piping diagram around the reinjection well.

Table 2-2-2.6 Steam Gathering System Configuration

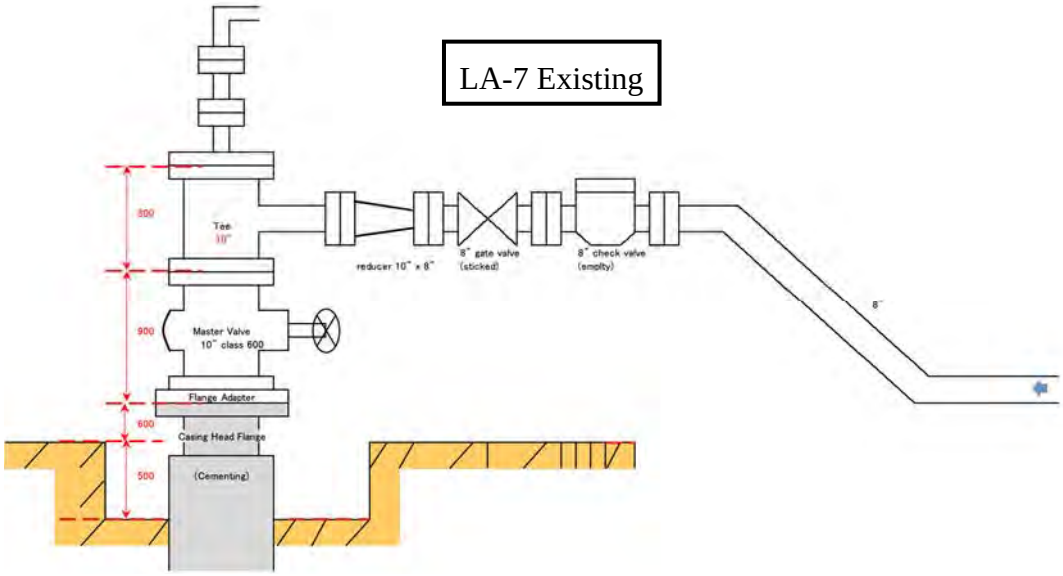
Item	Qty	Description
Two-phase piping	1 set	From 2 x production wells (LA-9D and LA-10D) to separator; piping, valves, instruments, insulation, pipe supports, etc.
Steam piping	1 set	Piping, safety valve, bypass valve, rapture disk, steam flow meter, valves, instruments, insulation, pipe supports, etc.
Brine pipeline	1 set	Pipeline between separator and reinjection well; piping, valves, instruments, insulation, pipe supports, etc.
Separator	1 set	Bottom outlet cyclone separator, hot water tank (depends on the contractor's system), level control valve, discharge valve, brine flow meter, valves, instruments, insulation, pipe supports, etc.
Scrubber	1 set	Scrubber, piping, valves, instruments, pipe supports, etc. Scrubber type will be decided by the contractor.
Pressure control system	1 set	Steam relief valve, bypass valve, thermal insulation, etc.
Separator level control system	1 set	Level control valve, brine relief valve, piping, thermal insulation, etc.
Drain transfer pump	1 set	Pump, motor, piping, power supply system, instruments (To transfer miscellaneous drain from LA-9D thermal pond to reinjection pipeline.)
Steam flowmeter	1 set	Main steam flowmeter, transmitter, thermal insulation, etc.
Instrumentation	1 set	Temperature instrumentation, pressure instrumentation, flow instrumentation, level instrumentation, instrumentation mounting material, installation accessories, etc.
Platform	1 set	Scaffolding, corridor, steps, ladder, hand rail, etc. for maintenance works
Hoist	1 set	Hoist, gantry, hanging metal fitting, etc. for maintenance works
Foundation works	1 set	Foundations for pipeline, vessels, equipment, etc. including foundation bolt, anchor bolt, supports, culvert, etc.
Installation	1 set	Including transportation and corrosion proof painting
Test, adjustment and commissioning	1 set	Hydrostatic test of pipeline and nondestructive test at welding points based on international standards such as ASME B31.1, ASME BPVC, or equivalent
Consumables, spare parts	1 set	Spare parts, consumables during commissioning, special tools, etc.
Detailed design	1 set	Design documents and drawings
Manuals	1 set	As built drawing, operation manuals and maintenance manuals
O&M training	1 set	
Fence	1 set	EEP's scope

Source: Prepared by the Survey Team

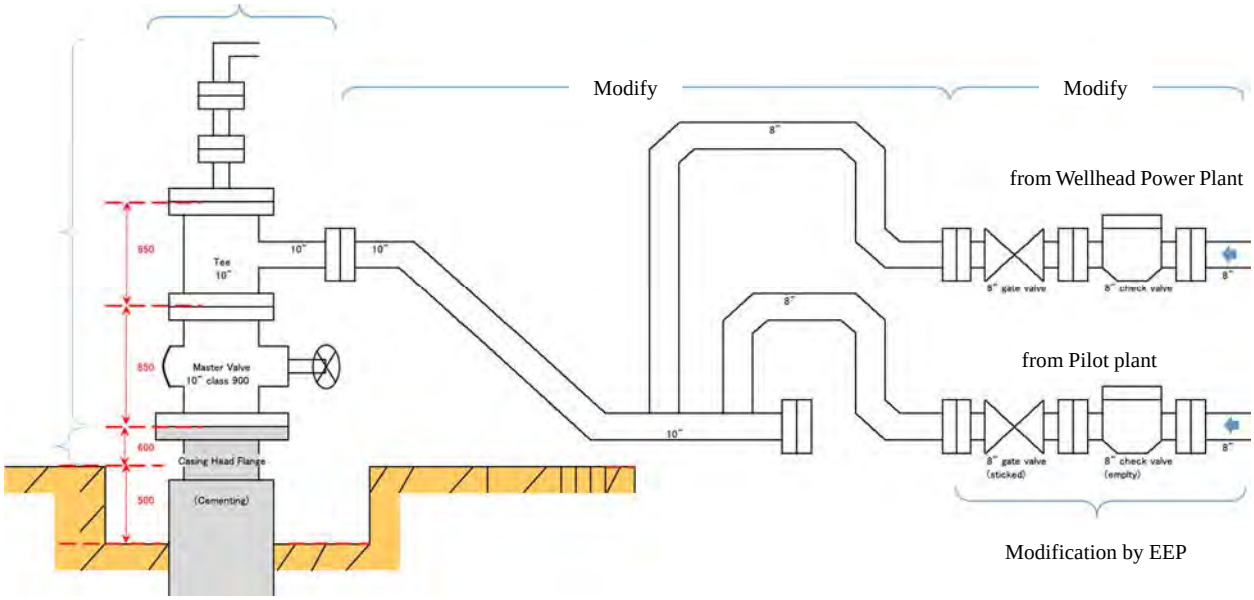


Source: Prepared by the Survey Team

Figure 2-2-2.7 Overall Piping Diagram for Steam Gathering System (Plan)



Alternative 1: Modification of existing wellhead equipment



Source: Prepared by the Survey Team

Figure 2-2-2.8 Piping Diagram for Reinjection Well LA-7 (Plan)

2) Wellhead power system

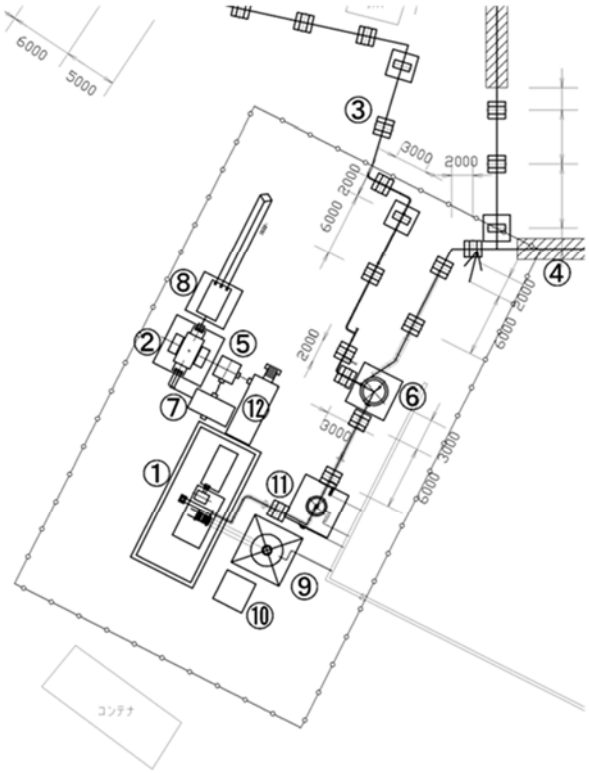
Table 2-2-2.7 shows the main components of the wellhead power system. Figure 2-2-2.9 shows the plot plan of the wellhead power system.

Table 2-2-2.7 Components of Wellhead Power System

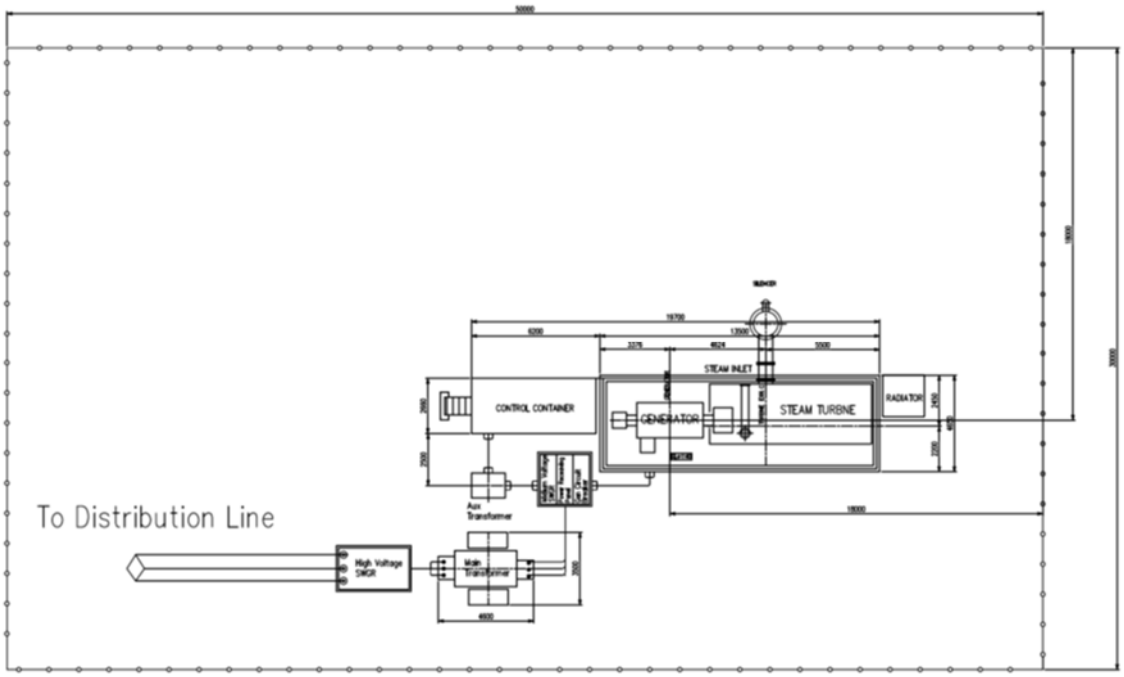
Equipment	Qty	Description
Turbine and auxiliaries	1 set	Single flash type single flow back pressure turbine including steam strainer, main steam stop valve and governor valve
Turbine exhaust silencer	1 set	10 m height silencer with piping, valves, instruments, insulation and supports
Lube oil system	1 set	Oil tank, oil pump, emergency oil pump, oil cooler, vapor extractor, strainer, filter, etc.
Gear reducer	1 set	Depend on manufacturer's design
Generator and auxiliary equipment	1 set	Horizontal cylindrical type generator with blush less/PMG static type exciter
Enclosure	1 set	To protect turbine, generator and auxiliaries from wind, rain, dust, etc. also for countermeasures against noise from turbine and/or aux equipment. Door(s), lighting, and maintenance working space should be equipped.
Station service transformer	1 set	Outdoor type oil immersed ONAN step-down transformer with ± 5% tap changer
Medium voltage switchgear	1 set	Outdoor type metal enclosed self-standing 6.6 kV switchgear (voltage level 12 kV) with circuit breakers, disconnection switches with earthing switch, potential transformer and lightning arrester
Low voltage switchgear	1set	Indoor type metal enclosed self-standing 400 V motor and load control center
DC power supply system	1set	Indoor type metal enclosed self-standing DC 110V distribution board(s) including AC/DC converter, transformer, dropper, battery and battery charger system
Distributed control system	1set	Indoor type metal enclosed self-standing type, which can operate and monitor all the equipment of the wellhead power plant, the steam gathering system and the 15 kV distribution line
Turbine-Generator control panel	1set	Indoor type self-standing metal enclosed panel with turbine speed control, load control, voltage control, plant OPS function and maintenance tools
Generator and transformer protection panel	2 panels	Indoor type metal enclosed self-standing protection panel for generator and transformer including test terminal and maintenance tools

Equipment	Qty	Description
Medium voltage cable	1 set	Power cable and accessories (generator – generator SWGR, medium voltage switchgears – station service transformer, power receiving panel – 15 kV step-up transformer)
Earthing system	1 set	Grounding mesh, wire, rod or plate
Low voltage cables	1 set	Power cables and accessories (low voltage switchgears – each load)
Control cables	1 set	Control cables and accessories
Control room (Container)	1 set	Container type with air-conditioning equipment and H_2S filter
Remote operation system	1 set	Remote monitoring system for wellhead power plant from the existing Pilot Plant
Fire protection equipment	1 set	Fire extinguisher as necessary based on manufacturer's design, smoke and fire detector, alarm device
Conduit pipes	1 set	Conduit pipes for cable installation and protection
Cable tray	1 set	Cable tray and supports for cable installation
Lighting	1 set	Lighting devices for plant compound
Lightning protection equipment	1 set	Lightning protection devices in plant compound
Hoist	1 set	Hoist, gantry, hanging metal fitting, etc. for maintenance works
Foundation works	1 set	Foundations for equipment, oil-water separator, oil fence etc. including foundation bolt, anchor bolt etc.
Installation	1 set	Including transportation and corrosion proof painting
Test, adjustment and commissioning	1 set	Hydrostatic test of pipeline and nondestructive test at welding points based on international standards such as ASME B31.1, ASME BPVC, or equivalent
Consumables, spare parts	1 set	Spare parts, consumables during commissioning, special tools, etc.
Detailed design	1 set	Design documents and drawings
Manuals	1 set	As built drawing, operation manuals and maintenance manuals
O&M training	1 set	
Fence	1 set	EEP's scope

Source: Prepared by the Survey Team



①Turbine Generator
②Step up Transformer
③Pipe Foundation
④Culvert
⑤Station Service Transformer
⑥Separator
⑦MV Switchgear
⑧15kV Switchgear
⑨Silencer
⑩Radiator
⑪Scrubber
⑫Control Room Container



Source: Prepared by the Survey Team

Figure 2-2-2.9 Wellhead Power System Plot Plan (reference plan)

3) Substation (including 15 kV distribution system)

Table 2-2-2.8 shows the components of the substation including the 15 kV distribution system.

Table 2-2-2.8 Components of Substation including 15 kV Distribution System

Equipment	Qty	Description
15 kV step-up transformer	1 set	Outdoor type ONAN step-up transformer with OLTC 15 kV +/- 7.5%
15 kV switchgear	1 set	Outdoor type metal enclosed self standing type 15 kV switchgear (voltage level 24 kV) with circuit breakers, disconnection switches with earthing switch, potential transformer and lightning arrester
15 kV cables and accessories	1 set	Power cable and accessories (15 kV step-up transformer – 15 kV switchgear – Line switch of electric pole)
Termination pole with line switch	2 sets	Termination H type wooden pole, cross arm, earthing rod, line switch, lightning arrester, stay wire, optical fiber cable support
Intermediate pole	2 sets	Intermediate T type wooden pole, cross arm, optical fiber cable support
Light angle pole	3 sets	Termination H or A type wooden pole, cross arm, stay wire, optical fiber cable support
Heavy angle pole	4 sets	Intermediate T type wooden pole, cross arm, stay wire, optical fiber cable support
Strain pole	7 sets	Strain H or A type wooden pole, cross arm, stay wire, optical fiber cable support
Connection to the existing distribution line	1 set	U type cross arm, ball eye, socket eye, clamp, big collars, small collars
Overhead conductor	1 lot	Overhead conductor, AAC 95 mm^2 , 2400 m
Pin insulator	1 lot	Pin type insulator, 22 kV, pre-form tie strap
Disk insulator	1 lot	Disk type, 22 kV, retention type clamp
Lightning arrester	1 lot	Insulator type arrester, 28 kV distribution line, pre-form tie strap
Foundation works	1 set	Foundations for equipment, oil-water separator, oil fence etc. including foundation bolt, anchor bolt etc.
Installation	1 set	Including transportation and corrosion proof painting
Test, adjustment and commissioning	1 set	
Consumables, spare parts	1 set	Spare parts, consumables during commissioning, special tools, etc.
Detailed design	1 set	Design documents and drawings
Manuals	1 set	As built drawing, operation manuals and maintenance

Equipment	Qty	Description
		manuals
O&M training	1 set	

Source: Prepared by the Survey Team

(4) Equipment Plan

1) Main equipment

The main equipment of the project is summarized in the following Table 2-2-2.9.

Table 2-2-2.9 Main Equipment List

No.	Equipment Name	Procured Country	Country Origin	Specifications	Qty	Purpose
1-1	Two-phase piping	Japan	Japan	Length: 62 m or more (LA-9D) 105 m or more (LA-10D) 75 m or more (Separator inlet header) Pipe thickness: Sch 40 or more	1	Transport geothermal two-phase fluid from production wells (LA-9D & LA-10D) to separator
1-2	Steam piping	Japan	Japan	Length: 33 m or more Pipe thickness: Sch 40 or more	1	Transport geothermal steam from separator to wellhead power system
1-3	Brine piping	Japan	Japan	Length: 1,700 m or more Pipe size: 8 inches, Sch 40 or more	1	Transport geothermal brine from separator to existing reinjection well LA-7
1-4	Separator	Japan	Japan	Type: Bottom-outlet, cyclone type separator Separation efficiency: 99.995% or more	1	Separate geothermal two-phase fluid into steam and brine
1-6	Scrubber	Japan	Japan	Wetness at outlet: 0.02 weight% or less	1	Remove water droplet impurities from geothermal steam

No.	Equipment Name	Procured Country	Country Origin	Specifications	Qty	Purpose
1-7	Pressure control system	Japan	Japan	Pressure: 6 - 9.4 bara Flow rate: 43 - 66 t/h	1	When the wellhead power system trips, in order to protect facility from over pressure, steam relief valve opens to discharge excess steam to turbine exhaust silencer.
1-8	Separator level control system	Japan	Japan	Pressure: 900 kPa (abs) at rated output Temperature: 174 deg. C	1	To prevent steam from blowing through separator into reinjection well
1-9	Drain transfer pump	Japan	Japan	Temperature: 10 - 70 deg. C Head: 90 m or more Capacity: 0.6 m^3/min or more	1	To transfer miscellaneous drain collected in the thermal pond of LA-9D wellpad to brine reinjection piping
1-10	Steam flowmeter	Japan	Japan	Pressure: 6 - 9 bara Flow rate: 43 - 66 t/h	1	To measure steam flow rate in order to monitor the performance of wellhead power system and reservoir
1-11	Instrumentation	Japan	Japan	Temperature instrumentation: Thermocouple type or resistor temperature detector with compensated cable and protection tube Pressure instrumentation: Bourdon tube, diaphragm or bellow type	1	To be used for monitoring operating conditions and performance of steam gathering system
1-14	Pipe supports	Japan	Japan	Supports for two-phase piping: For pipe 182 m or more Supports for steam piping: For pipe 35 m or more Supports for brine pipe: For pipe 1,646 m or more	1	Support pipes
2-1	Turbine and auxiliaries	Japan	Japan	Type: Single casing, single flow, backpressure steam turbine Output: 5,000 kW, (2,600 kW when LA-9D and LA-10D are used)	1	Drive the generator using geothermal steam

No.	Equipment Name	Procured Country	Country Origin	Specifications	Qty	Purpose
2-2	Turbine exhaust silencer	Japan	Japan	Type: Vertical cylindrical type Height: 10 m or more from ground	1	To reduce noise level of turbine exhaust
2-3	Lube oil system	Japan	Japan	Main oil pump: Centrifugal pump driven by AC motor Emergency oil pump: Centrifugal pump driven by DC motor	1	To supply and cool lubricating oil for steam turbine and generator
2-5	Generator and auxiliary equipment	Japan	Japan	Generator Type: Horizontal mount cylindrical rotor Standard: IEC, JIS, BS, JEC or equivalent Rated capacity: 6 MVA Voltage: 6,600 V Exciter Type: Brushless or static type Initial excitation method: Permanent magnet or DC power supply	1	To convert driving force of steam turbine to electrical energy
2-7	Station service transformer	Japan	Japan	Type: Outdoor type, Standard: IEC, JIS, BS, JEC or equivalent Rated capacity: 300 kVA or more Frequency: 50 Hz Primary voltage: 6,600 V Secondary voltage: 400 V	1	To step-down electricity voltage to 440 V from generator voltage to supply electricity power for auxiliary equipment
2-8	Medium voltage switchgear	Japan	Japan	Type: Outdoor use, Metal enclosure or Metal clad type air insulated Standard: IEC, JIS, BS, JEC or equivalent Rated voltage: 12 kV or higher Rated frequency: 50 Hz	1	To receive generator electricity power and to supply electricity to main transformer and auxiliary station service transformer
2-9	Low voltage switchgear	Japan	Japan	Type: Indoor use, Metal enclosed type air insulated withdraw type, installed in container control room Standard: IEC, JIS, BS, JEC or equivalent Input: AC 400 V Output: AC 400 V +/- 5%, AC 230 V +/- 5%	1	To supply AC power for plant auxiliary loads, working loads, SGS loads, and lighting loads

No.	Equipment Name	Procured Country	Country Origin	Specifications	Qty	Purpose
2-10	DC power supply system	Japan	Japan	Type: Indoor use, thyristor type, air insulated, metal enclosed self-standing type, installed in container control room Standard: IEC, JIS, JEM, JEC or equivalent Input: AC 400 V+/- 10% Output: DC 110 V (+/- 3%)	1	To supply DC power for auxiliary plant loads, including DC power supply system, battery, DC distribution panel, and DC motor starter panel
2-12	Turbine-Generator control panel	Japan	Japan	Type: Indoor use, metal enclosed self-standing type Standard: IEC, JIS, JEM, JEC or equivalent System composition: Turbine main valve control function, Local control function for power plant and wellhead facilities, Generator voltage control function, and Plant auto start and stop function	1	Control and protection for turbine and generator
2-13	Generator transformer protection panel	Japan	Japan	Type: Indoor use, metal enclosed self-standing type Standard: IEC, JIS, JEM, JECor equivalent System composition: Generator protection, Transformer protection, and Automatic synchronization	2	In case of electric fault accident of plant, to protect generator, transformer, and automatic synchronization system
2-14	Medium voltage cable	Japan	Japan	Standard: IEC, JIS or equivalent standard Type: 6.6 kV XLPE, Tin coated copper conductors, Tin coated copper tape, Nonflammable cable Length: 60 m between generator and generator switchgear	1	To connect generator and related electrical equipment with medium voltage cables
2-15	Earthing system	Japan	Japan	Type: Buried grounding copper conductor earthing mesh and grounding rods Scale of earthing mesh: 1,664 m^2 or larger	1	To provide the shortest path from earthed equipment to ground

No.	Equipment Name	Procured Country	Country Origin	Specifications	Qty	Purpose
2-16	Low voltage cables	Japan	Japan	Standard: IEC, JIS or equivalent Type: 600 V XLPE, Tin coated copper conductors, Nonflammable cable	1	To supply electric power for all equipment of wellhead power plant with low voltage power cables
2-17	Control cables	Japan	Japan	Standard: IEC, JIS or equivalent Type: 600 V XLPE, Tin coated copper conductors, Nonflammable cable	1	To transmit and receive control signals with control cables
2-23	Conduit pipes	Japan	Japan	XLPE coated or equivalent, Rigid steel conduit or equivalent, Flexible type conduit, Pull box type water proof junction box	1	Conduit pipe to protect installed cables
2-24	Cable trays	Japan	Japan	Cable tray: Steel type tray and rack Cable occupancy in tray not exceed 50%	1	To lay cables on cable trays
3-1	15 kV step-up transformer	Japan	Japan	Type: Outdoor use oil immersed with on-load tap changer Standard: IEC, JIS, BS, JEC or equivalent Rated capacity: 6,000 kVA Frequency: 50 Hz, 3 phase Primary voltage: generator voltage Secondary voltage: 15 kV	1	Step-up the generated electric power voltage to 15 kV in order to transmit the electricity to distribution line
3-2	15 kV switchgear	Japan	Japan	Type: Outdoor use metal enclosed type air insulated Standard: IEC, JIS, BS, JEC or equivalent Rated voltage: 24 kV (with altitude correction factor, nominal 15 kV) Frequency: 50 Hz	1	15 kV switchgear to connect electricity evacuated from the generator to 15 kV distribution line
3-3	15 kV cable and accessories	Japan	Japan	Standard: IEC, JIS or equivalent Type: 15 kV XLPE, Tin coated copper conductors, Tin coated copper tape, Nonflammable cable Length: 30m between 15 kV switchgear and 15 kV step-up transformer, 45 m between 15 kV switchgear and 15 kV distribution line	1	Lay high voltage cable between 15 kV step-up transformer, 15 kV switchgear, 15 kV distribution line and line switch

Source: Prepared by the Survey Team

2) 15 kV Distribution Line

The design conditions of the 15 kV distribution line are specified in Table 2-2-2.10.

Table 2-2-2.10 15 kV Distribution System Design Conditions

Item	Design Conditions
Altitude	Less than 2,000 m
Conductor temperature	
Minimum	5 deg. C
Nominal	25 deg. C
Maximum temperature	80 deg. C
Temperature for sag calculation	50 deg. C
Wind velocity	40.0 m/s
Wind load	
Conductor	56.3 kg/m^2
Pole	163.1 kg/m^2
Allowable bearing	400 kN/m^2 (Survey data)

Source: Prepared by the Survey Team

(a) Grid voltage

Distribution line voltage: 15 kV ± 5%

(b) Frequency

50 Hz (49.0 – 50 – 50.2 Hz)

(c) Grounding

Solidly grounded

(d) Insulator pollution level

IEC60815 Light level

(e) Applicable standard

15 kV distribution system should be designed based on IEC standards and/or equivalent standards.

Basic configurations

- 15 kV wooden poles will be constructed for wellhead power system. CV cable and 15 kV switchgear will be installed for connection to 15 kV distribution system. The 1st pole has line switches for 15 kV CV cable.
- Newly constructed distribution system will use wooden poles consisting of intermediate poles, strain poles, heavy and light angle poles and termination poles, which should be EEU's standard type.
- The connection point with the existing 15 kV distribution system should be equipped with line switches.
- All poles have optical fiber cable supports, which are for monitoring and control of the wellhead power system from the existing pilot plant.

Table 2-2-2.11 shows the specifications of the 15 kV distribution system.

Table 2-2-2.11 Specifications of 15 kV Distribution System

No.	Items	Specifications	Qty
1-1.	Wooden pole 1) Type 2) Material 3) Size 4) Withstand load	 : H Type pole, horizontal conductor layout, termination pole with line switches, single circuit : Wood with anti-termite and corrosion proof treatment : Height 12 m, Bottom: 260 mm or more : 600 daN or more	2 sets
1-2.	Wooden pole 1) Type 2) Material 3) Size 4) Withstand load	 : H Type pole, horizontal conductor layout, strain pole, single circuit : Wood with anti-termite and corrosion proof treatment : Height 12 m, Bottom: 260 mm or more : 600 daN or more	2 sets
1-3.	Wooden pole 1) Type 2) Material 3) Size 4) Withstand load	 : T Type pole, horizontal conductor layout, light angle pole (2-30 degrees), single circuit : Wood with anti-termite and corrosion proof treatment : Height 12 m, Bottom: 260 mm or more : 600 daN or more	3 sets
1-4.	Wooden pole 1) Type 2) Material 3) Size 4) Withstand load	 : H Type pole, horizontal conductor layout, heavy angle pole(30-60 degrees), single circuit : Wood with anti-termite and corrosion proof treatment : Height 12 m, Bottom: 260 mm or more : 600 daN or more	4 sets
1-5.	Wooden pole 1) Type 2) Material 3) Size 4) Withstand load	 : T Type pole, horizontal conductor layout, intermediate pole, single circuit : Wood with anti-termite and corrosion proof treatment : Height 12 m, Bottom: 260 mm or more : 600 daN or more	7 sets
2.	Conductor 1) Type 2) Size	 : AAC : 95 mm^2 , EN50182 (BS215)	2,400 m
3-1.	Pin insulator 1) Standard 2) Type 3) Creepage distance 4) Material 5) Number of insulators	 : IEC60720, IEC60305, IEC60383 or equivalent : Pin insulator : 480 mm or more : Porcelain : 1 pc./phase	48 sets

No.	Items	Specifications	Qty
3-2.	Disk insulator 1) Standard 2) Type 3) Creepage distance 4) Material 5) Number of insulators	 : IEC60720, IEC60305, IEC60383 or equivalent : Disk insulator ball socket type : 480 mm or more : Porcelain : 4pcs/phase	9 sets
3-3.	Lighting Arrester 1) Standard 2) Type 3) Rated voltage 4) Material 5) Number of LA	 : IEC60099, JEC or equivalent : Insulator type lightning arrester : 18.7 kV : Porcelain : 1set/circuit	2 sets
9.	Cross arm 1) Type 2) Material 3) Purpose	 : U type angle : Hot dip galvanized steel : for termination, strain, intermediate, angle poles 2,500 mm length	21 sets
10.	Cross arm 1) Type 2) Material 3) Purpose	 : L type angle : Hot dip galvanized steel : for fixing LA and LS 2,500 mm length	4 sets
11.	Line switch (LS) 1) Type 2) Rated voltage 3) Withstand voltage	 : Insulator type pole mounting, IEC62271 or equivalent : 28 kV 50Hz : Power frequency withstand voltage; 50 kV Lightning impulse withstand voltage; 150 kV	2 sets
12.	Stay wire 1) Standard 2) Type 3) Min Tension 4) Size 5) Number of wire	 : BS 183 or equivalent : Hot dip galvanized steel wire : 4.31 (kN) : 9.6 (mm) : 7/3.2 (No./mm)	18 sets
13. (1)	Earthing Earthing wire 1) Type 2) Rated voltage 3) Size (2) Earthing rod 1) Type 2) Material 3) Length	 : Cabtyre cable : 22 kV : Annealed copper wire, tension 1.04 kN or more, 2.6 mm dia. or more : Driving type : Polished copper rod : 0.9 m or more	2 sets
14.	Fiber optical cable support 1) Type 2) Material 3) Junction box	 : LV insulator with angle : Insulator: Porcelain, angle: galvanized steel : Galvanized steel sheet outdoor type	18 sets

No.	Items	Specifications	Qty
15	Foundation 1) Depth 2) Diameter 3) Cement base 4) Embedded depth	 : 2.1 m or more : Intermediate pole; 0.8 m, light angle pole; 0.9 m, heavy angle/strain/termination pole; 1 m or more : 10 cm : 2 m or more	26 sets

Source: Prepared by the Survey Team

Table 2-2-2.12 is 15kV distribution system material list.

Table 2-2-2.12 15 kV Distribution System Material List

No.	Item	Unit	Qty	Total
DL1-1 Termination Pole with Line Switches				***2***
1	Pole	pc	2	4
2	U-cross arm 80 x 45 x 6/8 mm	pc	2	4
3	Big collar	pc	4	8
4	15 kV Insulator type LA	pc	3	6
5	15 kV pin for insulator type LA	pc	3	6
6	L-cross arm 80 x 45 x 6/8 mm	pc	2	4
7	L-cross arm fixing long bolt	pc	2	4
8	L-cross arm support	pc	2	4
9	15 kV insulator pin for earthing wire	pc	3	6
10	15 kV pin insulator for earthing wire	pc	3	6
11	Small collar with nut & washer	pc	6	12
12	Ball eye 16 mm	pc	6	12
13	15 kV disk insulator	pc	12	24
14	Socket eye 16 mm dia.	pc	6	12
15	Strain clamp 25 mm for 95 mm2 AAC	pc	6	12
16	Parallel grove clamp	pc	3	6
17	Line switch	pc	1	2
18	Pin insulator for earthing wire	pc	3	6
19	Stay wire	pc	2	4
20	Stay insulator 15 kV	pc	1	2
21	Stay rod MV	pc	1	2
22	Stay plate	pc	1	2
23	Earthing wire (copper)	lot	1	2
24	Earthing rod	pc	1	2
25	Fiber optics cable support	pc	1	2
26	Fiber optics cable support clamp	pc	1	2
27	Lightning arrestor	lot	1	2
28	Foundation	lot	2	4
DL1-2 Strain Pole				***2***
1	Pole	pc	2	4
2	U-cross arm 80 x 45 x 6/8 mm	pc	1	2
3	Big collar	pc	2	4

No.	Item	Unit	Qty	Total
4	15 kV pin insulator	pc	3	6
5	15 kV insulator pin	pc	3	6
6	Small collar with nut & washer	pc	6	12
7	Ball eye 16 mm	pc	6	12
8	15 kV disk insulator	pc	12	24
9	Socket eye 16 mm dia.	pc	6	12
10	Strain clamp 25 mm for 95 mm2 AAC	pc	6	12
11	Stay wire	lot	2	4
12	Stay insulator 15 kV	pc	1	2
13	Stay rod MV	pc	1	2
14	Stay plate	pc	1	2
15	Fiber optics cable support	pc	1	2
16	Fiber optics cable support clamp	pc	1	2
17	Parallel grove clamp	pc	3	6
18	Foundation	lot	2	4
DL1-3 Light Angle Pole				***3***
1	Pole	pc	1	3
2	U-cross arm 80 x 45 x 6/8 mm	pc	1	3
3	Long bolt	pc	1	3
4	15 kV pin insulator	pc	3	9
5	Tie strap	pc	2	6
6	Long bolt	pc	1	3
7	Stay wire	pc	1	3
8	Bolt M10x30 and nut M10	pc	3	9
9	15 kV insulator pin	pc	3	9
10	Stay insulator 15 kV	pc	1	3
11	Stay rod MV	pc	1	3
12	Stay plate	pc	1	3
13	Fiber optics cable support	pc	1	3
14	Fiber optics cable support clamp	pc	1	3
15	Foundation	lot	1	3
DL1-4 Heavy Angle Pole				***4***
1	Pole	pc	2	8
2	U-cross arm 80 x 45 x 6/8 mm	pc	1	4
3	Big collar	pc	2	8
4	15 kV insulator pin	pc	3	12
5	15 kV pin insulator	pc	3	12
6	Small collar with nut & washer	pc	6	24
7	Ball eye 16 mm	pc	6	24
8	15 kV disk insulator	pc	12	48
9	Socket eye 16 mm dia.	pc	6	24
10	Strain clamp 25 mm for 95 mm2 AAC	pc	6	24
11	Stay wire	pc	1	4
12	Stay insulator 15 kV	pc	1	4
13	Stay rod MV	pc	1	4
14	Stay plate	pc	1	4
15	Parallel grove clamp	pc	3	12

No.	Item	Unit	Qty	Total
16	Fiber optics cable support	pc	1	4
17	Fiber optics cable support clamp	pc	1	4
18	Foundation	lot	2	8
DL1-5 Intermediate Pole				***7***
1	Pole	pc	1	7
2	U-cross arm 80 x 45 x 6/8 mm	pc	1	7
3	Long bolt	pc	1	7
4	15 kV pin insulator	pc	3	21
5	Tie strap	pc	2	14
6	Long bolt	pc	1	7
7	15 kV insulator pin	pc	3	21
8	Bolt M10x30 and nut M10	pc	2	14
9	Fiber optics cable support	pc	1	7
10	Fiber optics cable support clamp	pc	1	7
11	Foundation	lot	1	7
Connection with the Existing Pole				***1***
1	U-cross arm 80 x 45 x 6/8 mm	pc	1	1
2	Big collar	pc	2	2
3	Small collar with nut & washer	pc	6	6
4	Ball eye 16 mm	pc	6	6
5	15 kV disk insulator	pc	12	12
6	Socket eye 16 mm dia	pc	6	6
7	Strain clamp 25 mm for 95 mm2 AAC	pc	6	6

Source: Prepared by the Survey Team

(5) Plan of Spare Parts and Consumables

The spare parts to be procured in the project are selected parts which are needed for repair and/or replacement in the periodical maintenance due to aging, wear, deterioration, and damage. The quantity of the spare parts is sufficient for four (4) years of operation.

The consumables to be procured in the project will be necessary to be replaced in the relatively short term during the daily operation and maintenance, due to wear and deterioration. The quantity of the consumables is sufficient for four (4) years of operation.

The spare parts and consumables to be procured in the project are listed in Table 2-2-2.13 and Table 2-2-2.14 respectively.

Table 2-2-2.13 Spare Parts Procured in the Project

Equip. No.	Compo. No.	Equipment Name	Unit	Quantity
1	Steam Gathering System			
	1-1	Two-phase piping		
		Gaskets	pcs.	8
		Manual valves small size 3 inches or less	sets	4
		Packing of valves 4 inches or more in size	pcs.	4
	1-2	Steam piping		
		Gaskets	pcs.	8
		Seat packings	pcs.	28
		Bolts and nuts	sets	6
		Steam traps	sets	2
		Manual valves small size 3 inches or less	sets	6
	1-3	Brine piping		
		Gaskets	pcs.	4
		Bolts and nuts	sets	10
		Packing of valves 4 inches or more in size	pcs.	4
		Manual valves small size 3 inches or less	sets	2
	1-4	Separator		
		Gaskets	lot	4 gaskets for each nozzle, 1 gasket for manhole
		Bolts and nuts	lot	10% of all bolts and nuts of each nozzle
	1-6	Scrubber		
		Gaskets for scrubber body	lot	4 gaskets for each nozzle, 1 gasket for manhole
		Bolts and nuts for scrubber body	lot	10% of all bolts and nuts of each nozzle
		Spare vane elements for scrubber body	sets	2
		Bolts and nuts for piping	sets	2
		Gaskets for piping	pcs.	4
		Seat packings	pcs.	2
		Manual valves small size 3 inches or less	sets	2
	1-7	Pressure control system		
		Steam relief valve	set	1
	1-8	Separator level control system		
		Bolts and nuts for piping	sets	16
		Gaskets	pcs.	8
		Manual valves small size 3 inches or less	sets	1
		Packing of valve 4 inches or more in size	pcs.	8

Equip. No.	Compo. No.	Equipment Name	Unit	Quantity
	1-9	Drain transfer pump		
		Pump for replacement	sets	4
		Float switch heat resistance type	sets	4
		3 phase cable 10 m	sets	4
		Bolts and nuts	sets	5
		Gaskets	pcs.	4
		Packing of valves 4 inches or more in size	pcs.	4
2	Wellhead Power System			
	2-1	Turbine and auxiliaries		
		Turbine bearing metal	set	1 (for turbine 1 unit)
		Lube oil filter element	pcs.	4
		Lube oil sight glass	pcs.	6
		Spare bolts and nuts	set	10% of number of each size
		Flange gaskets	set	4 each for all flanges
		Small size manual valves	set	50% of total number of valves 3 inches or less in size
		Valve packing	pcs.	2 each for valves 4 inches or more in size
		Mechanical seal	set	1 (1 set each for all pumps)
		Seal sleeve	Set	1 (1 set each for all pumps)
		Bearing set	set	1 (1 set each for all pumps)
	2-2	Turbine exhaust silencer		
		Bolts and nuts	set	1
		Seat packing	sets	3
	2-5	Generator and auxiliary equipment		
		Generator bearing metal	set	1 (for 1 unit generator)
	2-12	Turbine-Generator control panel		
		Instrumentation	set	1 (1 set each of all instrumentation)
3	Substation			
	3-2	15 kV switchgear		
		Fuse	set	1

Source: Prepared by the Survey Team

Table 2-2-2.14 Consumables Procured in the Project

Equip. No.	Compo. No.	Equipment Name	Unit	Quantity
1	Steam Gathering System			
	1-1	Two-phase piping		
		Metal repair putty, (e.g. Belo-metal standard type 2.5kg canned)	cans	4
		Heat and weather resistance tape	pcs.	10
2	Wellhead Power System			
	2-1	Turbine and auxiliaries		
		Earthing brush	pcs.	4
		Consumables of MSV and CV for site overhaul work	sets	2
		Oil filter	sets	4
		Gasket for oil cooler	sets	2

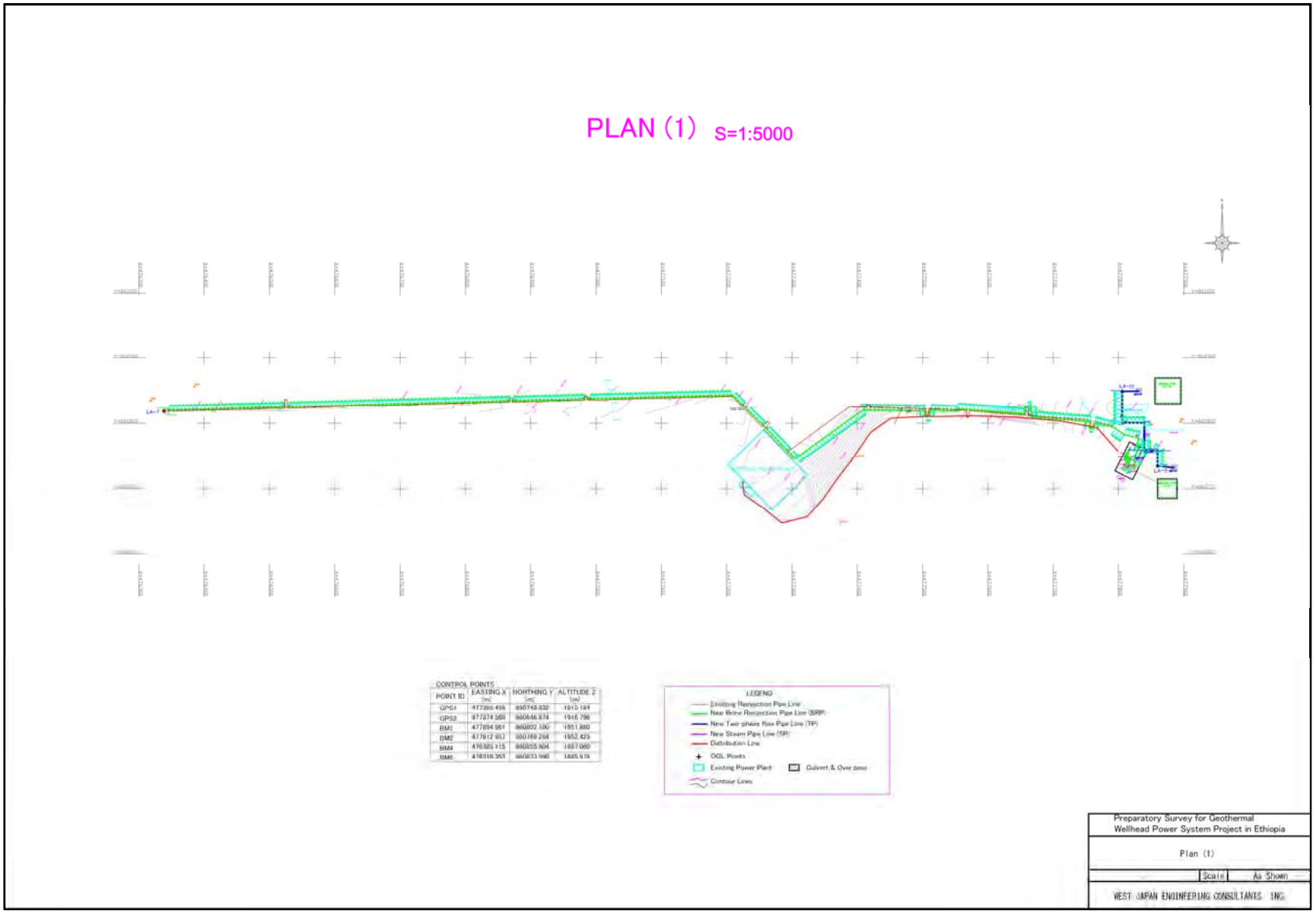
Source: Prepared by the Survey Team

2-2-3 Outline Design Drawings

The following basic design drawings are integrated in Appendix 6-1, and the following main drawings (* marked in the list) are introduced in this Clause; 1 - Plan (1) (overall layout), 2 - Plan (2), 7 - Power Plant Plan, 23 - Wellhead Steam and Brine Flow, 24 – Piping Arrangement Around Wellhead Power Plant, and 26 - Single Line Diagram.

Drawing No.	Drawing Title
1 *	Plan (1)
2 *	Plan (2)
3	Plan (3)
4	Plan (4)
5	Plan (5)
6	Plan (6)
7 *	Power System Plan
8	Pipeline Profiles (1)
9	Pipeline Profile (2)
10	Pipeline Profile (3)
11	Turbine, Generator Foundation
12	Step Up Transformer Foundation
13	Pipeline Foundation
14	Culvert
15	Station Service Transformer Foundation
16	Separator Foundation
17	MV Switchgear Foundation
18	15 kV Switchgear Foundation
19	Silencer Foundation
20	Radiator Foundation
21	Scrubber Foundation
22	Control Room Container Foundation
23 *	Wellhead Steam and Brine Flow
24 *	Piping Arrangement Around Wellhead Power Plant
25	General Piping Arrangement Around TG

26 *	Single Line Diagram
27	Line Material Bill of Quantity
28	15 kV Terminal Structure (DL1-1)
29	15 kV Terminal Structure (DL1-2)
30	15 kV Light Angle Structure (DL1-3)
31	15 kV Heavy Angle Structure (DL1-4)
32	15 kV Suspension Structure (DL1-5)
33	Cross Arm Arrangement Detailing (DL1 AUX1)
34	Pole Foundation (DL1 AUX2)
35	15 kV Distribution Line Route Plan
36	LA-9D Thermal Pond (Concrete)
37	LA-10D Thermal Pond (Concrete)
38	LA-9D Thermal Pond (Stone Masonry)
39	LA-10D Thermal Pond (Stone Masonry)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NORTHING Y (m)
ALTITUDE Z (m)
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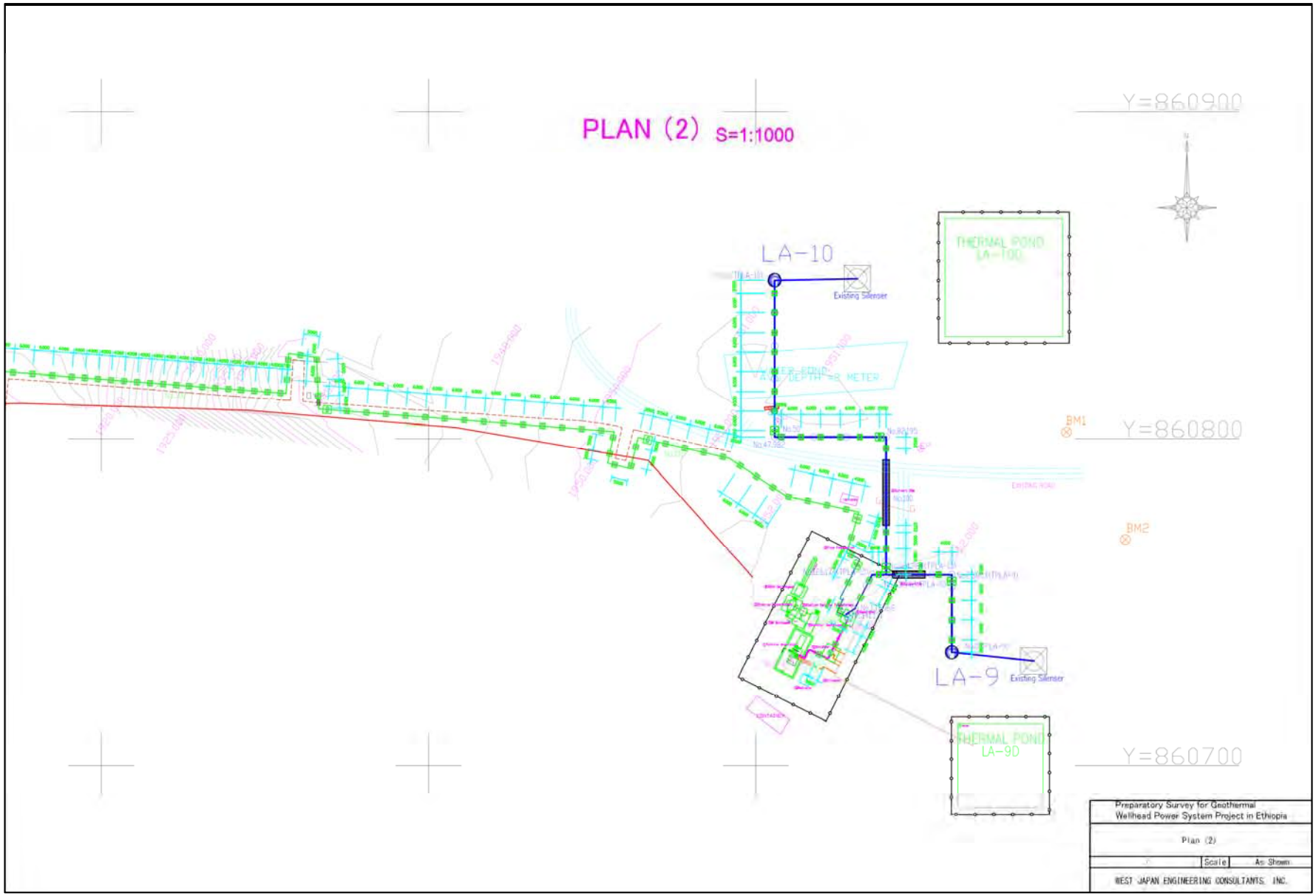
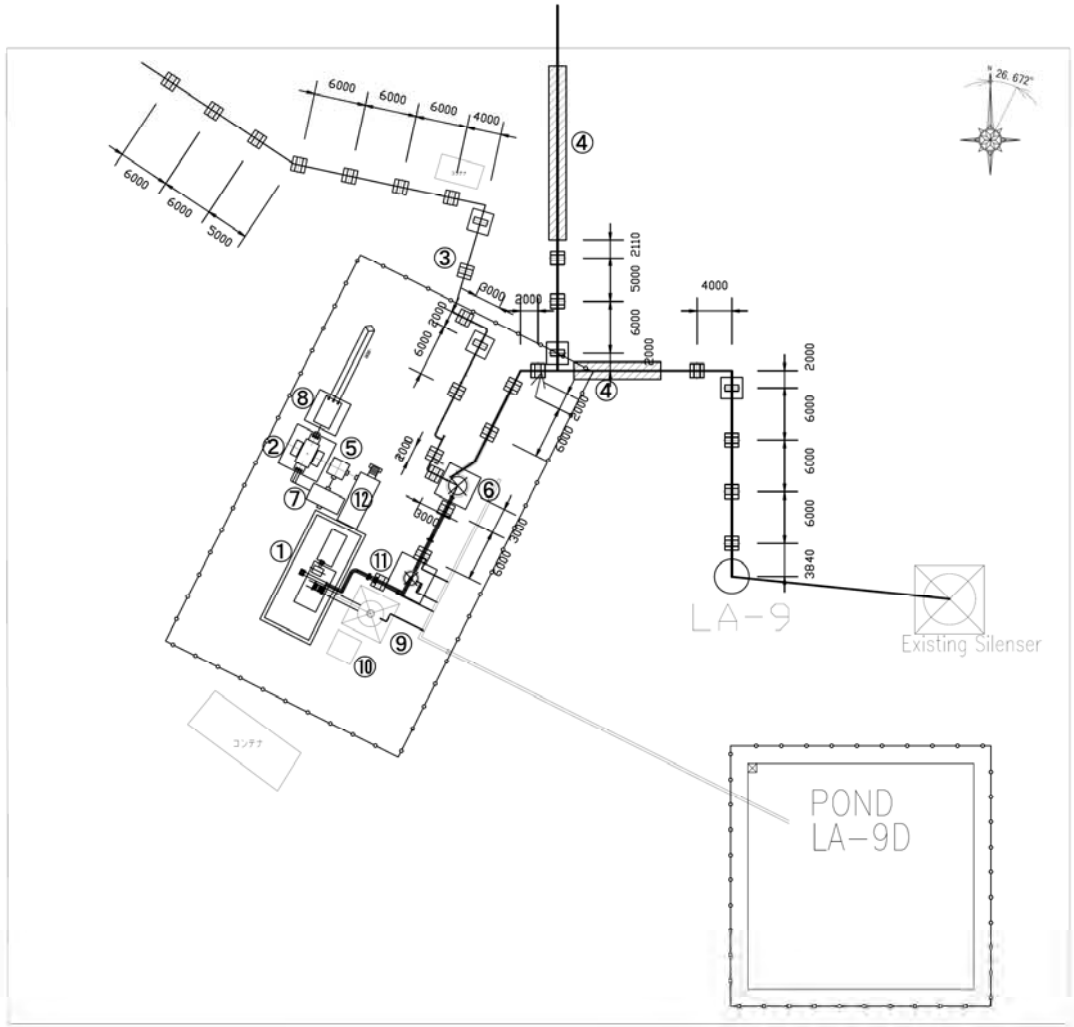
BM4 478325.415 860355.804 1887.060
BM6 478318.353 860833.990 1885.978
LEGEND
Existing Reinjection Pipe Line
New Brine Reinjection Pipe Line (BRP)
New Two-phase flow Pipe Line (TP)
New Steam Pipe Line (SP)
Distribution Line
OGL Points
Existing Power Plant
Culvert & Over pass
Contour Lines
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia
Plan (1)
Scale As Shown
WEST JAPAN ENGINEERING CONSULTANTS INC.

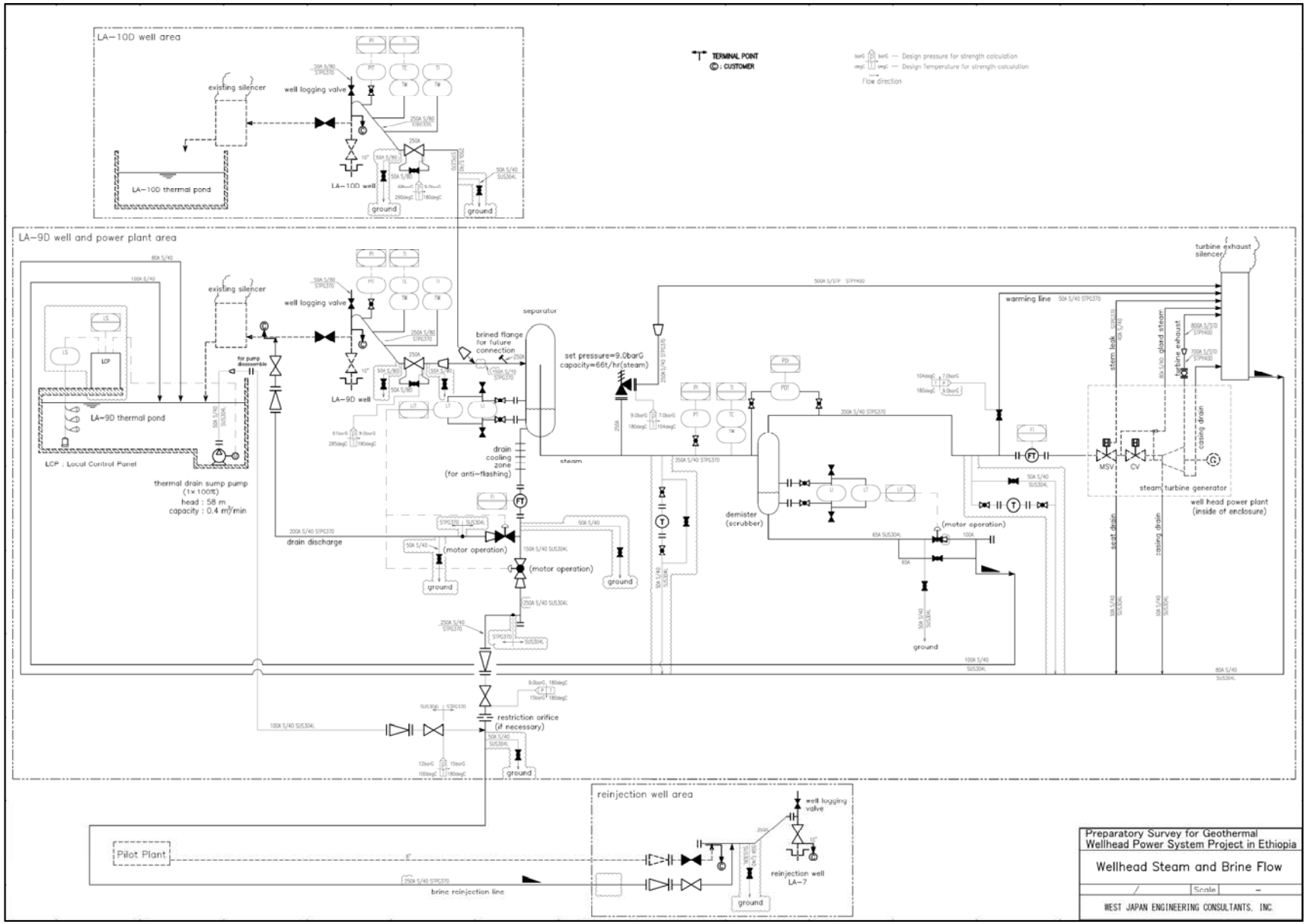

PLAN (2) S=1:1000
Y=860900
Y=860800
Y=860700
LA-10
LA-9
THERMAL POND LA-10D
THERMAL POND LA-9D
Existing Silencer
Existing Silencer
BM1
BM2
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia
Plan (2)
Scale As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.

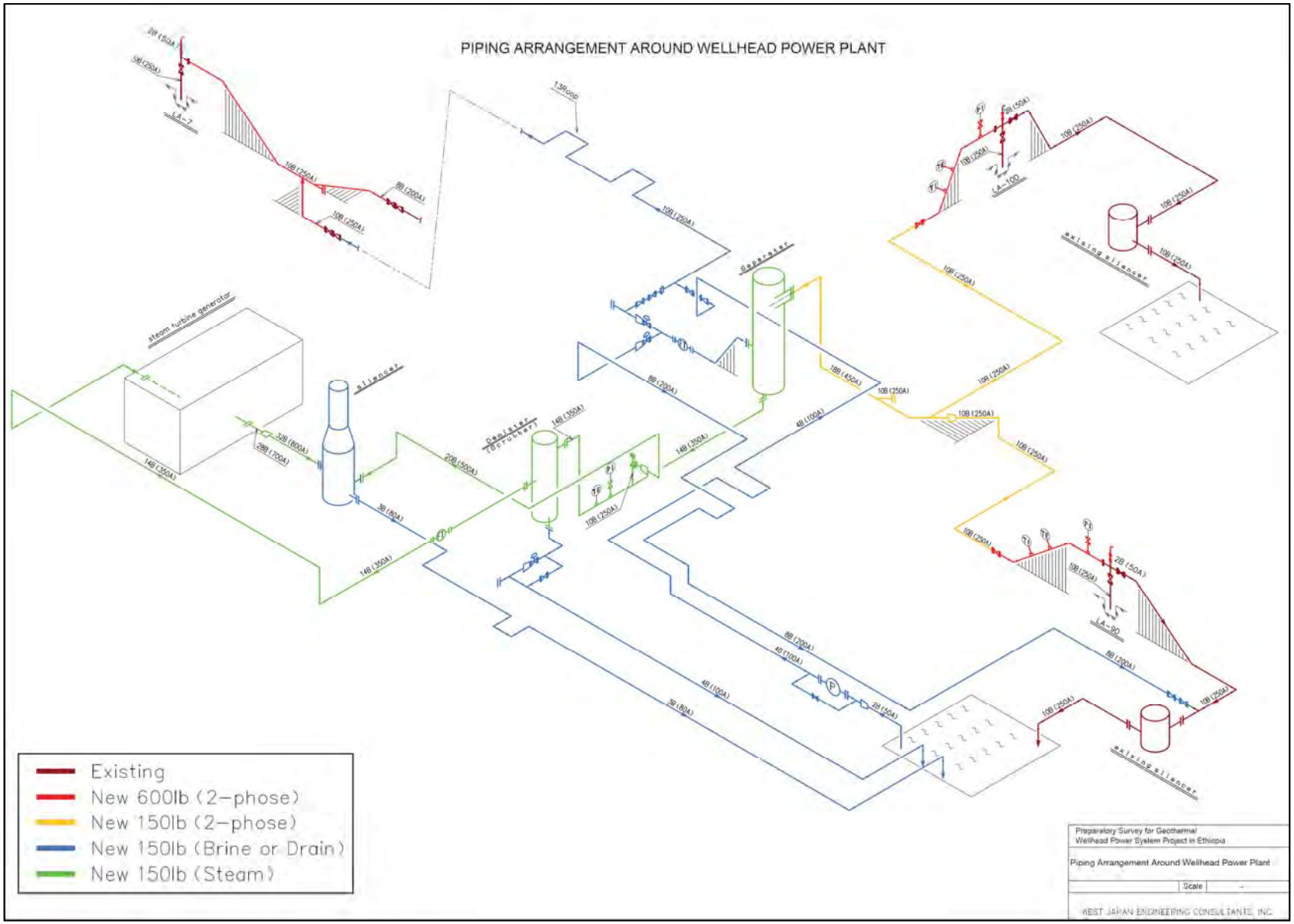
POWER SYSTEM PLAN S=1:500

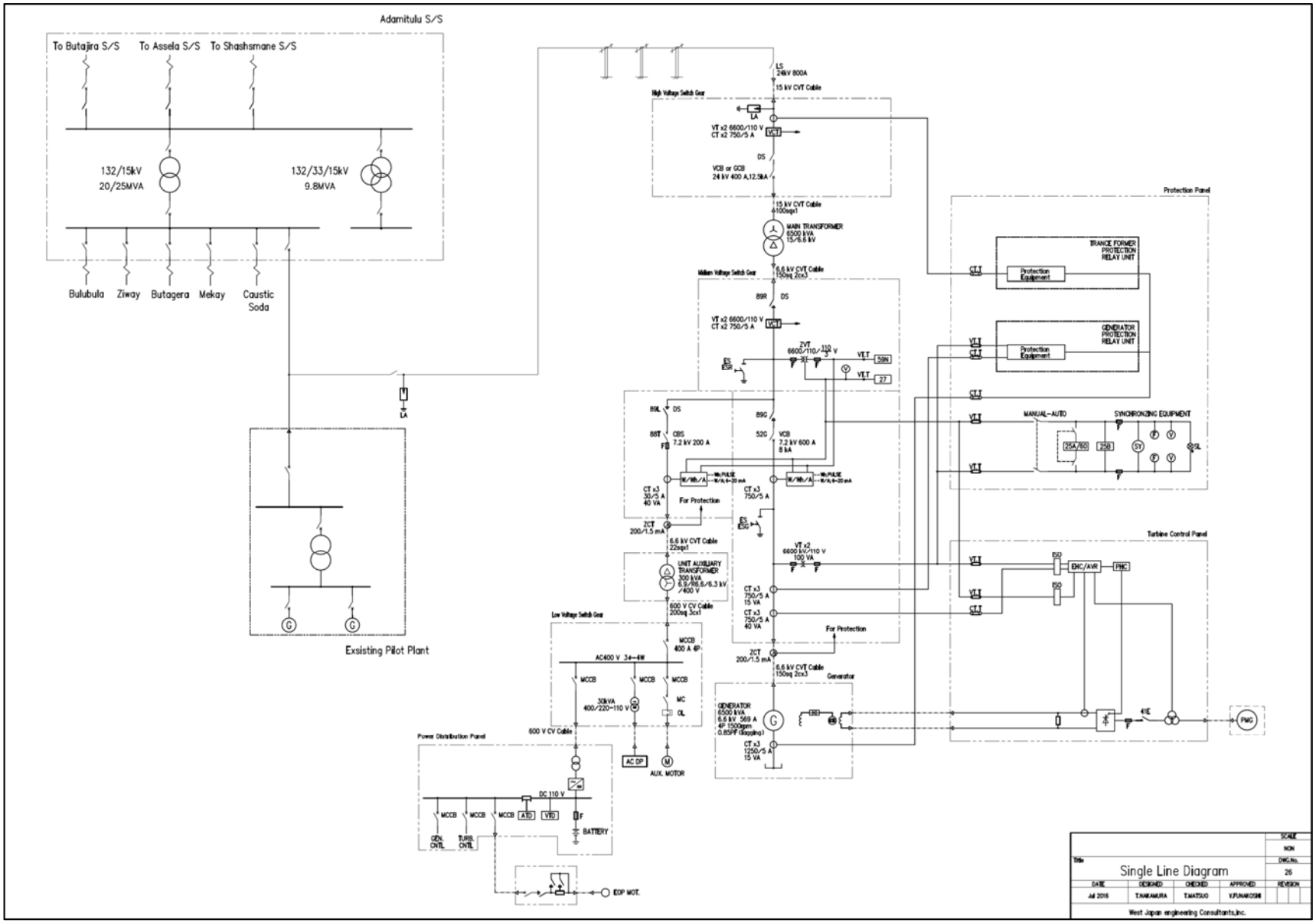


①Turbine Generator
②Step up Transformer
③Pipe Foundation
④Culvert
⑤Station Service Transformer
⑥Separator
⑦MV Switchgear
⑧15kV Switchgear
⑨Silencer
⑩Radiator
⑪Scrubber
⑫Control Room Container

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Power System Plan	
Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.	


LA-10D well area
existing silencer
well logging valve
LA-10D well
LA-10D thermal pond
ground
TERMINAL POINT
©: CUSTOMER
Flow direction
LA-9D well and power plant area
existing silencer
well logging valve
separator
brined flange for future connection
set pressure=9.0barG
capacity=66t/hr(steam)
warming line
turbine exhaust silencer
LA-9D well
LA-9D thermal pond
LCP : Local Control Panel
thermal drain sump pump
(1×100%)
head : 58 m
capacity : 0.4 m³/min
drain cooling zone
(for anti-flashing)
drain discharge
demister
(scrubber)
(motor operation)
restriction orifice
(if necessary)
MSV
CV
steam turbine generator
well head power plant
(inside of enclosure)
steam
steam drain
casing drain
reinjection well area
well logging valve
reinjection well LA-7
Pilot Plant
brine reinjection line
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia
Wellhead Steam and Brine Flow
Scale –
WEST JAPAN ENGINEERING CONSULTANTS, INC.

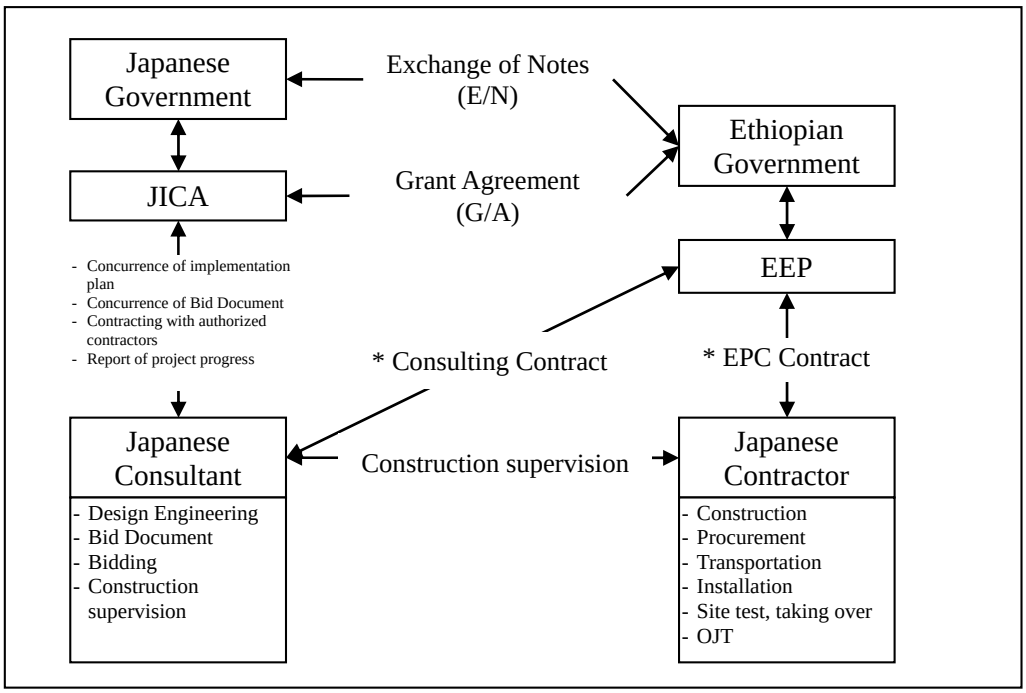

PIPING ARRANGEMENT AROUND WELLHEAD POWER PLANT
steam turbine generator
silencer
Condenser
Separator
existing silencer
existing silencer
Existing
New 600lb (2-phose)
New 150lb (2-phose)
New 150lb (Brine or Drain)
New 150lb (Steam)
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia
Piping Arrangement Around Wellhead Power Plant
Scale
WEST JAPAN ENGINEERING CONSULTANTS, INC.


Adamitulu S/S
To Butajira S/S
To Assela S/S
To Shashsmane S/S
132/15kV
20/25MVA
132/33/15kV
9.8MVA
Bulubula
Ziway
Butagera
Mekay
Caustic Soda
Exsisting Pilot Plant
LS
24kV 800A
15 kV CVT Cable
High Voltage Switch Gear
LA
VT x2 6600/110 V
CT x2 750/5 A
VCT
DS
VCB or GCB
24 kV 400 A,12.5kA
15 kV CVT Cable
4-100sqx1
MAIN TRANSFORMER
6500 kVA
15/6.6 kV
6.6 kV CVT Cable
150sq 2cx3
Midden Voltage Switch Gear
89R
89L
89T
89G
52G
CBS
7.2 kV 200 A
VCB
7.2 kV 600 A
8 kA
CT x3
30/5 A
40 VA
For Protection
CT x3
750/5 A
ZCT
200/1.5 mA
6.6 kV CVT Cable
22sqx1
UNIT AUXILIARY TRANSFORMER
200 kVA
6.6/Y6.6/6.3 kV
/400 V
600 V CV Cable
200sq 3cx1
Low Voltage Switch Gear
MCCB
400 A 4P
AC400 V 3φ-4W
30kVA
400/220-110 V
MC
OL
600 V CV Cable
AC DP
AUX. MOTOR
Power Distribution Panel
DC 110 V
ATD
VTD
BATTERY
GEN. CNTL
TURB. CNTL
EOP MOT.
VT x2
6600 kV/110 V
100 VA
CT x3
750/5 A
15 VA
CT x3
750/5 A
40 VA
CT x3
1250/5 A
15 VA
Generator
GENERATOR
6500 kVA
6.6 kV 569 A
4P 1500rpm
0.85PF (dapping)
Protection Panel
TRANCE FORMER PROTECTION RELAY UNIT
GENERATOR PROTECTION RELAY UNIT
Protection Equipment
MANUAL-AUTO
SYNCHRONIZING EQUIPMENT
Turbine Control Panel
EHC/AVR
PMG
Single Line Diagram
SCALE
NON
DWG.No.
26
DATE
DESIGNED
CHECKED
APPROVED
REVISION
Jul 2016
T.NAKAMURA
T.MATSUO
Y.FUNAKOSHI
West Japan engineering Consultants,Inc.

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

Since this project will be conducted under Japanese Grant Aid, the Japanese government approves implementation of the project after the agreement of Exchange of Notes (hereinafter referred to as "E/N") between the Japanese government and the Ethiopian government and G/A between JICA and the Ethiopian government. Figure 2-2-4.1 shows the overall organization of the project and the relationship of the concerned parties.



*Note: JICA concurrence is needed for Consulting contract and EPC contract.

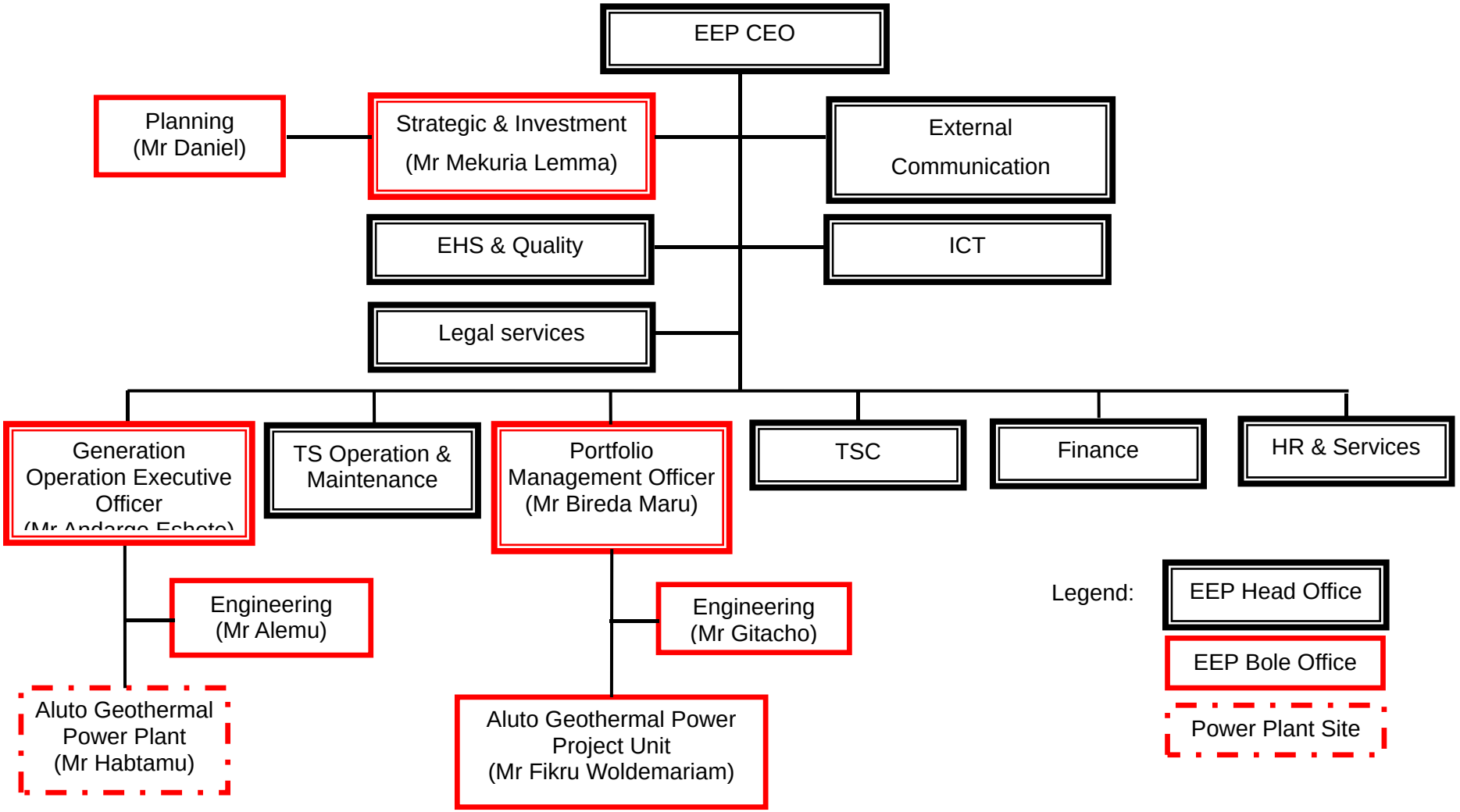
Source: Prepared by the Survey Team

Figure 2-2-4.1 Project Overall Organization

(1) Project Executing Agency

The Project Executing Agency will be the EEP and supervised by MOWIE. EEP will implement the operation and maintenance after completion of the project, and the operation and maintenance organization for the geothermal wellhead power system is introduced in the Section 2-4 of this Chapter. EEP should assign a responsible person for the management of this project and establish the project implementation team. The EEP project team should be responsible for the project implementation with the assistance of coordination and discussions with the Japanese consultant and the contractor. The assigned EEP project manager will give sufficient explanations to other EEP staff, relevant organizations and local residents regarding the project, in order to obtain their understanding of and cooperation with the implementation of the project.

Figure 2-2-4.2 shows the EEP organization structure.



Source: Prepared by the Survey Team

Figure 2-2-4.2 EEP Organization

(2) EEP Project Implementation Organization of Geothermal Wellhead Power System

Regarding the project implementation organization, the following three (3) plans can be considered.

Plan-1: The present Aluto Geothermal Project Unit to undertake the construction of the project for the geothermal wellhead power system and to form a sub-project team within the present Project Unit

Plan-2: To establish a new project unit exclusively to undertake construction of the project for geothermal wellhead power system

Plan-3: The present Aluto Power Plant to undertake the construction of the project for geothermal wellhead power system

Plan-1, sub-project implementation team, will be most appropriate to implement the project because of the following points.

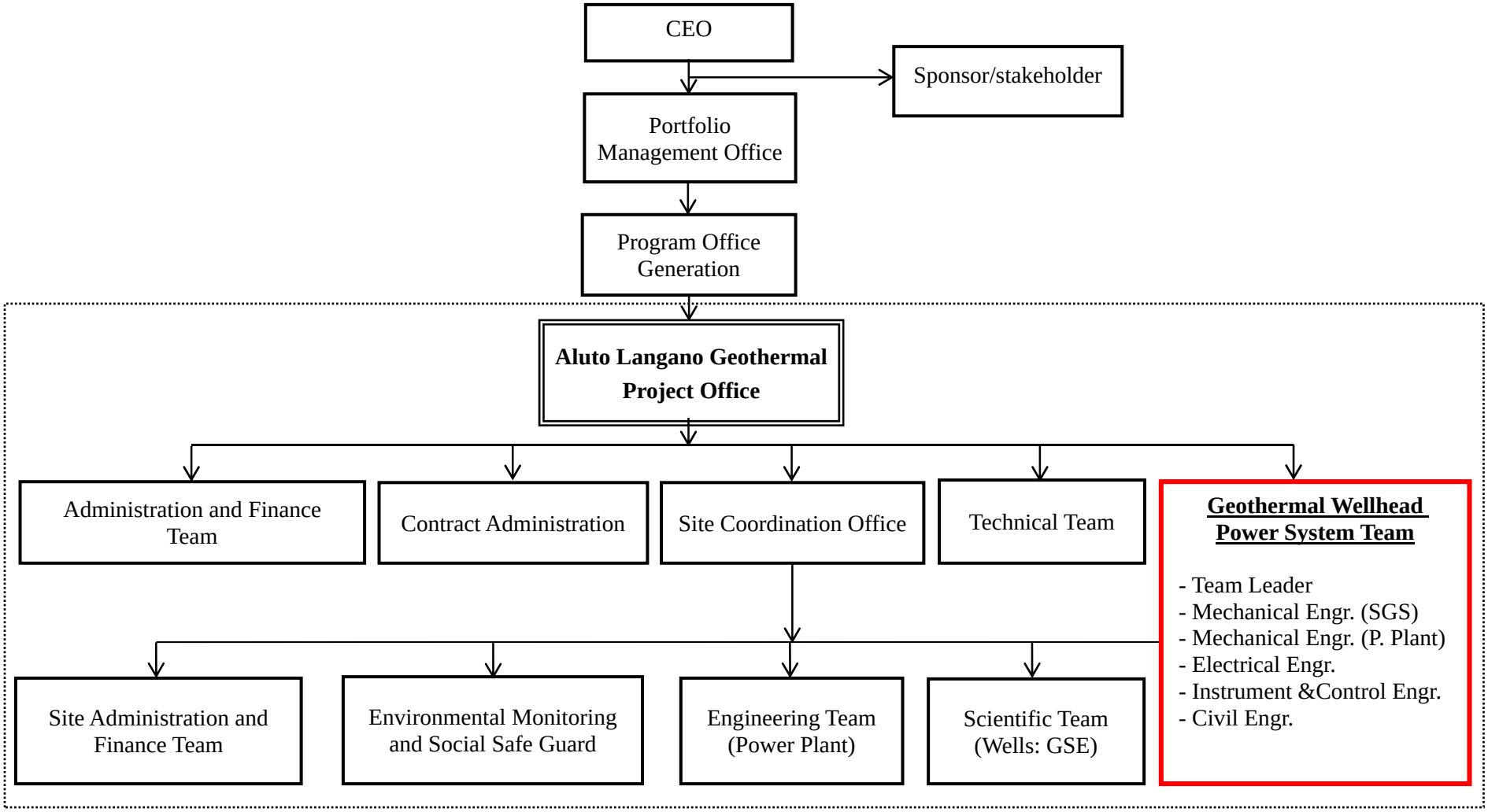
1) The Project Unit has been already established in EEP for the Aluto Geothermal Power Project.
2) The geothermal wellhead power system project will be a part of the Aluto Geothermal Project.
3) The experience of the geothermal wellhead power system project will be a good exercise and learning experience for the succeeding large -scale Aluto Geothermal Power Plant Project.
4) The new sub-project team will work exclusively for the geothermal wellhead power system project under the Aluto Geothermal Project Manager, and the project implementation structure will be simple and clear.

For the new sub-project team of the geothermal wellhead power system, the following staff will be required.

- One (1) Team leader
- One (1) Mechanical engineer for the SGS (Steam Gathering System)
- One (1) Mechanical engineer for the wellhead power plant
- One (1) Electrical engineer
- One (1) Instrument and Control engineer
- One (1) Civil engineer

Figure 2-2-4.3 shows the organization of the project implementation of the wellhead power system.

Plan -2, exclusive project implementation team, is also a good alternative organization to ensure the project implementation and the capacity building for the geothermal power plant project. In the case of Plan-2, the exclusive project team, more staff for the Administration and Finance team (approximately 3 people: secretary, accountant, document control, etc.) will be necessary in addition to the engineers in the case of Plan-1.



Source: Prepared by the Survey Team

Figure 2-2-4.3 EEP Project Implementation Organization

(3) Consultant

To implement the equipment procurement and installation work for the project, a Japanese consultant concludes the engineering service contract with EEP and the consultant will implement the engineering design and the supervision of the construction work related to the project. In addition, the consultant will prepare the bid documents and implement the bidding of the project on behalf of EEP.

(4) Contractor

According to Japanese Grant Aid framework, Japanese corporation(s) will be selected as the contractor of the project by the EEP through the use of public open bidding, and the contractor will perform the EPC contract work (engineering, procurement, transportation, construction, testing, adjusting, and commissioning) of the project. The contractor should note possible separate contracts for supplying spare parts and follow-up services after the completion of the project.

(5) Necessity of the Dispatch of Contractor's Engineers

Since this project consists of construction of a power plant including the substation and relevant civil works, the construction work of 700 m distribution lines, and the installation of steam gathering system, also the connection work with the existing 15 kV distribution system is necessary. Therefore, the construction schedule should be carefully maintained. Additionally in order to maintain the schedule, from the point of view of quality and safety, it is necessary for the contractor to dispatch a site manager from Japan.

To maintain high quality in the installation, adjustment and testing works of the power plant equipment, piping, separator, instruments and monitoring devices, the contractor should dispatch high-technical level engineers from Japan to perform quality control, technical guidance and process control.

2-2-4-2 Implementation Conditions

(1) Circumstance of the Construction Works in Ethiopia and Technical Transfer

There are several construction companies and electrical construction companies in the city of Addis Ababa. Some of the those Ethiopian local companies can be sub-contracted for local labor, transportation facilities, construction equipment, civil works for power plant construction, and construction of distribution line.

This project is a Japanese Grant Aid project. The site construction works of the steam gathering system, the wellhead power system, and the substation system are complicated, and these construction works should be carried out in parallel and with good coordination with each other. The construction work should be well managed in both scheduled progress and quality control. As stated in foregoing clause, Japanese engineers should be dispatched to the project site work for schedule management, quality control, safety control, and the adjustment and commissioning activities after the installation.

Through the implementation of this project, dispatched Japanese engineers with high technical knowledge and experience will work towards facilitating technology transfer; not only to the EEP staff but also to the Ethiopian engineers.

(2) Installation Works

1) Civil work

The civil work includes mainly the earthwork and the concrete foundation work for the steam gathering system (two-phase piping, steam piping, brine piping, and other equipment), the wellhead power system, and the substation system including 15 kV distribution line. The

civil work will be carried out by the local sub-contractors with construction equipment procurement and labor supply under the management and the supervision of the site manager and the supervisors of the Japanese contractor.

2) Equipment installation work

The equipment of the steam gathering system, the wellhead power system, and the substation system will be installed under the management, supervision and instruction of the contractor. For the management, supervision, and instruction, the contractor will dispatch the site manager, the supervisors, and the installation engineers of turbine, generator, transformers, switchgears, and control system.

(3) Utilization of Local Materials and Equipment

Aggregates, cement, reinforcing bars, etc. for civil work are available in Ethiopia and these materials are used for many projects in Ethiopia. Wooden poles for distribution lines should be purchased in Ethiopia from EEU via a local company.

Considering the above, the construction scheme should be planned, and the construction equipment and materials will be procured in the local market as much as possible. Power plant equipment and the steam gathering system, however, should be imported from Japan or third countries, since these are not available in the Ethiopian market.

(4) Safety Issue

Strikes, riots, etc. by local residents, and also pick-pocketing, snatching, home invasions, and robberies have occurred in Ethiopia. Ordinary crimes tend to increase before and after religious holidays such as the opening of fasting and Christmas. In addition, due to an increase in the illegal residents from neighboring countries, and smuggling of weapons, narcotics, etc., there is concern regarding violent crime, mainly in urban areas. The project site will be in the Oromiya regional state, which is adjacent to the south of Addis Ababa, is accessible distance by car and it is relatively easy to monitor the project. However, due to the risk of security deterioration, it is necessary to pay attention to the prevention of theft of equipment and materials, the assurance of safety to the workers involved in construction, etc. Regarding safety, measures should be implemented, not only by the Ethiopian government, but also from the Japanese side.

(5) Tax Exemption

Since this project will be implemented as a Japanese Grant Aid project, tax exemption (tariff, value added tax) will be taken. The detailed scheme and the concrete procedures for the tax exemption have been discussed between the Ethiopian government and Japanese government. It will be necessary to track progress on this issue so that the delay in tax exemption does not affect the progress of this project.

2-2-4-3 Scope of Works

Table 2-2-4.1 shows the scope of works for the Japan side and the Ethiopia side.

Table 2-2-4.1 Scope of Works and Assignment for Japan Side and Ethiopia Side

Work Items	Japan	Ethiopia	Remarks
			Note: "X" means responsible party.
1. General			
(1) Compensation for resettlement		X	To be completed before starting of site works by Japanese contractor
(2) Preparation of storage space		X	To be completed before starting of site works by Japanese contractor
(3) Securing the safety of field workers during construction		X	Necessary countermeasures to ensure safety during construction period.
(4) Correspondence and compensation for consumers for power cuts necessary for construction work		X	
(5) Information to consumers of power cut plan necessary for construction work		X	
(6) Traffic regulation		X	
(7) Provision of disposal space for surplus soil and miscellaneous waste water		X	
(8) Provision of water supply, wastewater discharge, rainwater discharge, telephone line etc.		X	
(9) Preparation of site office space		X	
(10) EEP and consultant office furniture		X	
(11) Assistance for prompt unloading, custom clearance, and tax exemption		X	
2. Steam Gathering System			
(1) Removal of waste and existing structures in project site		X	To be completed before starting of site works by Japanese contractor
(2) Site preparation and drainage facility		X	
(3) Maintenance of access roads		X	
(4) Maintenance of drainage of access roads		X	
(5) Temporary fences and/or gates		X	To be completed before starting of site works by Japanese contractor
(6) Permanent fences and/or gates		X	
(7) Repair and improvement of thermal ponds (wellpads LA-9D and LA-10D)		X	To be completed before starting of site works by Japanese contractor
(8) Landfill of thermal pond at south area of wellpads LA-10D		X	To be completed before starting of site works by Japanese contractor

Work Items	Japan	Ethiopia	Remarks
			Note: "X" means responsible party.
(9) Maintenance/Replacement of wellhead facilities of reinjection well LA-7		X	To be completed before starting of site works by Japanese contractor
(10) Maintenance of wellhead facilities of LA-9D and LA-10D		X	To be completed before starting of site works by Japanese contractor
(11) Construction of piping systems of two-phase, steam, and brine	X		
(12) Civil works (including pipe supports, foundations, etc.)	X		
(13) Control devices and instruments installation (procurement, installation, control cabling work, commissioning, calibration, etc.)	X		
(14) Control power supply (cabling, cable supports, installation)	X		
(15) Earthing work	X		
3. Wellhead Power System			
(1) Removal of waste and existing structures in project site		X	To be completed before starting of site works by Japanese contractor
(2) Maintenance of access roads		X	
(3) Maintenance of drainage of access roads		X	
(4) Temporary fences and/or gates		X	To be completed before starting of site works by Japanese contractor
(5) Drainage facility	X		
(6) Structural work (including structure and firefighting equipment)	X		
(7) Civil work (including foundations, premise road, lighting)	X		
(8) Turbine, generator, and associated equipment (procurement, installation, commissioning, etc.)	X		
(9) Earthing work	X		
(10) Connection to 15 kV distribution line	X		
4. Substation including 15 kV Distribution Line			
(1) Substation system (procurement, installation, commissioning, etc.)	X		
(2) Site preparation including access road and permission for land use		X	
(3) Site preparation for working area including access road		X	
(4) Removal of waste and existing structures and logging of trees in project site and work area		X	
(5) Repair and/or modification of the existing 15kV distribution line between Adami Tulu substation and the existing Pilot Plant		X	

Work Items	Japan	Ethiopia	Remarks
			Note: "X" means responsible party.
(6) 15kV distribution line construction (including overhead conductors)	X		
(7) Connection to the existing 15 kV distribution line	X		
5. Others			
(1) Spare parts and special tools (including test devices)	X		Special tools will also be used by the contractor during the construction work.
(2) Storage of spare parts and special tools		X	
(3) Securing staff for operation and maintenance		X	
(4) Performance test	X	X (witness)	
(5) OJT (On the Job Training)	X (training)	X (selection of participants)	

Source: Prepared by the Survey Team

2-2-4-4 Consultant Supervision

Consultant will organize the project team, and perform the consulting services of design engineering and construction supervision for the project.

(1) Consultant Services in Design and Bidding Stage

The consultant will organize the service team consisting of one chief engineer, one mechanical engineer, one electrical/I&C engineer and one civil engineer for the steam gathering system, the wellhead power system and the substation system of the project. Assisting EEP, the consultant will perform the following services. Table 2-2-4.2 shows the consultant personnel plan for the services.

Detailed Design:	Detailed research and design survey, Confirmation of project design, and Review of equipment specifications
Bidding Service Stage 1:	Preparation of bid documents, EEP approval of bid documents, and JICA concurrence
Bidding Service Stage 2:	Bid announcement, Bid issue, Pre-bid conference, Bid submission, Bid evaluation, and Contracting

Table 2-2-4.2 Consultant Personnel Plan for Service of Design and Bidding Stage

Services	Personnel
Detailed Design	Chief engineer
	Mechanical engineer (Steam gathering system, Wellhead power system)
	Electrical/I&C engineer (Wellhead power system, Substation system)
	Civil engineer (Civil works)
Bidding Service Stage 1	Chief engineer
	Mechanical engineer (Steam gathering system, Wellhead power system)
	Electrical/I&C engineer (Wellhead power system, Substation system)
	Civil engineer (Civil works)
Bidding Service Stage 2	Chief engineer
	Electrical/I&C engineer (Wellhead power system, Substation system)

Source: Prepared by the Survey Team

(2) Consultant Services in Implementation Stage

During the implementation stage, the consultant will assign a resident supervising engineer, three (3) procurement supervising engineers (a mechanical engineer for the steam gathering system/wellhead power system, an electrical & I/C engineer for the wellhead power system/substation system, and a civil engineer for the civil facilities), an inspection engineer, and a local supervising engineer. The O&M management instructor will also concurrently serve as the inspection engineer, and he will witness the inspection work before the expirention of the manufacturers' warranty period.

The factory inspections of the main equipment such as the turbine, the generator, and the control system will be conducted by the respective procurement supervising engineers. The factory

inspections of the other equipment will be confirmed by check and review of the factory inspection reports prepared by the contractor. The inspection agency entrusted by the consultant will conduct the pre-shipment inspections of verification between the contract equipment list and the shipping documents and also between the shipping documents and the actual equipment.

The procurement supervising engineer (civil facilities) will be dispatched to the project site two (2) times according to the progress of the foundation civil work, and he/she will conduct the confirmation of the construction drawing and the construction method and the work completion inspection. At the same time as the on-site civil work is started, a local supervising engineer will be dispatched to the project site until the completion of the geothermal wellhead power system, and he/she will support the resident supervising engineer.

The procurement supervising engineer (an electrical & I/C engineer for the wellhead power system/substation system) will be dispatched to the project site two (2) times, and he/she will perform for the construction work confirmation and the completion inspection of the 15 kV distribution line work, and also inspect the construction work, the adjustment commissioning, and the completion of the electrical/control facilities of the geothermal wellhead power system.

The resident supervising engineer (a mechanical plant engineer) and the contractor's site manager will be dispatched to the project site for confirmation of the EEP advance work progress. The resident supervising engineer will be dispatched continuously from the commencement of the equipment installation work up to the completion of the geothermal wellhead power system, and he/she will supervise the equipment installation work, the commissioning, the contractor's training services, and the taking over.

The consultant chief engineer will be dispatched to the project site for the final confirmation of the completion of the geothermal wellhead power system, the acceptance and the taking over.

The other procurement supervising engineers of the consultant will supervise the contractor for the scheduled progress and safe execution of the project.

The consultant personnel plan for the procurement supervising services is shown in Table 2-2-4.3.

Table 2-2-4.3 Consultant Personnel Plan for Service of Supervision Stage

Personnel	Services
Chief engineer	Inspection of project completion and taking over
Resident supervising engineer (Plant mechanical)	Confirmation of EEP advance work
	Supervision of equipment installation, commissioning, contractor's training, and taking over
Procurement supervising engineer (Mechanical for Steam gathering system, Wellhead power system)	Check and review of the contractor's drawings
	Factory test inspection
Procurement supervising engineer (Electrical & I/C for Wellhead power system, Substation system)	Check and review of the contractor's drawings
	Factory test inspection
	Construction work confirmation and completion inspection of the 15 kV distribution line work
	Inspection of construction work, adjustment commissioning, and the completion of the geothermal wellhead power system
Civil engineer (Civil works)	Check and review of construction drawing and construction method
	Inspection of civil work completion

Source: Prepared by the Survey Team

(3) Contractor's Project Management Work

1) Factory Tests and Equipment Inspection at Shipping

The contractor will assign factory inspectors to conduct the factory tests to confirm the quantity, the specifications, the functions, and performance for the manufactured equipment witnessed the consultant. The factory tests should be carried out for the following equipment.

(a) Turbine,

(b) Generator, and

(c) Main Control System

For the other equipment including the third country procured equipment, the contractor will conduct the factory tests and submit the factory test reports to the consultant for confirmation.

The pre-shipment inspection of the equipment will be carried out in the following groups for the verification of the shipping documents with the contract equipment list and the verification of the shipping documents with the shipping equipment

(Lot-1) Turbine, Generator, Main Control System

(Lot-2) Piping, LV Switchgear, Transformers, DC Power Supply System

(Lot-3) HV Switchgear, Cables

(Lot-4) Piping, Separator, Scrubber, Turbine Exhaust Silencer

2) Site Work Management

The contractor will carry out the civil foundation work and the procured/delivered equipment installation work at the project site for the steam gathering system, the wellhead power system, and the substation system. For the civil foundation work and the equipment installation work, the contractor will sub-contract Ethiopian local companies for the project site work. The contractor will dispatch a site manager and an assistant (local engineer) to the project site from the commencement of the civil foundation work until the completion of the project, and the site manager and his assistant engineer will supervise the local sub-contractors regarding work schedule management, work quality control, work accomplishment, and safety measures. During the equipment installation work, the contractor will dispatch Japanese specialist engineers regarding the installation, the adjustment, the commissioning, and the training. The Japanese specialist engineers will provide technical skill guidance for the local sub-contractors and supervise their work.

2-2-4-5 Quality Control Plan

(1) Acceptance and Taking-over Tests/Inspections

1) Consultant

The chief engineer and the supervising engineers of the consultant will confirm the equipment quality and the completed construction work to be satisfied that the quality and the completeness is as required by the contract. When an issue is found regarding the quality or the completeness, the consultant will require the contractor to correct, modify or revise the defects.

- Check of the construction drawings and the equipment installation manuals
- Check of the procedures for the commissioning, the calibration, the tests, and the inspections
- Supervision/witness of the site installation work and witness of the commissioning, the calibration, the tests, and the inspections

- Inspection/confirmation of the construction drawings and the completed works
- Check of the completed work and the as-built drawings

2) Contractor

The contractor's site manager will be responsible for conducting the completion inspection and the taking-over. The contractor's acceptance activities are mainly as follows.

- The reports of quality and completeness of the construction work at the project site
- The reports of the equipment installation, the adjustment, the commissioning, and the completion tests

(2) Inspection before Expiration of the Manufacturers' Warranty Period

A warranty period for one (1) year will be included in the contract. The contractor will dispatch personnel to the project site for equipment inspection before expiration of the manufacturers' warranty period. The consultant will assign the guidance engineer on power plant O&M management, who will be dispatched to the project site at that time for confirmation of the results of Soft Component program, to witness the inspection together with the project owner (EEP).

2-2-4-6 Equipment Procurement Plan

(1) Procurement Lot and Bidding

The project of the geothermal wellhead power system consists of the [1] steam gathering system, [2] wellhead power system and [3] substation system (including 15 kV distribution line facilities), The geothermal wellhead power system will work as a complete power plant system with these three (3) sub-systems. The project will be procured in one (1) combined contract lot of these three (3) sub-systems with EPC full turn-key of design, engineering, manufacturing, delivery, construction, and commissioning.

(2) Contractor Selection Procedure

According to the Japanese Grant Aid Basic Policy, the contractor will be selected through a general competitive bidding among Japanese firms only.

(3) Equipment Procurement

The equipment and materials which are available in Ethiopia will be procured in Ethiopia. These include wooden poles and accessories of 15 kV distribution line facilities, cement, etc. Other equipment which is not available in Ethiopia will be procured from Japan or third countries, such as power plant equipment, substation equipment, piping, control and monitoring devices. The main equipment such as turbine and generator should be procured from Japanese manufacturers only. The suppliers will be selected considering convenience of operation and maintenance, spare parts supply, and manufacturers' after services for a failed machine.

Table 2-2-4.4 Equipment Procurement and Suppliers

Equipment	Suppliers	
	Japan	Ethiopia
Steam Gathering System	X	―
Wellhead Power System	X	―
Substation System (including 15 kV Distribution Facilities)	X	X

Source: Prepared by the Survey Team

2-2-4-7 Operation Guidance Plan

(1) Equipment Adjustment, Plant Commissioning, and Training

After the completion of the equipment installation, the contractor's engineers will carry out equipment adjustment and testing, and then conduct the plant commissioning including operational tests, functional tests, and performance tests to confirm the proper and safe operation of the plant system. The local mechanical and electrical engineers will assist in these activities.

This geothermal wellhead power system is the first case in Ethiopia, and the EEP will actually operate and maintain the geothermal wellhead power system. In order to ensure the proper operation and maintenance of the plant system, the contractor's engineers will conduct guidance and training regarding the operation and maintenance of the plant system to the EEP operators and maintenance engineers.

The contractor will prepare and submit the test reports of adjustment and tests of the equipment. EEP and the consultant will review the equipment test reports to confirm satisfaction with conducting the final acceptance and performance tests of the geothermal wellhead power system.

(2) Initial Operation Guidance and Maintenance Training

The contractor will conduct the initial operation guidance and maintenance training to the EEP staff before, during, and after the acceptance tests mentioned in above Item (1). This initial guidance and training regarding the operation and the maintenance for the geothermal wellhead power system is necessary for EEP staff due to the fact that they are not experienced in the operation and maintenance of a geothermal wellhead power system. The Japanese Grant Aid scheme will supply the first geothermal wellhead power system in Ethiopia. The contractor will dispatch instructor engineers to conduct the operational guidance and training regarding the equipment and the plant system for EEP's operators and maintenance engineers.

The contractor's instructor engineers will perform the guidance and the training by means of class room lectures and OJT (On the Job Training) utilizing the operation and maintenance manuals prepared by the manufacturers. For smooth implementation of the training, EEP will assign the trainees through the close coordination and discussion with the consultant and the contractor. The EEP trainees will disseminate the knowledge and skills obtained through the training to the other EEP staff who cannot attend the training. Thereby, EEP will improve its capability regarding operation and maintenance of the geothermal power system.

(3) Maintenance Training

The contractor will perform training regarding equipment maintenance to the EEP trainees. The training includes the know-hows of the daily maintenance and operation such as the configuration of the geothermal wellhead power system, the equipment structures of mechanical, electrical and

control systems, the periodical maintenance scheme, the diagnosis of equipment failures, the repair order procedure, and the methods to contact the manufacturers, etc. The training will be conducted mainly by using lecture format.

The contractor will submit the reports of the above mentioned trainings for confirmation and review by EEP and the consultant. EEP and the consultant will confirm that the training is satisfactory, and with EEP approval, the consultant will issue a technical training completion certificate to the contractor.

In order to promote the smooth implementation of the training, EEP will assign the trainees through close coordination and discussion with the consultant and the contractor. The EEP trainees will disseminate the knowledge and skills obtained throufh training to the other EEP staff who cannot attend the training. Thereby, EEP will improve its capability regarding the operation and maintenance of the geothermal power system.

The EPC contractor will dispatch the following specialists and engineers to conduct the training to the EEP operation and maintenance staff at the Aluto Langano project site.

[For Plant Construction]

- Turbine installation specialist,
- Generator installation specialist,
- Installation specialist for control and instrument devices,
- Adjustment/setting specialist of control and instrument devices,
- EHC (turbine control) specialist,
- AVR (generator control) specialist,
- Switchgear installation specialists,

[For Plant Commissioning and Operation]

- Turbine commissioning engineer,
- Generator commissioning engineer,

[For Plant Maintenance Instruction]

- Maintenance instruction engineer (turbine and auxiliaries),
- Maintenance instruction engineer (generator and auxiliaries)

The training will be conducted by means of classroom lectures and OJT during the plant construction and commissioning period.

The classroom training will be conducted in English and the following subjects will be included.

Typical Contents of the Classroom Training (Reference only)

A. Plant Features

1) Equipment Layout

   The plant equipment layout will be explained based on the final layout drawings of the general plot plan of the Project.

2) Flow Diagrams

The following flow diagrams will be explained regarding the project.

- Steam, drain, and gland steam
- Lube and control oil diagram

B. Mechanical Equipment Descriptions

Design features and construction of the following equipment will be explained.

- Steam turbine & auxiliaries (general, nozzle, blade, casing, rotor, bearing, turning gear)
- Lube and control oil diagram

C. Electrical Equipment Descriptions

Design features and construction of the following equipment will be explained.

- Generator & auxiliaries
- Excitation system

D. Instruments & Control (I & C) Descriptions

The following equipment system will be explained.

- D-EHC
- Turbine supervisory equipment
- Vibration monitoring system (if possible).

E. Operation Principles & Method

The following equipment systems will be explained.

- Normal start-up procedure

  Plant start-up method will be explained with P&I Diagrams with set points. This includes the start-up preparation of the lube oil system.

- Normal shut-down procedure

  Plant shut-down method will be explained with P&I Diagrams.

- Routine test procedure

  Routine testing methods for turbine and associated parts will be explained.

- Trouble shooting

  Trouble shooting methods for turbine, oil system, generator, turbine governor, excitation system, and auxiliaries will be explained.

2-2-4-8 Soft Component (Technical Assistance) Plan

In Ethiopia only one (1) geothermal power plant has been installed, and further improvement of the geothermal development capacity is an important issue. The Soft Component is planned in this project.

The purpose of the Soft Component is to support the smooth inception of the project and to ensure that the equipment procured through the Grant Aid project will be sustainably operated and maintained. The transfer of technical expertise related to the management of the operation and maintenance of a geothermal power generation system (including geothermal wells) will be implemented for the existing Aluto Langano geothermal power plant office in charge of the O&M of the geothermal wellhead power system.

The goals of this Soft Component are described below, and it is expected that the effect of the Grant Aid project will be sustainable by achieving those goals:

(1) After the completion of the project, EEP will carry out the establishment of an operation and maintenance system for the geothermal wellhead geothermal power system and the formulation of a maintenance manual.

(2) The operation and maintenance of the geothermal wellhead power system facilities will be implemented sustainably.

(3) The monitoring and maintenance management of wells and geothermal reservoirs shall be sustainably implemented.

The details of the Soft Component are described in the attachment “Soft Component Plan”.

The Soft Component is planned with the following objectives, results and activities.

Objectives	Result of the Soft Component	Activity Contents
1. After completion of the project, the EEP will carry out the establishment of an O&M system for the geothermal wellhead power system.	1.1. Development of the system for operation and maintenance of the geothermal wellhead power system	• Establish an O&M system • Provision of duties to the O&M personnel • Establish a safety and quality system
	1.2. Understanding of the system configuration and design concept of the geothermal wellhead power system	• Understanding of the system configuration and design concept • Understanding operation concept of the Plant (removal, movement, reinstallation, basic procedure for re-operation)
	1.3. Preparation of the O&M management manual, operation management log and turbine security logbook	• Formulation of an O&M management manual • Scrutinizing plant monitoring items and preparation of a logbook format
2. The operation and maintenance of the geothermal wellhead power system is implemented sustainably.	2.1. Based on the O&M management manual and logbook drawn-up in 1.3, daily operation management and appropriate judgment of the unit situation are carried out in order to predict facility troubles in advance.	• After checking the O&M status of the generation equipment and the monthly power generation report, review of the equipment status on a monthly basis

Objectives	Result of the Soft Component	Activity Contents
	2.2. Based on the daily operation management situation, formulate a periodic overhaul cycle and establish concrete inspection items.	• Formulation of the periodic overhaul cycle after one year of operation • Preparation of a management plan of equipment inspection
3. The monitoring and maintenance management of the wells and geothermal reservoir is implemented sustainably.	3.1. The monitoring regarding fluctuations of the physical characteristics of wells and geothermal reservoir is performed as planned.	• Analyzing the data obtained by various monitoring methods, and understanding the fluctuations of the physical characteristics of wells and the geothermal reservoir ,
	3.2. The monitoring regarding fluctuations of the chemical characteristics of wells and geothermal reservoir is performed as planned.	• Analyzing the data obtained by various monitoring methods, and understanding the fluctuations of the chemical characteristics of the wells and the geothermal reservoir
	3.3. Reflect the results of the monitoring of wells and geothermal reservoir in relation to the operation and maintenance of the power generation facility	• Investigating the causes of fluctuations in the characteristics of the wells and the geothermal reservoir, and studying the countermeasures

2-2-4-9 Implementation Schedule

After the conclusion of G/A, the project will be implemented within a 24 months period; 5.5 months for the period of implementation design up to the contractor contracting, and then 18.5 months for procurement, installation and commissioning of the geothermal wellhead power system.

(1) Design and Manufacturing Period

The maximum scheduled period for the design and manufacturing of the turbine and generator (including the preparation of manufacturing and installation drawings) is 12 months.

(2) Transportation Period

The equipment transportation from Japan or third countries to the Djibouti port is scheduled to take approximately eight (8) weeks. Another one (1) week is scheduled from the port to the project site including equipment loading and transfer to the trucks.

(3) Time for Various Procedures

Shipping (export) procedure: approximately two (2) weeks

Tax exemption: approximately one (1) week

(4) Installation Work Schedule

The installation work period of the project is scheduled for eleven (11) months including the civil work, the equipment installation, and the adjustment and commissioning of the whole geothermal wellhead power system.

1) Steam Gathering System

Civil foundation work period: six (6) months (foundation work for piping, separator,

scrubber, and other equipment)

Installation work period: four (4) months (installation work for piping, separator, scrubber, and other equipment)

2) Wellhead Power System

Civil foundation work period: six (6) months (foundation work for turbine, generator, transformers and other equipment)

Installation work period: four (4) months (installation work for turbine, generator, transformers, cabling and other equipment)

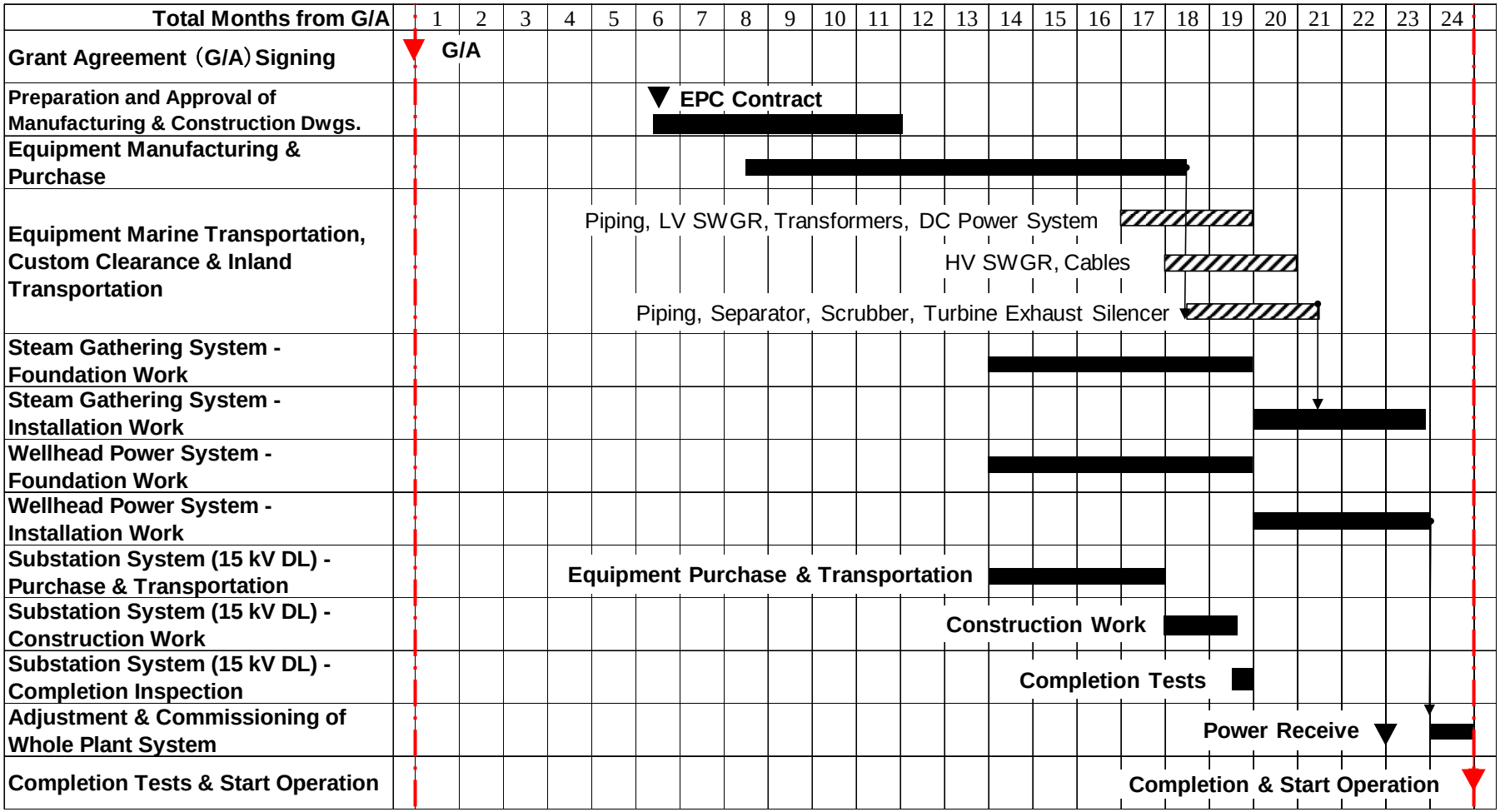
3) Substation (15 kV Distribution Line) System

15 kV distribution line construction work period:

one and one half (1.5) months (construction work for pole erection, auxiliary equipment, and cabling)

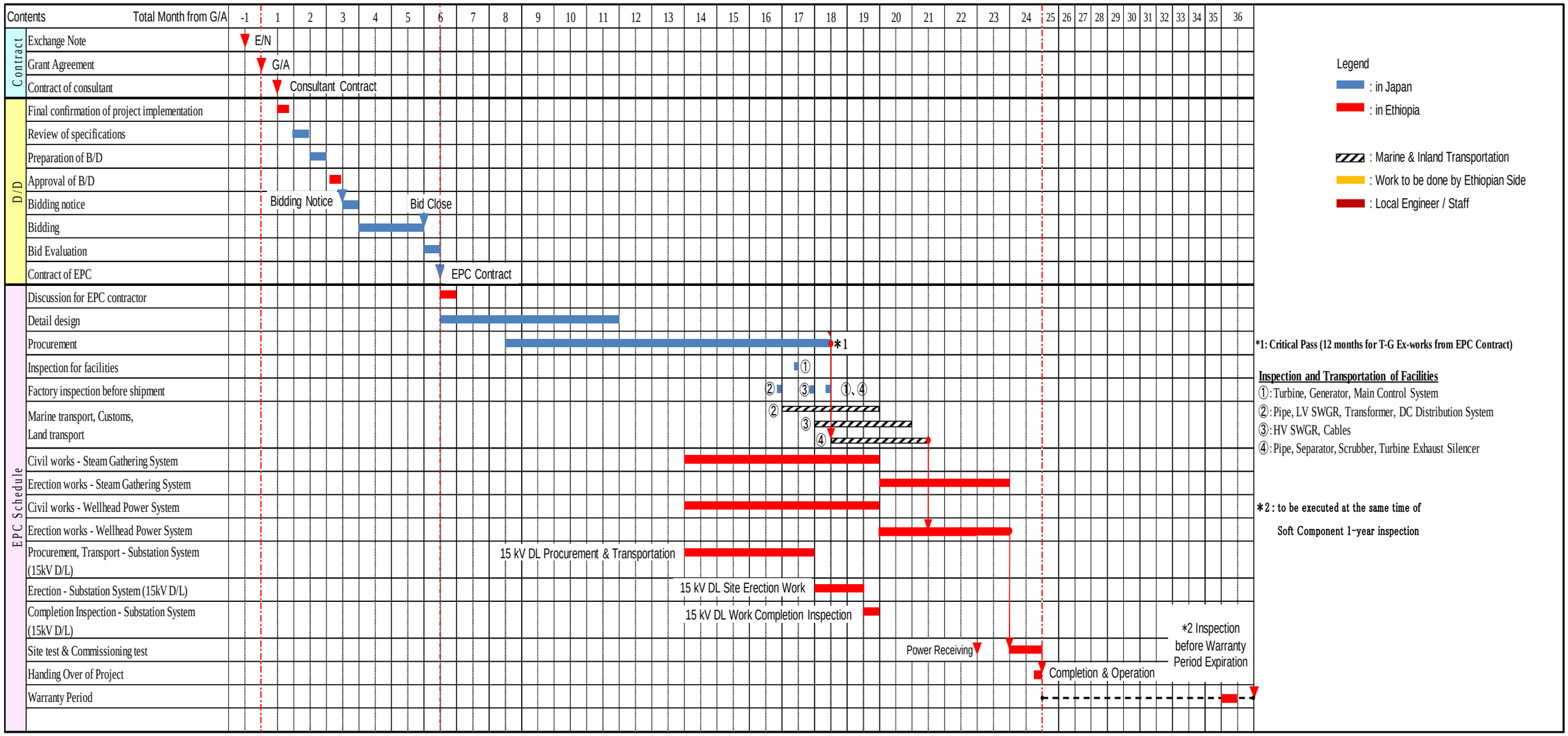
(5) Project Implementation Work Schedule

The project schedules from the G/A to the completion are described in Figure 2-2-4.4 for the project outline schedule and in Figure 2-2-4.5 for the project implementation schedule.



Source: Prepared by the Survey Team

Figure 2-2-4.4 Project Outline Schdule



Source: Prepared by the Survey Team

Figure 2-2-4.5 Project Implementation Schedule

2-3 Obligations of Recipient Country

The country of Ethiopia shall implement and/or cover the cost of the following items for the project (see also the foregoing Clause 2-2-4-3 “Scope of Works”).

Common Items

① Provision of information and data necessary for the project

② Prompt unloading customs clearance and tax exemption in port of the equipment and materials necessary for the project

③ Tax exemption and provision of facilities for the equipment and materials necessary for the project and the Japanese persons dispatched.

④ Procurement of the equipment and materials necessary for the project and exemption of business tax for Japanese corporations and persons.

⑤ Bearing of registration fees for the registration of consultant and building contractors for the project

⑥ Bearing of customs duties, internal taxes and other fiscal levies which may be imposed in the country of the recipient with respect to the purchase of the products and/or the services be exempted; such customs duties, internal taxes and other fiscal levies mentioned above include but are not limited to VAT, income tax, corporate tax, and withholding tax, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.

⑦ Bearing of the cost to open an account at an authorized foreign exchange bank in Japan and payment of fees.

⑧ Bearing of all the costs necessary for the implementation of the project that are not included in Japan’s grant aid.

⑨ Appointment of expert engineers for the technical transfer regarding the operation and maintenance of the project: check of the construction works during the construction period: and witness of quality inspection of equipment and materials.

⑩ Appropriate use and maintenance of the facilities and equipment constructed or procured with Japan’s grant aid

⑪ Execution of environment monitoring

⑫ To submit project monitoring report

Preparation works

① Securing of the project site, Removal of the existing facilities and trees at the project site

② Improvement of access road (outside of site)

③ Preparation of facilities for the distribution of electricity, water, drainage and other incidental facilities

④ Maintenance or repair of the existing wellhead equipment of LA-7, or replace it with a class 900 valve

⑤ Refurbishment of the existing thermal ponds at LA-9D and LA-10D well-pads and reclamation of the thermal pond between LA-10D and road

⑥ Rehabilitation of the existing 15 kV distribution line 13 km double conductors between the existing Pilot Plant and Adami Tulu substation

⑦ Establishment of new benchmark point in Aluto Langano

⑧ Installing fences around the wellhead power plant, LA-9D and LA-10D thermal ponds and LA-7 reinjection well after the installation works

(1) Technical Support for EEP work

According to the M/D January 2017, the following work items for the thermal ponds, the water supply and the drainage works will be undertaken by the Ethiopian side (EEP). EEP requested technical assistance for the work planning from the preparatory survey team. The preparatory survey team conducted an additional survey and proposes the following measures.

1) Thermal ponds

Refurbishment of the thermal ponds is the responsibility of the Ethiopian side; however, EEP does not have much experience regarding the design and construction of thermal ponds for a geothermal project. Responding to the EEP request for technical assistance, the preparatory survey team conducted a site survey and technical study for the refurbishment work of the thermal ponds of LA-9D and LA-10D. The preparatory survey team suggested a refurbishment method of covering the pond surface with a geomembrane sheet and concrete. For details refer to Appendix 6-1 “Outline Design Drawings” Nos. 36 to 39.

In the meeting with EEP, EEP proposed using a stone masonry method as an alternative to concrete, in consideration of reducing the cost and difficulty of the construction work. Both concrete and stone masonry methods are technically acceptable. Therefore, the preparatory survey team prepared two method drawings; the geomembrane sheet covering with concrete or stone masonry.

EEP will further study both methods and EEP will then carry out the refurbishment work of the thermal ponds with their selected method. The geomembrane sheet can be domestically produced and procured by Geosynthetics Industrial Works, PLC in Ethiopia.

Regarding the refurbishment work of thermal ponds, stones that could scratch the geomembrane sheet should be removed after excavation/leveling the pond surface. The geomembrane sheet has a thickness of 1.5mm or more, and the wrap length of the joint part should be 10 cm or more, and the sheets should be joined by heat sealing. Acid resistant cement should be used for concrete and stone masonry.

2) Water supply

In order to secure the water for construction, a field survey was conducted to plan the water supply method into the project site at Aluto Langano. The water is required mainly for mixing concrete, and the water amount is estimated to be about 200 m^3.

The preparatory survey team conducted a public water survey of Bulbula, Adami Tulu, and Ziway, East Shewa Zone, Oromia Region. The survey team also interviewed GSE about availability of groundwater in the Aluto Langano area. The water survey revealed the following findings, and the survey results are summarized by water sources in Table 2-3.1.

a. The Adami Tulu city water most likely contains some salinity, the water supply capacity is limited, and water outages happen frequently.

b. The Ziway treated water is transparent. However, the water supply capacity seems limited, and water outages happen frequently.

c. According to GSE interview, there was groundwater at -280m from the ground level of LA-9D at the Aluto Langano area.

In this field survey, we collected the tap water of Bulbulla and the water quality was analyzed. The water quality analysis results are shown in Figure 2-3.2, and the Bulbulla water is suitable for drinking and usable for concrete mixing water.

The price of the water of Bulbulla is eight (8) Birr per 1m^3 at the water supply site. Aluto Langano site is approximately 31 km from Bulbulla, and the cost of water transportation by water truck should be considered. For the 200 m^3 of water requirement for the project, when an 8 m^3 GSE water truck is utilized, the water truck will be required to travel 25 times between Bulbulla and Alto Langano project site.

Table 2-3.1 Summary of Water Resource Survey

	Bulbulla	Adami Tulu	Ziway	Aluto Langano
Distance from project site	Approx. 31 km	Approx. 14 km	Approx. 22 km	Approx. 100 m
Transportation method	Water truck	Water truck	Water truck	Piping or water truck
Water source	Tuffa spring water	Well water	Ziway lake water (treated with hypochlorite, alum sulphate, soda ash)	Well water (no actual supply)
Water price (per 1m^3)	8 Birr	11 Birr	6 Birr	—
Water supply capacity	Plenty No interruption	Limited Water outage frequent	Limited Water outage frequent	—
Problem		High salinity		High salinity and fluorine. The groundwater is at GL-200 m, and well construction cost will be high.
Evaluation	Good	Not applicable	Poor	Not applicable

Source: Prepared by the Survey Team

Bulbulla water supply service office

Situation of water supply

Source: Prepared by the Survey Team

Figure 2-3.1 Bulbulla Water Supply & Sewerage Service Office

የኢትዮጵያ ኮንስትራክሽን
ዲዛይንና ሱፐርቪዥን ሥራዎች
ኮርፖሬሽን

ምርምር፣ ላቦራቶሪና ስልጠና ማዕከል
የውሃ ፕሮጀክት ክፍል

CDSWC

Ethiopian Construction Design and Supervision Works Corporation

Research, Laboratory and Training Center
Water Quality Section

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SELECTED PHYSIO-CHEMICAL WATER ANALYSIS RESULTS
Client/Project: West JEC

SOURCE OF SAMPLE	Spring				WHO maximum allowable Concentration (mg/l)
LOCATION	Bulbula-Tuffa				
DATE OF COLLECTION	21/3/2017				
DATE RECEIVED	21/3/2017				
CLIENTS ID.NO.	–				
LAB.ID NO.	4489/2009				
pH	7.37				6.5-8.5
Electrical Conductivity (µS/cm)	535.00				–
T. Dissolved Solid 105^{0}C(mg/l)	340.00				1000.0
T. Suspended Solid (mg/l)	1.00				
Sodium (mg/l Na^+)	79.00				
Total Hardness (mg/l Ca CO_3)	75.00				500.0
Calcium (mg/l Ca^{2+})	15.20				200.0
Magnesium (mg/l Mg^{2+})	8.88				150.0
Chloride (mg/l Cl^-)	12.35				250.0

REMARK:- ▪ The test result can be compared with the WHO maximum allowable concentration (mg/l) indicated on the last column; but it is not Sufficent to decide the suitability of water for drinking purpose based on these parameters only .
▪ The water sample was collected and submitted to our laboratory by the client .

Tested by: [signature] Date: 22/3/17
Processed By [signature] Date 22/3/17
Checked by: [signature] Date 22/03/17
Approved by: [signature] Date: 22/3/17

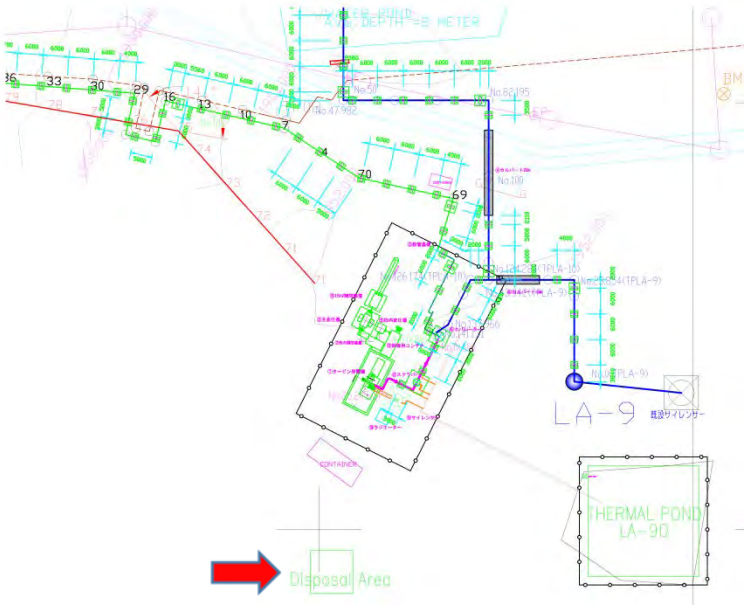
Ethiopian Construction Design & Supervision Works Corporation Water & Energy Design & Supervision Laboratory Service

Source: Ethiopian Construction Design and Supervision Works Corporation

Figure 2-3.2 Bulbula Water Analysis

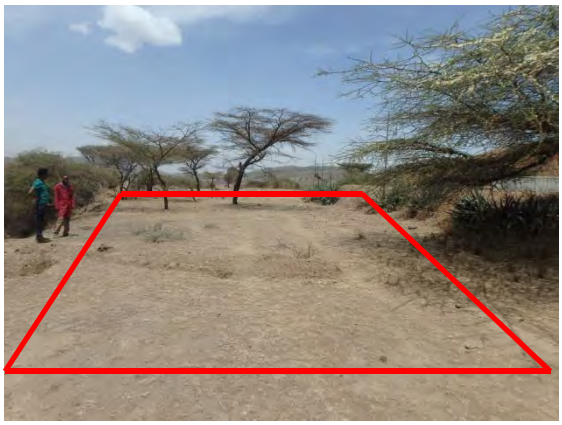
3) Drainage

Regarding the drainage water, a field survey was conducted with the person in charge of social environment at EEP. As a result of the field survey, instructions were given for holes to be dug in the ground at certain points and a natural underground infiltration method to be utilized. The drainage location is shown below in Figure2-3.3 and Figure 2-3.4.



Source: Prepared by the Survey Team

Figure 2-3.3 Plan of Drainage



Source: Prepared by the Survey Team

Figure 2-3.4Location of Drainage

2-4 Project Operation Plan

EEP is the project executing agency, and the organization structures of the whole EEP and the project implementation are shown in the foregoing Figure 2-2-4.2 and Figure 2-2-4.3 respectively. EEP is responsible for the operation and maintenance of the geothermal wellhead power system after the construction of the project. The following departments and units are mainly responsible for the operation and maintenance of the geothermal wellhead power system of the project.

EEP Departments & Units related to the Project	Responsible Person	Main Work Content
Generation & Operation Officer (EEP Head Office)	Mr Andarge Eshete	Management of operation and maintenance of all of the existing power plants of EEP
Aluto Geothermal Power Plant	Mr Habtamu	Management of operation and maintenance of the existing Aluto Langano Pilot Plant

(1) Organization of Operation and Maintenance of Wellhead Power System

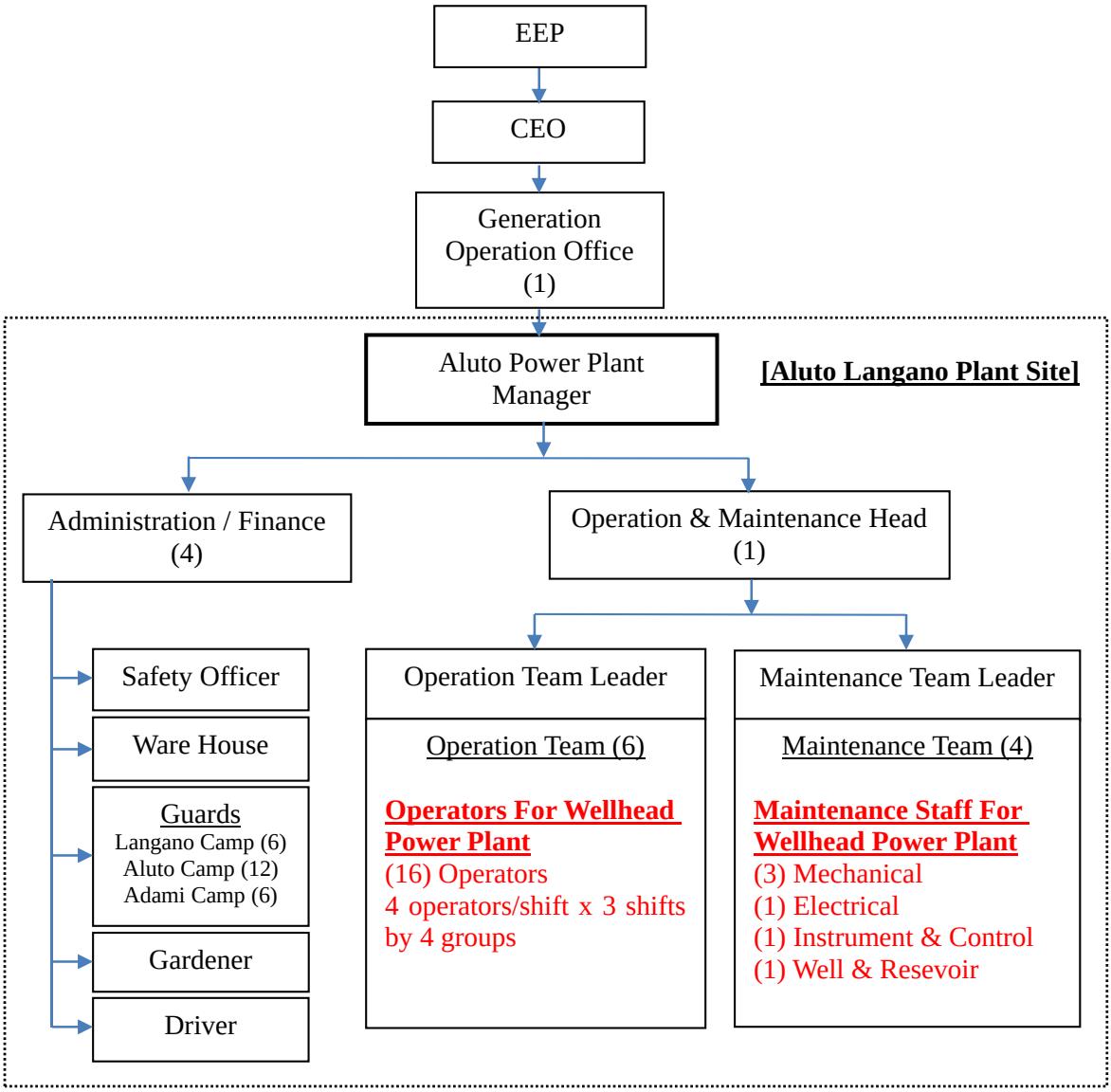
The present Aluto Power Plant will undertake the operation and maintenance of the geothermal wellhead power system during and after the plant commissioning and additional staff will be necessary for the operation team and the maintenance team of the geothermal wellhead power system.

For the operation of the geothermal wellhead power system, the following four (4) operators will be required per shift, and three (3) operation shifts will be assigned per day by four (4) groups. In total, sixteen (16) operators will be necessary.

- One (1) Control room operator
- One (1) Wellhead power plant operator
- Two (2) Operators for Steam Gathering System

For the maintenance of the Geothermal Wellhead Power System, the following maintenance staff will be required.

- Three (3) Mechanical engineers
- One (1) Electrical engineer
- One (1) Instrument & Control engineer
- One (1) Well & Reservoir engineer



Source: Prepared by the Survey Team

Figure 2-4.1Organization of Operation and Maintenance of Wellhead Power System

(2) Capacity Building for Operation and Maintenance

The capacity building is important for the operation and maintenance of the geothermal power plant, and the training and technology transfer is planned in the project by the EPC contractor, the turbine manufacturer, and the consultant.

The EPC contractor will conduct the following training:

- Operation guidance and training (OJT) regarding the operation of the geothermal wellhead power system during project commissioning stage.
- Classroom training and OJT for maintenance of the geothermal wellhead power system.

Consultant will conduct the following training (Soft Component Plan):

- Operation and maintenance management regarding the operation of the geothermal wellhead power system (including geothermal well and reservoir) during project

commissioning stage and for one (1) year from the completion of the construction of the geothermal wellhead power system.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Estimated Cost undertaken by the Ethiopian Side

16.7 Million ETB (Approx. 82 Million Japanese Yen)

Items to be borne by the Ethiopia Side		Estimated Amount (Million ETB)	Equivalent (Million Japanese Yen)
(1)	To bear the following commissions to a bank in Japan for the banking services based upon the Banking Agreement: - Advising commission of authorization to pay - Payment commission of authorization to pay	0.8	3.9
(2)	To secure the necessary budget and implement land acquisition and compensation with full replacement cost in accordance with RAP	0.1	0.5
(3)	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted; Such customs duties, internal taxes and other fiscal levies mentioned above include, but are not limited to VAT, income tax, corporate tax and withholding tax, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	5.1	25.0
(4)	To construct a part of access roads from Adami Tulu to project site	4.0	19.6
(5)	To repair the existing 15 kV grid connection line between Adami Tulu substation and the existing pilot plant	1.4 *Repair for 100 poles	6.9
(6)	To provide facilities for the distribution of electricity, water, drainage and other incidental facilities. a) Electricity b) Water supply c) Drainage d) Fence e) Thermal ponds	5.3 a) 0.02 b) 0.4 c) 0.3 d) 1.4 e) 3.2	26.0
Total		16.7	82.0

(2) Estimate Conditions

(a) Time of Estimation： August 2016, reference date: end of July 2016

(b) Exchange rate： 1 US$=107.12 Japanese Yen
1 ETB＝4.91 Japanese Yen
(Average rate of the previous 3 months according to JICA Estimate Guideline Manual)

(c) Project period： Refer to Project Implementation Schedule

(d) Others： Estimate should be carried out based on the Japanese Grant Aid System.

2-5-2 Operation and Maintenance Cost

As explained in the foregoing Section 2-4 Project Operation Plan, 22 additional staff will be necessary for the operation and maintenance of the geothermal wellhead power system. The operation and maintenance cost (O&M) recurs after the start of the plant operation. Annual operation cost is estimated to be US$ 0.132 million. In addition, maintenance is required every 2 years. The cost of maintenance is estimated to be US$ 0.536 million per every 2 years.

The additional wells to be drilled by the WB will be used in order to take advantage of the full capacity of the wellhead power system. In this case additional two-phase piping will be installed from the wells to the separator, and the cost of the piping is estimated to be US$ 1 million.

The geothermal wellhead power system will be transferred to another site after the construction of a large scale permanent geothermal power plant at Aluto Langano. The cost of the relocation is estimated to be US$ 2.5 million.

For the capacity building and training for the operation and maintenance of the geothermal wellhead power system, both EPC contractor (manufacturer) training and the consultant training (Soft Component Plan) are included in the project.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

Preconditions for the implementation of this project include the following items, which have already been confirmed with EEP, the executing agency. (Refer to the Minutes in Appendix No.4)

(1) The EIA report relevant to this project needs to be approved by MOWIE before the G/A signing.

(2) Providing the land for this project, including the land acquisition and compensation for the land use for the reinjection piping must have already been accomplished.

(3) The modification work of the existing 15 kV distribution line between the existing Pilot Plant and Adami Tulu substation which connects them to the system needs to have already been accomplished before the commencement of the construction of the geothermal wellhead power system of this project.

(4) The maintenance and improvement of the existing road between Adami Tulu and the project site.

(5) The repair of well head equipment of the existing reinjection well LA-7.

(6) The repair of the thermal ponds of LA-9D and LA-10D.

(7) The supply of power, water and drainage for the project construction work.

(8) The installation of the fences for the power plant, the thermal ponds, and LA-7.

(9) Tax benefits i.e. EEP bears VAT and Stamp duty, and custom duties are exempt, however, the duty exemption for the corporate tax, the individual income tax and withholding tax shall be negotiated and agreed by the both governments of Japan and Ethiopia.

3-2 Necessary Inputs by the Recipient Country

For the accomplishment of the whole program of this project, the matters the Ethiopian side shall implement are as follows:

(1) In order to maximize the potential of the power generating facility that Japan is to supply and construct for this project, the daily operation and management shall be diligently implemented.

(2) The allocation, education and training of the personnel in charge of the operation and maintenance of the facility constructed in this project shall be implemented after careful planning, and with consideration for the smooth operation of the facility.

(3) The EEP trainee engineers who participate in the contractor's training programs and the Soft Component Plan shall promptly be appointed for their full participation of the training program. Additionally, EEP internal training for the personnel who cannot participate in the said training shall be implemented for the dissemination of their skill and knowledge.

(4) According to the authorized EIA, a program of environmental monitoring shall be appropriately planned and implemented.

3-3 Important Assumptions (External Conditions)

The external conditions for developing and maintaining of this project effects are as follows:

(1) For EEP execution of the investment for this project, it is necessary to secure electricity revenues corresponding to expenditure. Consequently, a step by step rise of the electric

selling price to 8.11US Cents/kWh is needed based on the Power System Expansion M/P.

(2) Both the political and economic situation in Ethiopia must be stable.

(3) The production wells will be drilled in the Aluto Langano area with the WB support, and assistance from other donors needs to be maintained.

3-4 Project Evaluation

3-4-1 Relevance

As indicated below, it is judged that the validity of the project is high because this project contributes not only to the development and realization of the energy policy of Ethiopia but also is beneficial to the general public.

(1) Beneficiary Population in the Area

By this project implementation, a reliable and stable supply of electricity will be provided to 240,000 people, equivalent to approximately 70% population in Aluto Langano area.

(2) Stable Electricity Supply

Hydroelectric power represents 90% of the generating capacity in Ethiopia. However, instability of the power supply is increasing due to the influence of the recent climate change. In 2015 and 2016, the worst drought in more than 50 years hit the area, and power could not be generated at some hydroelectric power stations. The completion of Gibe III Hydroelectric Power Station and severe rainstorm after that drought barely avoided the interruption of electric supply but the unstable factor of the power supply is still left. In the light of this, it is necessary to develop geothermal power that utilizes the abundant geothermal resources of the area, in order to diversify and stabilize the base load power supply of Ethiopia.

(3) Improvement of Development Effect of Large-scale Geothermal Power Generation Business and Development Promotion

In the Aluto Langano area, in addition to the exploration wells which Japan has successfully drilled, production wells are planned to be drilled continuously in the future. By installing a geothermal wellhead power system, some of the costs could be recovered from the early stages of the project, by commencing the power generation in parallel with drilling the production wells. This is expected to improve the geothermal project effect and simultaneously encourages the development of geothermal power.

(4) Contribution to Infrastructure Development

In order to achieve agriculture development and the industrialization, Japan’s assistance policy for Ethiopia recognizes the importance of economic and social infrastructure as one of the fields of assistance. As a stable electric power supply is essential to facilitate sustainable industrialization, this project is judged to be effective assistance to reach these goals.

(5) Project Contribution to the Development Plan for Ethiopia

The energy sector is one of the 9 fields in infrastructure development of the GTP2 that is the five-year development program plan of Ethiopia. In the energy sector of the GTP2, satisfaction of energy demand and export are targeted and at the same time, development of the renewable energy, expansion of the energy infrastructure and improvement of the system ability that could effectively manage the energy source and infrastructure are noted as ways of the strategy.

This project includes the reinforcement of the supply of electric power to an urban area by geothermal electric power development, reinforcement of the base load power supply, and

the facilitation of renewable energy development to produce electric power for export to neighboring countries. These factors could all contribute to the development plan for Ethiopia.

(6) Grant Aid Scheme

This project is planned to be implemented according to the Japan Grant Aid scheme, so that the main equipment is supplied from Japan and the project is completed within the G/A time frame.

3-4-2 Effectiveness

The effect expected by implementation of this plan is as follows;

(1) Quantitative Evaluation

Outcome Index	Basic Value (2016) (Value at present)	Target Value (2022) (3 years after Project Completion)
Annual Availability (%)	0	70.0
Annual Total Generation Power (MWh)	0	15,943

※ The target value of the generated energy is calcurated with the generation capacity of the wellhead power plant as 2.6 MW.

(2) Qualitative Evaluation

Current Status and Matter	Measures in this Project	Effect of Project/ Improvement Degree
In the Aluto Langano area, production wells can be drilled sequentially for the large-scale geothermal power plant, but the power business cannot commence until sufficient steam capacity is confirmed, therefore, some wells are forced to be idle.	Power business can be commenced by installing a geothermal wellhead power system in parallel with drilling production wells.	Recovering some of the project cost from the early stages by commencing the power generation and improvement of the development effect of the business is expected. At the same time, stable power could be supplied to the Adami Tulu area contributing to the improvement of the activity and life in the area.

The early commencement of the geothermal power generation will contribute to the expansion of investment, secure a diversification of base load power resources, and contribute to economic development in the Aluto Langano area.

The geothermal wellhead power system is expected to be connected to the main power transmission system and the target annual total power generation is equivalent to the consumed power capacity used by 240,000 people (equivalent to approximately 70% population in the Aluto Langano area).

3-4-3 Economic Evaluation

(1) General

The purpose of this project is to provide a small scale wellhead geothermal plant to generate power, in order to take advantage of utilizing the existing wells before the start of the full scale power generation plant.

The most economical alternative has been selected taking into account the location of production and reinjection wells. The existing wells and steam gathering system will be used as much as possible. With this approach, the project can be implemented with the least cost.

Since it is expected that there will be a full scale power plant later, the geothermal wellhead power system is assumed to be transferred to other sites every 7 years in order to be used in each development site before commencement of full scale power generation.

Based on the estimated cost and output, the economic viability of the project is examined.

The basic assumptions were agreed to between EEP and the survey team during the visit to Ethiopia in July-August, 2016.

(2) Financial Internal Rate of Return (FIRR)

FIRR is estimated to be 8.5%.

The cash flow is calculated on the basis of the following assumptions.

1) Project life: 15 years after the start of the operation of the project
2) Transfer of the plant: Every 7 years
3) Price: All the prices used in the calculation of costs and benefits are based on data from January 2017.
4) Escalation and interest during construction are excluded.
5) Financial costs
   - The total investment cost is estimated.
   - The annual fund applied for the evaluation is based on the design, manufacturing and construction schedule.
   - The O&M cost recurs after the start of operation. Annual operation cost is estimated to be US$ 0.132 million. In addition, maintenance is required every 2 years. The cost of maintenance is estimated to be US$ 0.536 million per 2 years.
   - Drilling cost of wells is excluded. This is because the wells will be used during full scale power generation, and this wellhead power generation is only temporary at each site.
   - In order to take advantage of the full capacity of the wellhead generation system, it is assumed that the wells to be drilled by the WB will be used, and the cost of the steam gathering system is estimated to be US$ 1 million.
   - Every 7 years the wellhead power generation system is expected to be transferred to another site. The cost of the relocation is estimated to be US$ 2.5 million.
   - The income by selling the generated power of the geothermal wellhead power plant will be utilized for the future connection to the WB additional well and the plant relocation cost.
   - Income tax is not considered since EEP is a tax exempted institution.

6) Financial Benefit

- The financial benefit of the Project consists of the revenue accrued by selling the power generated.
- It is agreed with EEP to use 0.0811 US$/kWh as the sales unit cost. This is derived from the Power System Expansion M/P. According to this report, the actual total cost of electricity is 11.3 USc/kWh which includes a generation cost of 6.5 USc/kWh, while required total price should be 14.1 USc/kWh. Therefore, the selling price is set at 8.11 USc/kWh, prorating 14.1 USc/kWh to generation (=6.5/11.3x14.1).
- The first year's output capacity is estimated to be 2.6 MW and the operation period is estimated to be 8 months. From the second year, the output capacity is anticipated to be 5 MW, assuming the utilization of a well to be drilled using the WB's finance.
- It is assumed that in-house consumption is 20 kW and transformer loss is 2% respectively.
- Capacity factor (plant factor) at full operation is assumed to be 99.3% (93.0% during maintenance year).
- In conclusion revenue at full capacity of 5 MW is estimated to be US$ 3.4 million (US$3.18 million during maintenance year).

(3) Economic Internal Rate of Return (EIRR)

EIRR is estimated to be 28.2%.

The cash flow is calculated on the basis of the following assumptions.

1) Project life: 15 years after the start of the operation of the project
2) Transfer of the plant: Every 7 years
3) Price: All the prices used in the calculation of costs and benefits are based on data from January 2017.
4) Escalation and interest during construction are excluded
5) Economic costs are based on financial costs
6) Economic benefit

- Introduction of geothermal power generation enables cost savings of similar power generation which would otherwise be adopted. It is assumed that the use of a diesel power plant will be avoided by introducing geothermal power generation.
- In order to generate same amount of power, the initial investment cost of diesel power generation is estimated to be US$ 6.14 million taking into account the required power generation with capacity factor (plant factor) of 85.0%, station use 7.2% and unit cost of US$ 1,000/kW.
- Annual O&M costs are estimated to be US$ 0.42 million during full capacity operation years and US$ 0.39 million during maintenance years. In both cases the unit cost is estimated to be 0.01 US$/kWh.
- The annual cost of fuel is estimated to be US$ 4.4 million during full capacity operation years and US$ 4.12 million during maintenance years. In both cases the thermal efficiency is estimated to be 35% and the unit cost of fuel is estimated to be 10 US$/MMBTU.

Appendices

1 Member List of the Study Team

1 Member List of the Study Team

No.	Name	Assignment	Organization
1	Yoshimi FUNAKOSHI	Team Leader / Geothermal power generation plan	Thermal Power Engineering Dept. West Japan Engineering Consultants, Inc.
2	Teruaki MATSUO	Deputy Team Leader / Power transmission and Distribution Equipment	Thermal Power Engineering Dept. West Japan Engineering Consultants, Inc.
3	Takeshi YAMAMOTO	Geothermal power plant engineering	Thermal Power Engineering Dept. West Japan Engineering Consultants, Inc.
4	Manabu MOMITA	Geothermal resource development	Geothermal Dept. West Japan Engineering Consultants, Inc.
5	Hideki HATANAKA	Geothermal reservoir analysis	Geothermal Dept. West Japan Engineering Consultants, Inc.
6	Taro NAKAMURA	Substation equipment	Thermal Power Engineering Dept. West Japan Engineering Consultants, Inc.
7	Takeshi KAWAKAMI	Civil engineering / Facility plan	Civil Dept. West Japan Engineering Consultants, Inc.
8	Shatei IRI	Environmental and social consideration	Environmental Dept. Japan Engineering Consultants, Inc.
9	Shinji NAMBO	Economic and financial analysis	Overseas Business Dept. West Japan Engineering Consultants, Inc.
10	Hiroyuki ISHIGAKI	Procurement plan / Estimation	Japan International Cooperation System
11	Shinya ARAKAWA	Coordinator / Mechanical equipment assistance	Overseas Projects Management Dept. West Japan Engineering Consultants, Inc.

2 Study Schedule

2-1 1st Study Schedule

2 Study Schedule

2-1 1st Study schedule

No.	Date	Sutdy contents / Consultants		Accommodation
1	Sat. July 16	・Trip: Fukuoka - Inchon - Dubai (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nakamura, Kawakami, Arakawa)		In-flight
2	Sun. July 17	・Trip: Dubai - Addis Ababa (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nakamura, Kawakami, Arakawa)		Addis Ababa
3	Mon. July 18	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nakamura, Kawakami, Arakawa) ・Courtesy call (Ethiopian Electric Power, Geological Survey of Ethiopia) ・Submission of questionnaire and explanation of inception report ・Confirmation of project implementation organization		Addis Ababa
4	Tue. July 19	Aluto Langano (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nakamura, Kawakami, Arakawa) ・Site survey (Site for power plant construction and temporary distribution-line, Adami Tulu substation)		Addis Ababa
5	Wed. July 20	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nakamura, Kawakami, Arakawa) ・Courtesy call (JICA Ethiopia) ・Survey of outsourced contractors ・Confirmation of project implementation organization ・Study of environmental and social consideration ・Study of conceptual design		Addis Ababa
6	Thu. July 21	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nakamura, Kawakami, Arakawa) ・Survey of outsourced contractors ・Contract with outsourced contractors ・Confirmation of project implementation organization ・Study of environmental and social consideration ・Study of conceptual design		Addis Ababa
7	Fri. July 22	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nakamura, Kawakami, Arakawa) ・Survey of outsourced contractors ・Contract with outsourced contractors ・Confirmation of project implementation organization ・Study of environmental and social consideration ・Study of conceptual design		Addis Ababa
8	Sat. July 23	Addis Ababa (Funakoshi, Kawakami, Arakawa) ・Survey of outsourced contractors ・Contract with outsourced contractors ・Study of conceptual design	Aluto Langano (Matsuo, Yamamoto, Momita, Iri, Nakamura) ・Move to Aluto Langano ・Study of environmental and social consideration ・Study of conceptual design	Addis Ababa Ziway
9	Sun. July 24	Addis Ababa (Funakoshi, Kawakami, Arakawa) ・Study of conceptual design	Aluto Langano (Matsuo, Yamamoto, Momita, Iri, Nakamura) ・Study of environmental and social consideration ・Study of conceptual design	Addis Ababa Ziway

No.	Date	Sutdy contents Consultants		Accommodation
10	Mon. July 25	Addis Ababa (Funakoshi, Nambo, Ishigaki, Kawakami, Arakawa)	Aluto Langano (Matsuo, Yamamoto, Momita, Iri, Nakamura)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (power plant construction site)	
		・Data collection for economic and finance	・Site survey (temporary distribution-line)	
		・Kick off meeting with EEP and JICA	・Site survey (pilot plant)	
		・Meeting with MoWIE and JICA	・Study of environmental and social consideration	
11	Tue. July 26	Addis Ababa (Funakoshi, Nambo, Ishigaki, Kawakami, Arakawa)	Aluto Langano (Matsuo, Yamamoto, Momita, Iri, Nakamura)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (power plant construction site)	
		・Data collection for economic and finance	・Site survey (temporary distribution-line)	
		・Geothermal Workshop	・Site survey (pilot plant)	
		・Meeting with EEP and JICA	・Site survey (Adami Tulu substation)	
			・Study of environmental and social consideration	
12	Wed. July 27	Aluto Langano (Funakoshi, Matsuo, Yamamoto, Momita, Iri, Nambo, Ishigaki, Nakamura, Kawakami, Arakawa)		Addis Ababa Ziway
		・Move to Aluto Langano	・Site survey (power plant construction site)	
			・Site survey (temporary distribution-line)	
			・Site survey (pilot plant)	
			・Site survey (Adami Tulu substation)	
			・Site survey (geological survey)	
			・Study of environmental and social consideration	
			・Site Visit with JICA	
13	Thu. July 28	Addis Ababa (Funakoshi, Momita, Nambo, Ishigaki, Arakawa)	Aluto Langano (Matsuo, Yamamoto, Iri, Nakamura, Kawakami)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (power plant construction site)	
		・Data collection for economic and finance	・Site survey (temporary distribution-line)	
		・Meeting with Embassy of Japan and JICA	・Study of environmental and social consideration	
14	Fri. July 29	Addis Ababa (Funakoshi, Momita, Nambo, Ishigaki, Arakawa)	Aluto Langano (Matsuo, Yamamoto, Iri, Nakamura, Kawakami)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (power plant construction site)	
		・Data collection for economic and finance	・Site survey (temporary distribution-line)	
		・Preparation of technical minutes of discussion and field report	・Site survey (geological survey)	
			・Study of environmental and social consideration	

No.	Date	Sutdy contents Consultants		Accommodation
15	Sat. July 30	Addis Ababa (Funakoshi, Momita, Nambo, Ishigaki, Arakawa)	Aluto Langano (Matsuo, Yamamoto, Iri, Nakamura, Kawakami)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (power plant construction site)	
		・Data collection for economic and finance	・Site survey (temporary distribution-line)	
		・Preparation of technical minutes of discussion and field report	・Site survey (geological survey)	
			・Study of environmental and social consideration	
			・Move to Addis Ababa (Yamamoto, Nakamura, Kawakami)	
16	Sun. July 31	Addis Ababa (Funakoshi, Yamamoto, Momita, Nambo, Ishigaki, Nakamura, Kawakami, Arakawa)	Aluto Langano (Matsuo, Iri)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (temporary distribution-line)	
		・Data collection for economic and finance	・Site survey (geological survey)	
		・Preparation of technical minutes of discussion and field report	・Study of environmental and social consideration	
		・Move to Aluto Langano(Kawakami)	・Preparation of technical minutes of discussion and field report	
17	Mon. Aug. 1	Addis Ababa (Funakoshi, Yamamoto, Momita, Nambo, Ishigaki, Nakamura, Arakawa)	Aluto Langano (Matsuo, Iri, Kawakami)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (temporary distribution-line)	
		・Data collection for economic and finance	・Site survey (geological survey)	
		・Preparation of technical minutes of discussion and field report	・Study of environmental and social consideration	
		・Departure from Ethiopia (Momita)	・Preparation of technical minutes of discussion and field report	
18	Tue. Aug. 2	Addis Ababa (Funakoshi, Yamamoto, Nambo, Ishigaki, Nakamura, Arakawa)	Aluto Langano (Matsuo, Iri, Kawakami)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (temporary distribution-line)	
		・Data collection for economic and finance	・Site survey (geological survey)	
		・Preparation of technical minutes of discussion and field report	・Study of environmental and social consideration	
			・Preparation of technical minutes of discussion and field report	
19	Wed. Aug. 3	Addis Ababa (Funakoshi, Yamamoto, Nambo, Ishigaki, Nakamura, Arakawa)	Aluto Langano (Matsuo, Iri, Kawakami)	Addis Ababa Ziway
		・Study of conceptual design	・Site survey (geological survey)	
		・Data collection for economic and finance	・Preparation of technical minutes of discussion and field report	
		・Preparation of technical minutes of discussion and field report	・Move to Addis Ababa (Matsuo, Iri)	
		・Departure from Ethiopia (Nakamura)		

No.	Date	Sutdy contents Consultants		Accommodation
20	Thu. Aug. 4	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Ishigaki, Arakawa)	Aluto Langano (Kawakami)	Addis Ababa
		・Study of conceptual design	・Site survey (geological survey)	
		・Data collection for economic and finance	・Preparation of technical minutes of discussion and field report	
		・Preparation of technical minutes of discussion and field report	・Move to Addis Ababa (Kawakami)	
21	Fri. Aug. 5	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Ishigaki, Kawakami, Arakawa)		Addis Ababa
		・Study of conceptual design		
		・Data collection for economic and finance		
		・Preparation of technical minutes of discussion and field report		
22	Sat. Aug. 6	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Ishigaki, Kawakami, Arakawa)		Addis Ababa
		・Study of conceptual design		
		・Data collection for economic and finance		
		・Preparation of technical minutes of discussion and field report		
		・Departure from Ethiopia (Ishigaki)		
23	Sun. Aug. 7	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Kawakami, Arakawa)		Addis Ababa
		・Preparation of technical minutes of discussion and field report		
		・Data collection for finance		
		・Preparation of technical specifications for major equipment		
24	Mon. Aug. 8	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Kawakami, Arakawa)		Addis Ababa
		・Preparation of technical minutes of discussion and field report		
		・Data collection for finance		
		・Preparation of technical specifications for major equipment		
25	Tue. Aug. 9	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Kawakami, Arakawa)		Addis Ababa
		・Preparation of technical minutes of discussion and field report		
		・Data collection for finance		
		・Preparation of technical specifications for major equipment		
26	Wed. Aug. 10	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Kawakami, Arakawa)		Addis Ababa
		・Submission and explanation of technical minutes of discussion		
		・Preparation of technical specifications for major equipment		
27	Thu. Aug. 11	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Nambo, Kawakami, Arakawa)		Addis Ababa
		・Preparation of field report		
		・Preparation of technical specifications for major equipment		
		・Departure from Ethiopia (Nambo)		
28	Fri. Aug. 12	Addis Ababa (Funakoshi, Matsuo, Yamamoto, Iri, Kawakami, Arakawa)		Addis Ababa
		・Preparation of field report		
		・Preparation of technical specifications for major equipment		
		・Meeting with JICA Ethiopia		
29	Sat. Aug. 13	・Departure from Ethiopia (Funakoshi, Matsuo, Yamamoto, Iri, Kawakami, Arakawa)		In-flight
30	Sun. Aug. 14	・Arrival to Japan (Funakoshi, Matsuo, Yamamoto, Iri, Kawakami, Arakawa)		

2-2 2nd Study Schedule

2-2 2nd Study schedule

No	Date	Sutdy contents / Consultants	Accommodation
1	Sat. Jan. 14	・Trip: Fukuoka - Inchon - Dubai (Funakoshi, Matsuo, Nakamura)	In-flight
2	Sun. Jan. 15	・Trip: Dubai - Addis Ababa (Funakoshi, Matsuo, Nakamura)	Addis Ababa
3	Mon. Jan. 16	・Meeting with JICA Ethiopia (Confirmation of Schedule etc.) ・Explanation and discussion of draft minuts of discussions (MOD) to Ethiopia Electric Power (EEP)	Addis Ababa
4	Tue. Jan. 17	・Presentation and discussion of draft final report to EEP ・Discussion with EEP for draft MOD	Addis Ababa
5	Wed. Jan. 18	・Discussion with EEP for draft MOD ・Modification of project overview report	Addis Ababa
6	Thu. Jan. 19	・Review of draft MOD ・Modification of project overview report	Addis Ababa
7	Fri. Jan. 20	・Meeting with JICA Ethiopia ・Meeting with Embassy of Japan and JICA ・Discussion with EEP for draft MOD	Addis Ababa
8	Sat. Jan. 21	・Departure from Ethiopia (Funakoshi, Matsuo, Nakamura)	In-flight
9	Sun. Jan. 22	・Arrival to Japan (Funakoshi, Matsuo, Nakamura)	

3 List of Parties Concerned in the Recipient Country

3 List of Parties Concerned in the Recipient Country

Ministry of Water, Irrigation and Electricity

Mr. Sahele Tamiru Fekede	Director, Directorate of Energy Study and Development Follow-up
Ms. Detelihem Mekonnen	CDM&Environmental Senior Expert, Enviromental Impact development Office

Ethiopian Electric Power Head Office

Mr. Mekuria Lemma	Strategic & Investment
Mr. Daniel mulatu	Strategic & Investment
Mr. Bireda Maru	Portfolio Management Executive Officer
Mr. Andarge Eshete	Generation Operation Executive Officer
Mr. Hiwot Eshetu	Director, Procurement & Logistics
Ms. Emebet	Tax Maneger, Tax Administration
Mr. Mesfin Megonen	Director, EHS＆Quality

Ethiopian Electric Bole Office

Mr. Endale Mamo	Strategy Marketing and Reporting Manager
Mr. Estifanos Gebru	Strategy & Investment transmission Substation

Ethiopian Electric Power Mexico Office

Mr. Fikru Woldemariam	Aluto Langano Project Manager
Mr. Neway Abera	Aluto Langano Project, Assistant Project Manager

Ethiopian Electric Power Aluto Langano Pilot Plant

Mr. Habtamu Geremew	Aluto Langano Pilot Plant Manager

Geological Survey of Ethiopia

Mr. Solmon Kebede	Director of Exploration Dept.
Ms. Mayumi Hayashi	Advisor/ Geothermal Exploration & Development

Ethiopian Revenues and Customs Authority

Mr. Ato Gain Yibrah	Directorate director, Customs procedure and program Development

National Grid Control Center

Mr. Ato Dagim Dessalgen	National Grid Control Center Officer

Ethiopian Wildlife Conservation Authority（EWCA）

Mr. Girma Timer	Director of Wildlife Protected area Development Directorate Dept.

Oromia Forest and Wildlife Enterprise（OFWE）

Mr. Cammara Zawudee	Director of Wildlife Development& Utilization Directorate

Woreda Administration Office

Mr. Abdoo Aka	Head, Woreda Administration Office
Ms. Bekelech	Woman and Children Office Head
Tahir Hideto	Natural Resource and Protection Head

Embassy of Japan

Mr. Kazuhiro Suzuki	Ambassador Extraordinary and Plenipotentiary Permanent Representative
Mr. Kazuto Nakamura	Second Secretary, Economic Division
Mr. Keiichiro Ichikawa	Second Secretary, Development Cooperation Division

JICA Ethiopia

Mr. Takeshi Matsuyama	Senior Representative
Mr. Akitoshi Iio	Project Formulation Advisor (Infrastructure Sector)
Mr. Gaku Saito	Representative

4 Minutes of Discussions

4-1 Minutes of Discussions July 2016

Minutes of Discussions
on the Preparatory Survey for the Project on Geothermal Wellhead Power System

In response to the request from the Government of Ethiopia (hereinafter referred to as "Ethiopia") with letter ref No. B-C-3/20/34 dated 21st April 2015, the Government of Japan decided to conduct a Preparatory Survey for the Project for Geothermal Wellhead Power System (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") to Ethiopia, headed by Katsuya Kuge, Acting Director, Energy and Mining Group, Industrial Development and Public Policy Department, JICA, and is scheduled to stay in the country from 24 to 29 July, 2016.

The Team held a series of discussions with the EEP counterparts concerned of the Project and conducted a field survey in the Project area. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Addis Ababa, 29th July, 2016

Dr. Katsuya Kuge
Leader, Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Mekuria Lemma
Head, Strategy and Investment
Ethiopian Electric Power
Federal Democratic Republic of Ethiopia

Witnessed by

Mr. Sahele Tamiru Fakeda
Director, Directorate of Energy Study and Development Follow-up
Ministry of Water, Irrigation and Electricity

Mr. Kokeb Misrak
Director, Bilateral Cooperation Directorate
Ministry of Finance and Economic Cooperation

ATTACHEMENT

1. Objective of the Project

The objective of the Project is to commence early geothermal power generation in the Aluto-Langano by introduction of the Geothermal Wellhead Power Plant, thereby contributing to support promotion of geothermal development and capacity building in Ethiopia.

2. Tittle of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for Geothermal Wellhead Power System".

3. Project Site

Both sides confirmed that the site of the Project is in Aluto-Langano which is shown in Annex 1.

4. Line Ministry and Executing Agency

Both sides confirmed the line ministry and executing agency as follows:

4-1. The line ministry is Ministry of Water, Irrigation and Electricity (MoWIE), which would be the ministry to supervise the executing agency.

4-2. The executing agency is Ethiopian Electric Power (EEP). The executing agency shall coordinate with all the relevant agencies to ensure smooth implementation of the Project and make sure that the Undertakings are taken by relevant agencies properly and on time. The organization charts are shown in Annex 2.

5. Items requested by the Government of Ethiopia.

5-1. As a result of discussions, both sides confirmed that the items requested by the Government of Ethiopia are as follows:

- Construction of the portable geothermal wellhead power plant (back pressure turbine, generator and transformer) 1 unit, steam gathering system and 15 kV grid connection line from the portable geothermal wellhead power plant to the existing 15 kV grid connection line.
- Soft component (technical assistance for operation and maintenance of the wellhead geothermal power plant and making the operation and maintenance plan)

*The location of the requested power plant is as shown in Annex 1. The capacity is to

be confirmed in the preparatory survey based on the data from Japan International Cooperation System received in July 2016 for LA-9D and LA-10D.
*The Preliminary Grid Connection Plan from the wellhead power plant to Adami Tulu S/S is shown in Annex 3

5-2. JICA will assess the appropriateness of the above requested item through the survey and will report findings to the Government of Japan. The final components of the Project would be decided by the Government of Japan.

6. Japanese Grant Scheme

6-1. The Ethiopian side understands the Japanese Grant Scheme and its procedures as described in Annex 4, Annex 5 and Annex 6, and necessary measures to be taken by the Government of Ethiopia.

6-2. The Ethiopian side understands to take the necessary measures, as described in Annex 7, for smooth implementation of the Project, as a condition for the Japanese Grant to be implemented. The detailed contents of the Annex 7 will be worked out during the survey and shall be agreed by the Explanation of the Draft Preparatory Survey Report.
The contents of Annex 7 will be used to determine the following:
(1) The scope of the Project.
(2) The timing of the Project implementation.
(3) Timing and possibility of budget allocation.
Contents of Annex 7 will be updated as the Preparatory Survey progresses, and will finally be the Attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further survey in Ethiopia until 13th August, 2016.

7-2. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Ethiopia in order to explain its contents around January 2017.

7-3. If the contents of the draft Preparatory Survey Report is accepted in principle and the Undertakings are fully agreed by the Ethiopian side, JICA will finalize the Preparatory Survey Report in English and send it to Ethiopia around March 2017.

7-4. The above schedule is tentative and subject to change.

8. Environmental and Social Considerations

8-1. The Ethiopian side confirmed to give due environmental and social considerations during implementation of the Project, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).

8-2. The Project is categorized as B because the Project neither locates in a sensitive area, nor has sensitive characteristics, nor falls into sensitive sectors under the Guidelines, and its potential adverse impacts on the environment are not likely to be significant.

9. Other Relevant Issues

9-1. Grid Connection Plan

Both sides agreed that the existing 15 kV grid connection line from the pilot plant to Adami Tulu substation shall be used for the power supply from the wellhead power plant, as shown in Annex 3. In any case Ethiopian side shall avail sufficient transmission capacity to evacuate the power to Adami Tulu substation from the existing pilot power plant switchgear before the commencement of installation work of the new wellhead generator. The Team will propose the improvement plan for the existing grid connection line to Ethiopian side by the Draft Final Report.

9-2. Production and Reinjection wells

Both sides agreed that LA-9D, LA-10D and LA-7 shall be used for the production and reinjection wells and the additional wells financed by the World Bank might be used as production wells and reinjection wells with consent of World Bank.

9-3. Internal Rate of Return

Both sides discussed a way of the IRR estimation for the Project. Ethiopian side explained that the current average cost of generation is just under 3 USc/kWh reflecting the low-cost hydropower generation, however, in recent years it has been insufficient and significant price increase is indispensable as shown in the Ethiopian Power System Expansion Master Plan Study Report 2014. The report says that 9 USc/kWh is appropriate as export tariff. Both sides agreed to continue the technical discussion and determine the tariff for the IRR by 13th August 2016.

9-4. Operation and Maintenance

(1) Both sides agreed that it is necessary to support the capacity building for the operation and maintenance of the wellhead power plant. Both sides agreed to consider the system of the remote monitoring and support from Japan through the Internet of Things (IoT). Regarding the system of the remote monitoring and support from Japan, both sides agreed to decide whether the system will be installed or not by the middle of September.

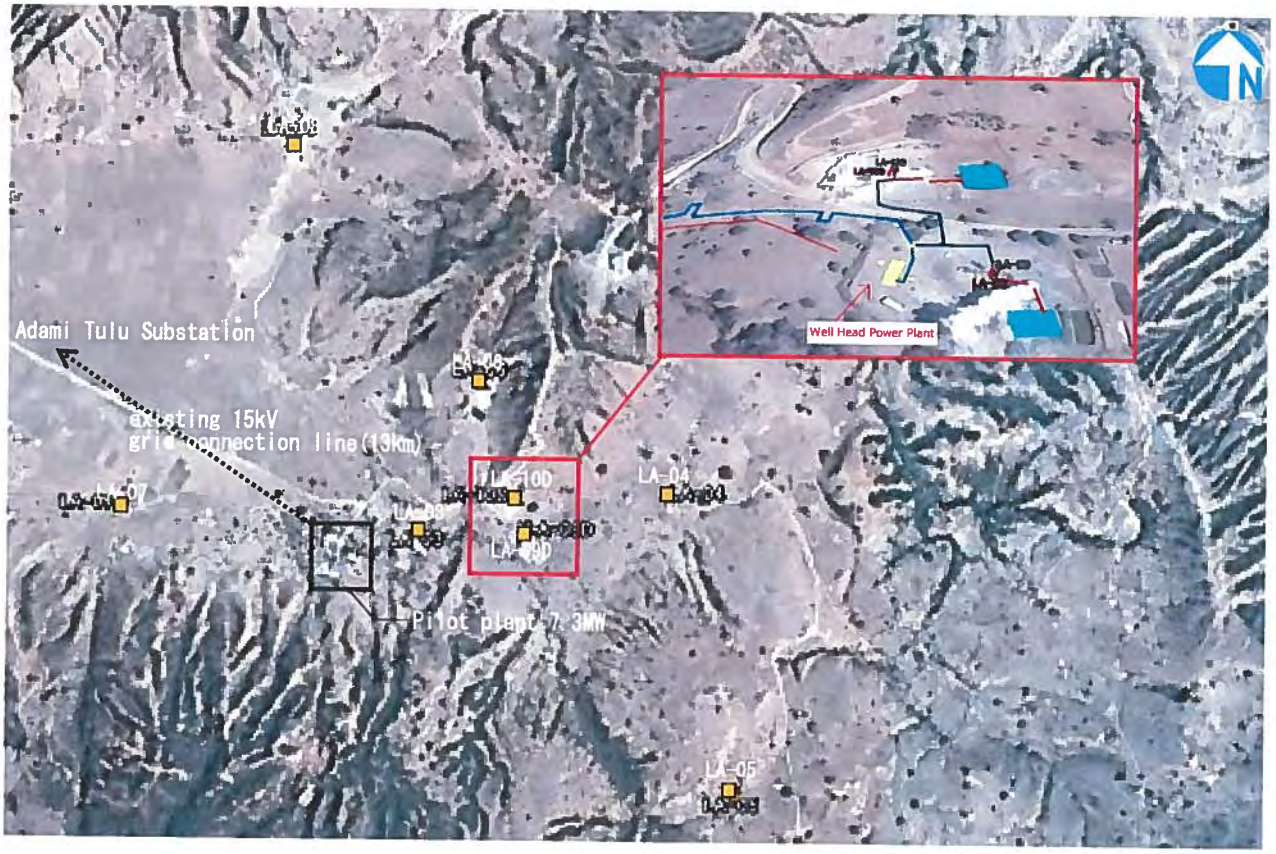
(2) Ethiopian side shall be responsible for proper operation and maintenance under the project. Ethiopian side shall also be responsible for the preparation of necessary budget and number of qualified staff for operation and maintenance of the wellhead power plant and equipment.

9-5. Tax Exemption

The Japanese side position as to the tax exemption is clearly stipulated under the grant agreement attached Annex-4 and clearly explained to Ethiopian side. However, Ethiopian side did not determine the framework of the tax issues related with corporate and income tax. Both sides agreed to undertake further discussions on the tax exemption under the consultation between the Government of Ethiopia and Government of Japan. The Team explained that if this tax issues are not cleared, the implementation time may be delayed.

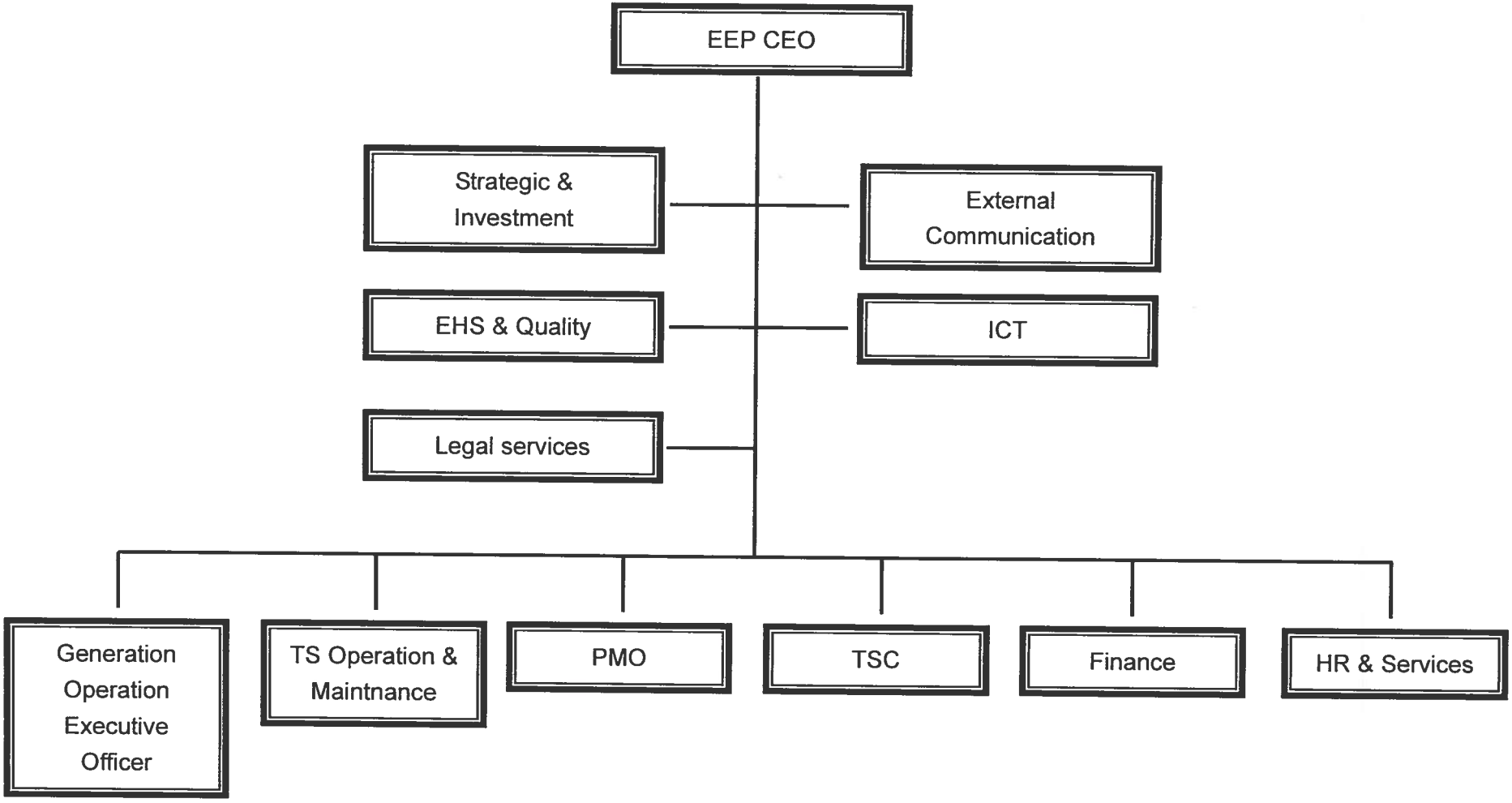
Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Preliminary Grid Connection Plan
Annex 4 Japanese Grant
Annex 5 Flow Chart of Japanese Grant Procedures
Annex 6 Financial Flow of Japanese Grant
Annex 7 Major Undertakings to be taken by Each Government
Annex 8 Project Monitoring Report (template)

Annex 1 Project Site



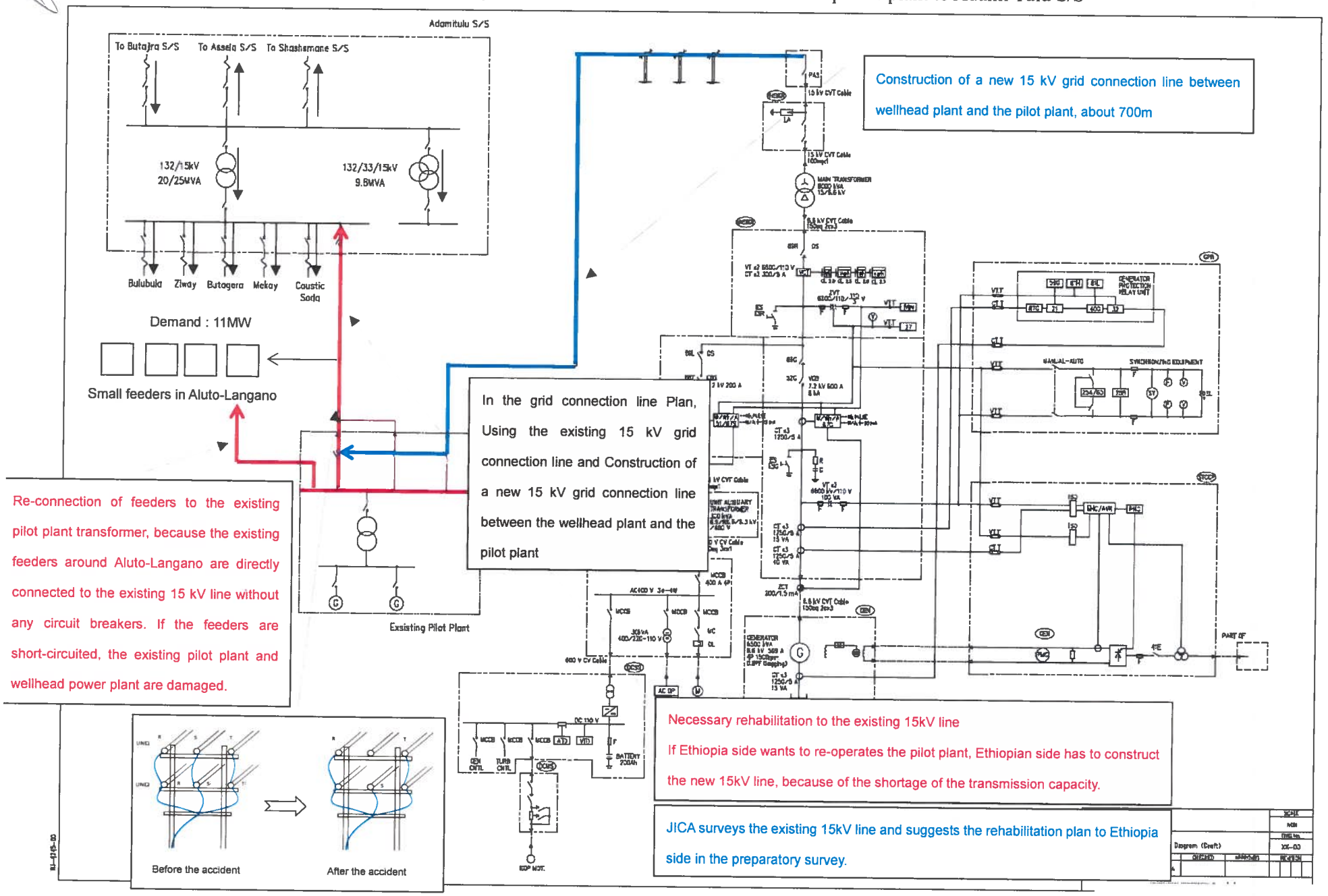
source: google earth

Annex 2 EEP Organization Chart



source:EEP

Annex3 Preliminary Grid Connection Plan from the wellhead power plant to Adami Tulu S/S



source: JICA mission Team

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.

Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

1. Grant Procedures

The Grant is supplied through following procedures :

・Preparatory Survey
- The Survey conducted by JICA

・Appraisal &Approval
-Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

・Authority for Determining Implementation
-The Notes exchanged between the GOJ and a recipient country

・Grant Agreement (hereinafter referred to as "the G/A")
-Agreement concluded between JICA and a recipient country

・Implementation
-Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

-Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.

-Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.

-Confirmation of items agreed between both parties concerning the basic concept of the Project.

-Preparation of an outline design of the Project.

-Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project.

Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japanese Grant Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the

facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April, 2010) .

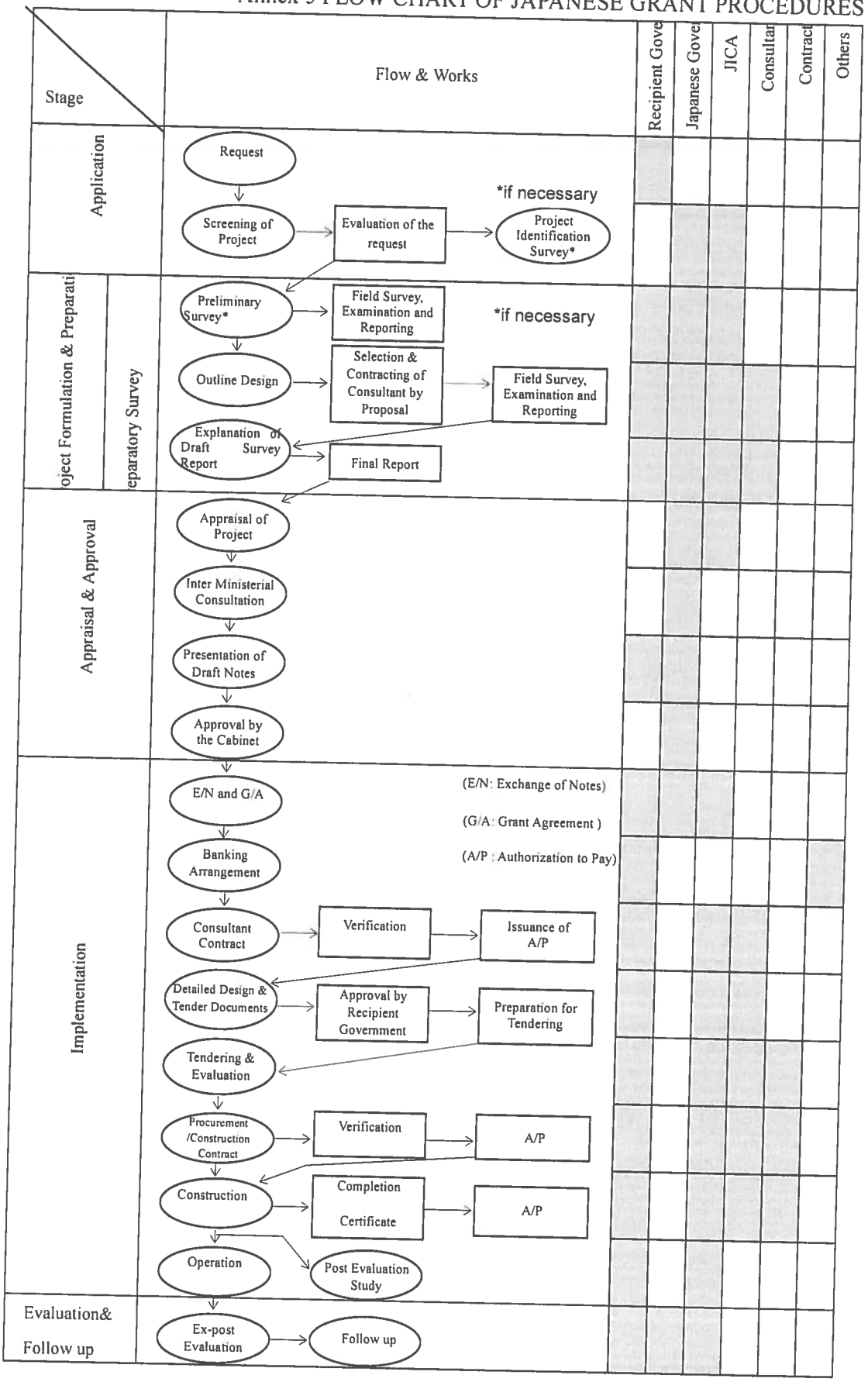
(11) Monitoring

The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

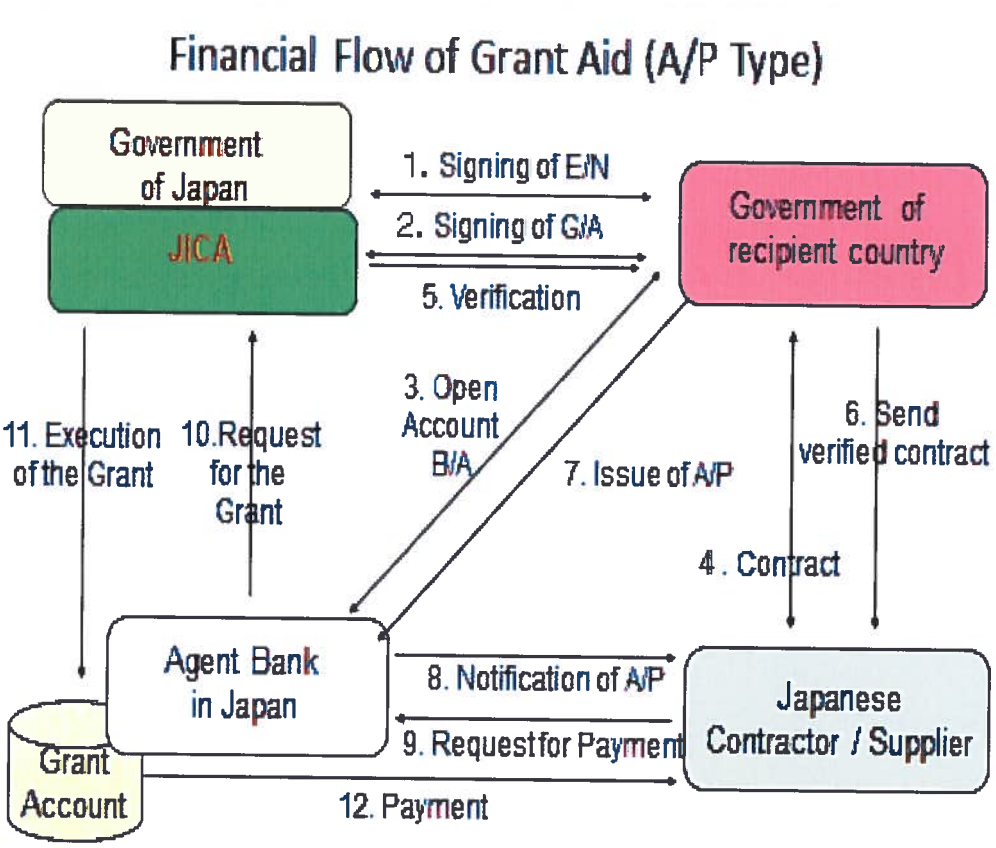
(12) Safety Measures

The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

Annex 5 FLOW CHART OF JAPANESE GRANT PROCEDURES



Annex 6 Financial Flow of Japanese Grant Aid



Annex 7 Major Undertakings to be taken by Each Government

Major Undertakings to be Covered by the Ethiopia side

1. Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A	MOFEC		
2	Securing of the Project site, Removal of the existing facilities and trees at the Project site,	before the commencement of installation work of the new wellhead generator	EEP		

2. During the Project Implementation

NO	Items	Deadline	In charge	Cost	Ref.
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		MOFEC		
	1) Advising commission of A/P	within 1 month after the singing of the contract	MOFEC		
	2) Payment commission for A/P	every payment	MOFEC		
2	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		EEP		
	1) Tax exemption and customs clearance of the products at the port of disembarkation	during the Project	EEP		
	2) Internal transportation from the port of disembarkation to the project site	during the Project	EEP		

3	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	during the Project	EEP		
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	during the Project	MOFEC		
5	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment	during the Project	EEP		
6	To Submit Project Monitoring Report	every months	EEP		Minutes of Discussions
7	To construct access roads (outside the site)	before the commencement of installation work of the new wellhead generator	EEP		
8	To provide facilities for the distribution of electricity, water, drainage and other incidental facilities.		EEP		
	1) Electricity The grid connection line to the site	before the commencement of installation work of the new wellhead generator	EEP		
	2) Water Supply The city water distribution main to the site	before the commencement of installation work of the new wellhead generator	EEP		
	3) Drainage The city drainage main (from storm, sewer and others) to the site	before the commencement of installation work of the new wellhead generator	EEP		

3. After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	EEP		

Major Undertakings to be Covered by the Japanese Grant

No	Items	Deadline	Cost Estimated (Million Japanese Yen)*	
1	To construct facility and provide equipment		XX.XX	
	1) To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country			
	a) Marine(Air) transportation of the products from Japan to the recipient country			
	b) Internal transportation from the port of disembarkation to the project site			
	2) To construct facilities			
	3) To provide equipment with installation and commissioning			
2	To implement detailed design, tender support and construction supervision (Consultant)			
3	Contingencies			
	Total			

*The cost estimates are provisional. This is subject to the approval of the Government of Japan.

Annex 8

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX
20XX, Month

Organization Information

Authority (Signer of the G/A)	Person in Charge _____ (Division) _____ Contacts Address: _____ _____ Phone/FAX: _____ _____ Email: _____ _____
Executing Agency	Person in Charge _____ (Division) _____ Contacts Address: _____ _____ Phone/FAX: _____ _____ Email: _____ _____
Line Agency	Person in Charge _____ (Division) _____ Contacts Address: _____ _____ Phone/FAX: _____ _____ Email: _____ _____

Outline of Grant Agreement:

Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____
Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:

1: Project Description

1-1 Project Objective

1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr)	Target (Yr)
Qualitative Effect		

2: Project Implementation

2-1 Project Scope

Table 2-1-1a: Comparison of Original and Actual Location

Location	**Original:** *(M/D)* **Attachment(s):Map**	**Actual:** *(PMR)* **Attachment(s):Map**

Table 2-1-1b: Comparison of Original and Actual Scope

Items	Original	Actual
(M/D)	*(M/D)*	*(PMR)*

'Soft component' shall be included in 'Items'.		Please state not only the most updated sc hedule but also other past revisions chron ologically. All change of design shal l be recorded regardless of its degree.

2-1-2 Reason(s) for the modification if there have been any.

(PMR)

2-2 Implementation Schedule

2-2-1 Implementation Schedule

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
【M/D】 'Soft component' shall be stated in the column of 'Items'. Project Completion Date*	*(M/D)*		*(PMR)* As of (Date of Revision) Please state not only the most updated schedule but also other past revisions chronologically.

*Project Completion was defined as _____ at the time of G/A.

2-2-2 Reasons for any changes of the schedule, and their effects on the project.

2-3 Undertakings by each Government

2-3-1 Major Undertakings

See Attachment 2.

2-3-2 Activities

See Attachment 3.

2-3-3 Report on RD

See Attachment 4.

2-4 Project Cost
2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan
(Confidential until the Tender)

Items			Cost (Million Yen)	
	Original	Actual	Original	Actual
Construction Facilities (or Equipment)	'Soft component' shall be included in 'Items'.			Please state not only the most updated schedule but also other past revisions chronologically.
Consulting Services	- Detailed design -Procurement Management -Construction Supervision			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

Table 2-4-1b Comparison of Original and Actual Cost by the Government of XX

Items			Cost (Million USD)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule but also other past revisions chronologically.
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = (local currency)

2-4-2 Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

(PMR)

2-5 Organizations for Implementation

2-5-1 Executing Agency:

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original: *(M/D)*
Actual, if changed: *(PMR)*

2-6 Environmental and Social Impacts

- The results of environmental monitoring as attached in Attachment 5 in accordance with Schedule 4 of the Grant Agreement.
- The results of social monitoring as attached in Attachment 5 in accordance with Schedule 4 of the Grant Agreement.
- Information on the disclosed results of environmental and social monitoring to local stakeholders, whenever applicable.

3: Operation and Maintenance (O&M)

3-1 O&M and Management

- Organization chart of O&M
- Operational and maintenance system (structure and the number ,qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

Original: *(M/D)*

Actual: *(PMR)*

3-2 O&M Cost and Budget

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

Original: *(M/D)*

4: Precautions (Risk Management)

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): *(M/D)*	
Potential Project Risks	Assessment
1.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
2.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:

	Contingency Plan (if applicable):
3.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s)	
(PMR)	

5: Evaluation at Project Completion and Monitoring Plan

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan for the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Undertakings to be taken by each Government
3. Monthly Report
4. Report on RD
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
   (Final Report Only)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-
-
-

Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

		Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost		(A/D%)	(B/D%)	(C/D%)	
	Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
	others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost		(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost		(A/D%)	(B/D%)	(C/D%)	
Total		(A/D%)	(B/D%)	(C/D%)	

4-2 Minutes of Discussions January 2017

Minutes of Discussions
on the Preparatory Survey for the Project for Geothermal Wellhead Power System
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between Ethiopian Electric Power (hereinafter referred to as "EEP") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 29th July, 2016 and in response to the request from the Government of Ethiopia (hereinafter referred to as "GoE") dated 21st April 2015, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Geothermal Wellhead Power System (hereinafter referred to as "the Project"), headed by Mr. Takeshi MATSUYAMA, Senior Representative, JICA Ethiopia office from 15th to 21st January, 2017.

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Addis Abeba, 25th January, 2017

Mr. Takeshi MATSUYAMA
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Mekuria LEMMA
Head
Strategy and Investment
Ethiopian Electric Power
Federal Democratic Republic of Ethiopia

ATTACHEMENT

1. Objective of the Project

The objective of the Project is to commence early geothermal power generation in the Aluto-Langano by introduction of the Geothermal Wellhead Power Plant, thereby contributing to strengthening power generation capacity and diversification of power sources in Ethiopia.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as "The Preparatory Survey for the Project for Geothermal Wellhead Power System".

3. Project site

Both sides confirmed that the site of the Project is in Aluto-Langano, which is shown in Annex 1.

4. Responsible authority for the Project

Both sides confirmed the authority responsible for the Project is as follows:
The EEP will be the executing agency for the Project (hereinafter referred to as "the Executing Agency"). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be taken care by relevant authorities properly and on time. The organization chart is shown in Annex 2.

5. Contents of the Draft Report

After the explanation of the contents of the Draft Final Report by the Team, the Ethiopian side agreed in principle to its contents and comments will be added, if necessary.

6. Cost estimate

Both sides confirmed that the cost estimate described in Annex 5. This cost is provisional and will be examined further by the Government of Japan for its approval.

Both sides confirmed that the cost estimate including the contingency is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster,

unexpected natural conditions and additional works etc.

7. Confidentiality of the cost estimate and technical specifications

Both sides confirmed that the cost estimate and technical specifications should never be disclosed to any third parties until all the contracts under the Project are concluded.

8. Procedures and Basic Principles of Japanese Grant

The Ethiopian side agreed that the procedures and basic principles of Japanese Grant as described in Annex 3 shall be applied to the Project. In addition, the Ethiopian side agreed to take necessary measures according to the procedures.

9. Timeline for the project implementation

The Team explained to the Ethiopian side that the expected timeline for the project implementation is as attached in Annex 4.

10. Expected outcomes and indicators

Both sides agreed that key indicators for expected outcomes are as follows. The Ethiopian side will be responsible for the achievement of agreed key indicators targeted in year 2022 and shall monitor the progress based on those indicators after successful of completion of the project.

[Quantitative indicators]

	2016	2022
Capacity factor (%)	N/A	70
Power Generation (MWh)	N/A	15,943

[Qualitative indicators]

The diversification of power source and stable power supply will be achieved in Adami Tulu area by installation of wellhead power system in Aluto Langano area.

11. Technical assistance ("Soft Component" of the Project)

(1) A characteristic aspect of the Project is that the power plant is not

permanently installed at the Project site but will be transferred to other geothermal development site where geothermal steam is available. Therefore, the Ethiopian side shall be responsible for proper operation, maintenance, and dismantle-transfer-reinstallation-recommssioning of the power plant. Ethiopian side shall also be responsible for the preparation of necessary budget and number of qualified staff for the above tasks.

(2) Considering the sustainability of the products and services granted through the Project, a technical assistance program, namely "Soft Component", for relevant capacity development will be implemented under the Project. Such Soft Component may include, reflecting the unique aspect, the capacity development for the operation and maintenance.

(3) The Ethiopian side confirmed to deploy necessary number of counterparts as described in the Draft Report, who are appropriate and competent in terms of its purpose of the Soft Component.

12. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 5. Both sides particularly confirmed that indirect taxes such as VAT and Stamp Duties except Custom Duties, which may be imposed in Ethiopia with respect to the purchase of the products and/or the services shall be borne by EEP without using the Grant, as stipulated in clause 5 of Annex 5. In addition, with respect to the Custom Duties related to the Project, both sides confirmed the exemption of the tax. However, with respect to direct taxes such as corporate taxes and personal income taxes, both sides understand that further discussion will be necessary between the Government of Japan and the Government of Ethiopia.

The Ethiopian side assured to take the necessary measures and coordination including allocation of the necessary budget, as stipulated in Annex 5, which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage. Details of obligations in the Project site is described in Annex 5. Both sides also confirmed that the Annex 5 will be used as an attachment of Grant Agreement.

13. Monitoring during the implementation

The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 6. The

timing of submission of the PMR is described in Annex 5.

14. Project completion

Both sides confirmed that the Project completes when all the facilities constructed and equipment procured by the grant are in operation. The completion of the Project will be reported to JICA promptly, but in any event not later than six months after completion of the Project. Turbine dismount inspection will be conducted during the warranty period.

15. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, and Sustainability). The result of the evaluation will be publicized. The Ethiopian side is required to provide necessary support for the data collection.

16. Schedule of the Study

JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Ethiopian side around April 2017.

17. Environmental and Social Considerations

17.1. General Issues

17.1.1. Environmental Guidelines and Environmental Category

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines") is applicable for the Project. The Project is categorized as B because the Project is not considered to be a large-scale thermal power, including geothermal power.

17.1.2. Environmental Checklist

The environmental and social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as Annex 7. Both sides confirmed that in case of major modification of the content of the Environmental Checklist, the Ethiopian side shall submit the modified version to JICA in a timely manner.

17.2. Environmental Issues

17.2.1. Environmental Impact Assessment (EIA)

Both sides confirmed the EIA report will be approved by Ministry of Water, Irrigation and Electricity before the signing of G/A which will be signed by April 2017.

17.2.2. Environmental Management Plan and Environmental Monitoring Plan

Both sides confirmed Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) of the Project is as Annex 8, respectively. Both side agreed that environmental mitigation measures and monitoring shall be conducted based on the EMP and EMoP, which may be updated during the detailed design stage.

17.3. Social Issues

17.3.1. Land Acquisition and Resettlement

Both sides confirmed the 0.5 ha of land would be acquired and 8 Households would be affected due to the implementation of the Project.

Such land acquisition shall be implemented based on the (Abbreviated) Resettlement Action Plan (RAP) which will be finalized in line with the Guidelines and authorized by the Ethiopian side before the signing of G/A which will be signed by April 2017.

17.3.2. Indigenous People

Both sides confirmed that no indigenous people live around the Project site.

17.4. Environmental and Social Monitoring

17.4.1. Environmental Monitoring

Both sides agreed that the Ethiopian side will submit results of environmental monitoring to JICA with PMR by using the monitoring form attached as Annex 9. The timing of submission of the monitoring form is described in Annex 5.

17.4.2. Social Monitoring

Both sides confirmed that the Ethiopian side will implement social monitoring about land acquisition plan proposed in the RAP. The Ethiopian side and the Team agreed that EEP will submit results of social monitoring to JICA with PMR by using the monitoring form attached as Annex 9.

17.4.3. Information Disclosure of Monitoring Results

Both sides confirmed that the Ethiopian side will disclose results of environmental and social monitoring to local stakeholders through their website or in their field offices.

The Ethiopian side agreed JICA will disclose results of environmental and social monitoring submitted by the Ethiopian side as the monitoring forms attached as Annex 9 on its website.

18. Other Relevant Issues

18.1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

18.2. Grid Connection Plan

Both sides confirmed that the wellhead power plant will be connected to the grid via the existing 15 kV line between the existing geothermal power plant and Adami Tulu substation, as shown in Annex 10. The Ethiopian side agreed to complete the following works by the distribution of the Request for Proposal of the Project.

Both sides agreed that Ethiopian side shall avail sufficient transmission capacity to evacuated the power to Adami Tulu substation from the existing pilot power plant before commencement of installation work of the new wellhead generator.

Based on JICA's recommendation, both sides agreed that wooden poles shall be installed in 15 kV line from wellhead generator to existing line as temporary facility.

18.3. Production and Reinjection wells

(1) Both sides confirmed that the power plant will be operated at the Project site, as described in the Draft Final Report, using the LA-9D and LA-10D for the production wells and LA-7 for the reinjection well. Both sides also confirmed that the plant will be transferred from the Project site to other appropriate area by end of the Aluto Langano flash geothermal power plant construction.

(2) The Ethiopian side indicated its willingness to maximize the output of the plant from the original designed installed capacity, 2.6MW, to the technically allowed capacity, 5.0MW if additional geothermal steam is available from the planned production wells to be drilled with the support by the World Bank. The Ethiopian side will consult JICA about the expansion plan before its execution in order to carefully examine it and to receive appropriate support from JICA.

18.4. Implementation of the obligations

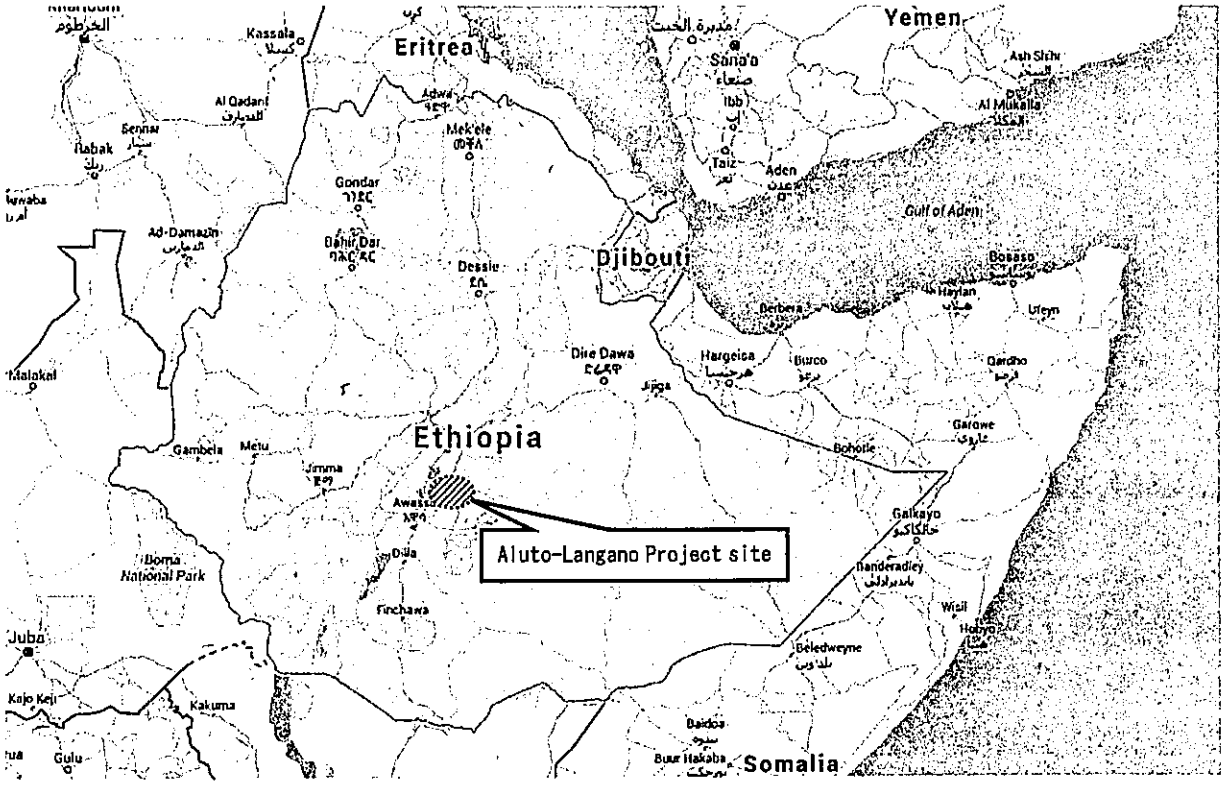
(1) Both sides confirmed that it is important for the smooth implementation of the Project that the both sides complete the respective obligations in a timely manner. In particular, the implementation of the obligations which requires preparatory procedures, such as the land clearance and access road construction works (Annex 5, 1.(1) No.5), the repair works of the existing 15kV grid connection lines (Annex 5, 1.(2) No. 8), and the works for the provision of associated facilities for the construction (Annex 5, 1.(2) No.9), should be carefully managed not to cause the delay of the Project.

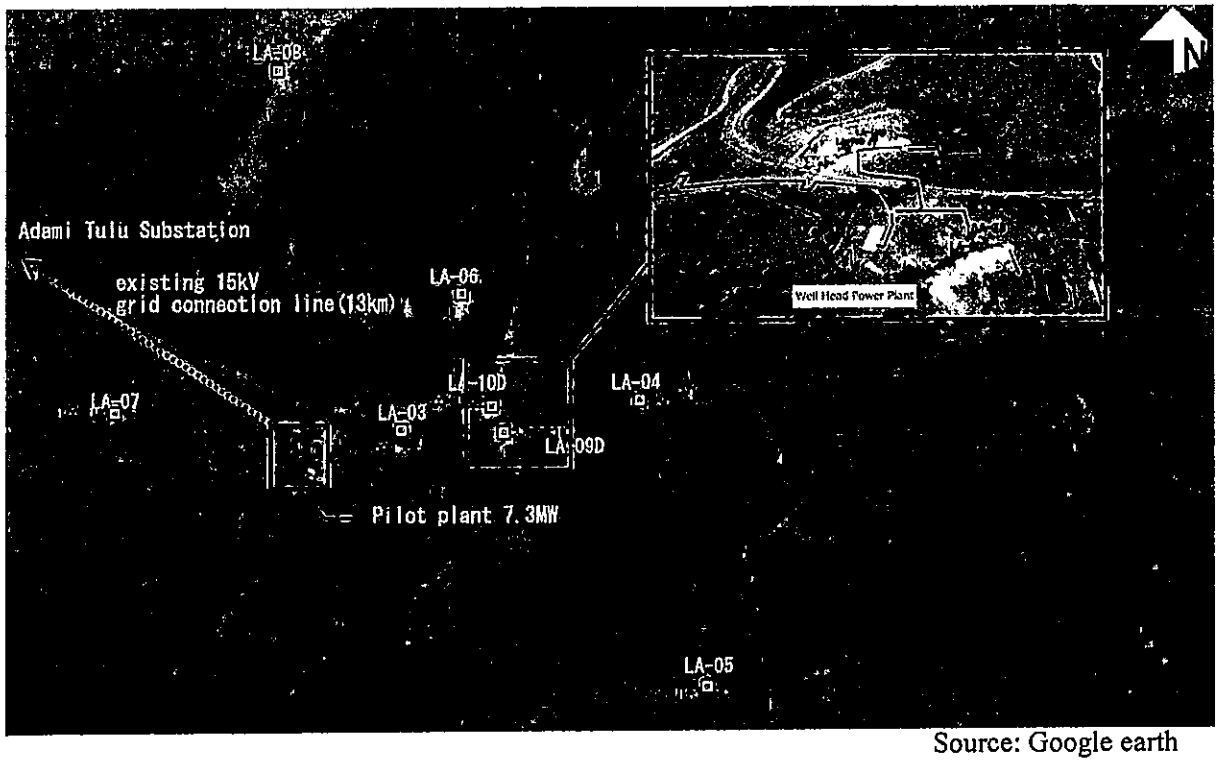
(2) Both sides confirmed that the preparation of the thermal pond includes environmental protection works to meet the JICA Guidelines for Environmental and Social Considerations (April 2010), such as the installation of permeation-preventing sheets. The specification of the construction works will be prepared by the Team and compiled in the Final Report.

(3) To secure the efficient implementation by the contractor(s), both sides confirmed that the distribution of the Request for the Proposal of the "Geothermal Wellhead Power System" will be made after confirming the completion of the RFP process for the key construction works, namely, the land clearance and access road construction (Annex 5, 1.(1) No.5), the repair of the existing 15kV grid connection lines (Annex 5, 1.(2) No.8), and the provision of associated facilities for the construction (Annex 5, 1.(2) No.9) To support the smooth implementation of such obligations, the Team will provide technical advice which will be compiled in the Final Report.

Annex list

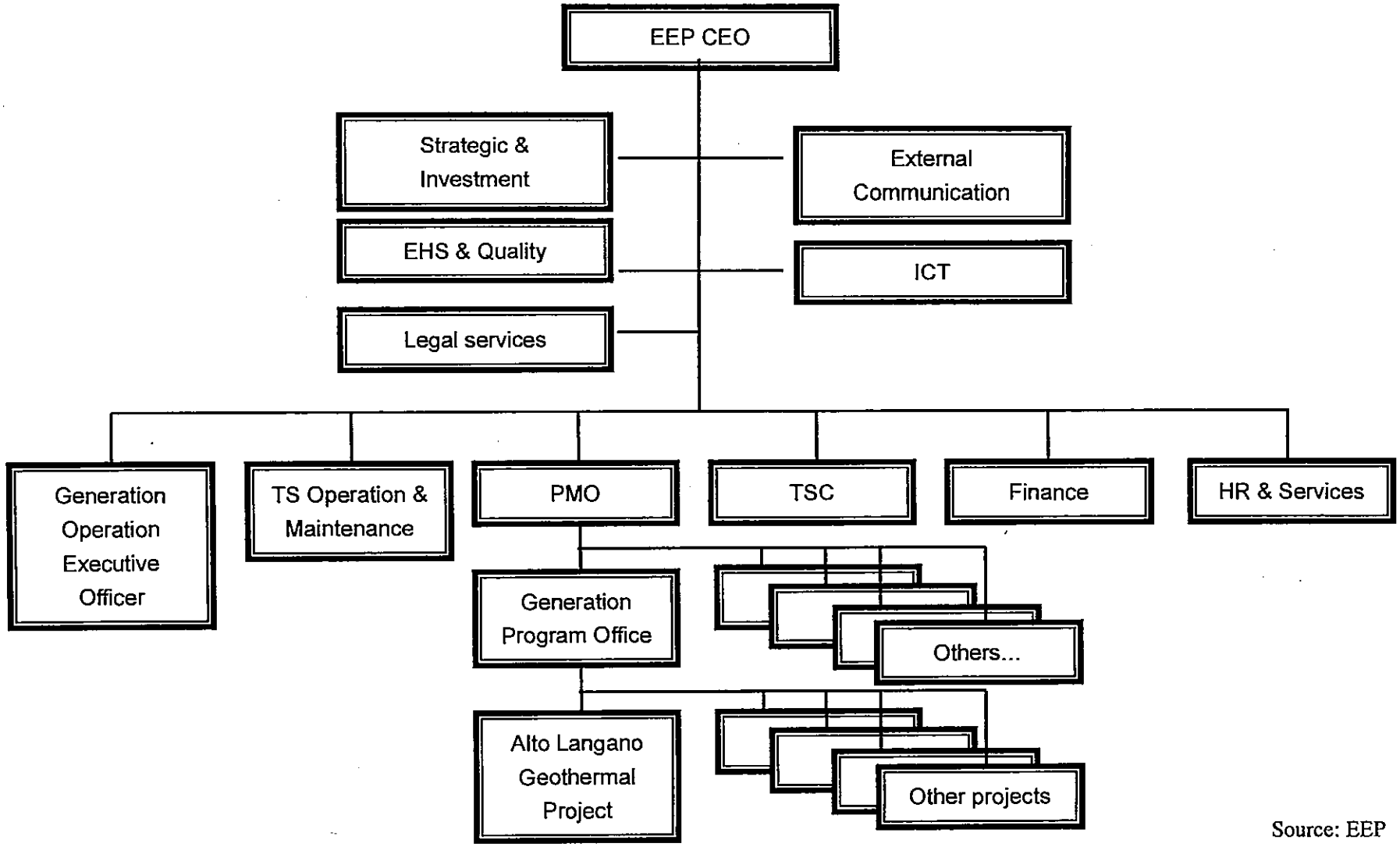
Annex 1 Project Site





Source: Google earth

Annex 2 EEP Organization Chart



Source: EEP

Annex 3 Japanese Grant

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.

Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

1. Grant Procedures

The Grant is supplied through following procedures:

・Preparatory Survey
- The Survey conducted by JICA

・Appraisal &Approval
-Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

・Authority for Determining Implementation
-The Notes exchanged between the GOJ and a recipient country

・Grant Agreement (hereinafter referred to as "the G/A")
-Agreement concluded between JICA and a recipient country

・Implementation
-Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

-Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.

-Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.

-Confirmation of items agreed between both parties concerning the basic concept of the Project.

-Preparation of an outline design of the Project.

-Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project.

Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japanese Grant Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient

country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April, 2010).

(11) Monitoring

The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

(12) Safety Measures

The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

Attachment 1

PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2)Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3)Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

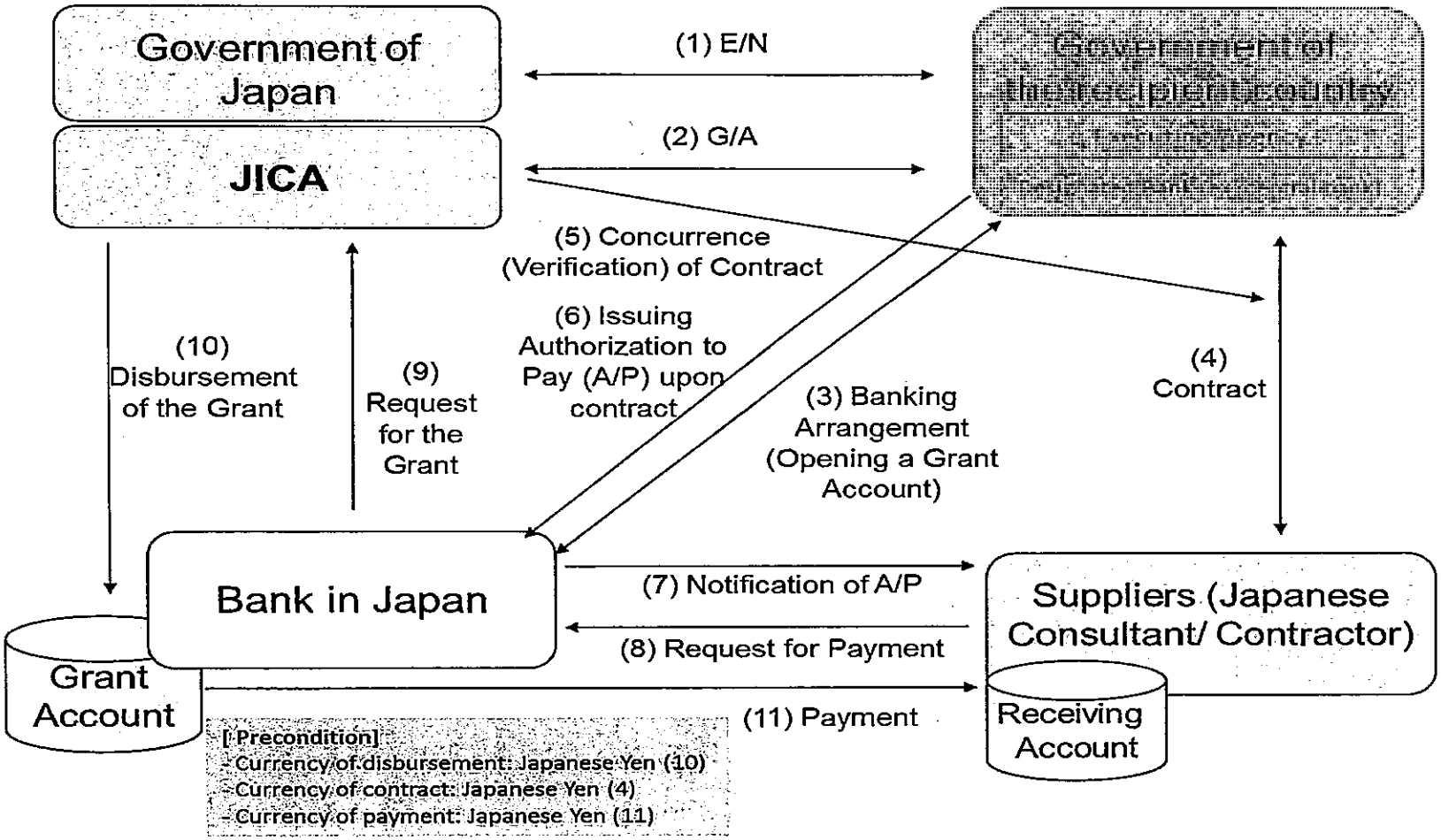
notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

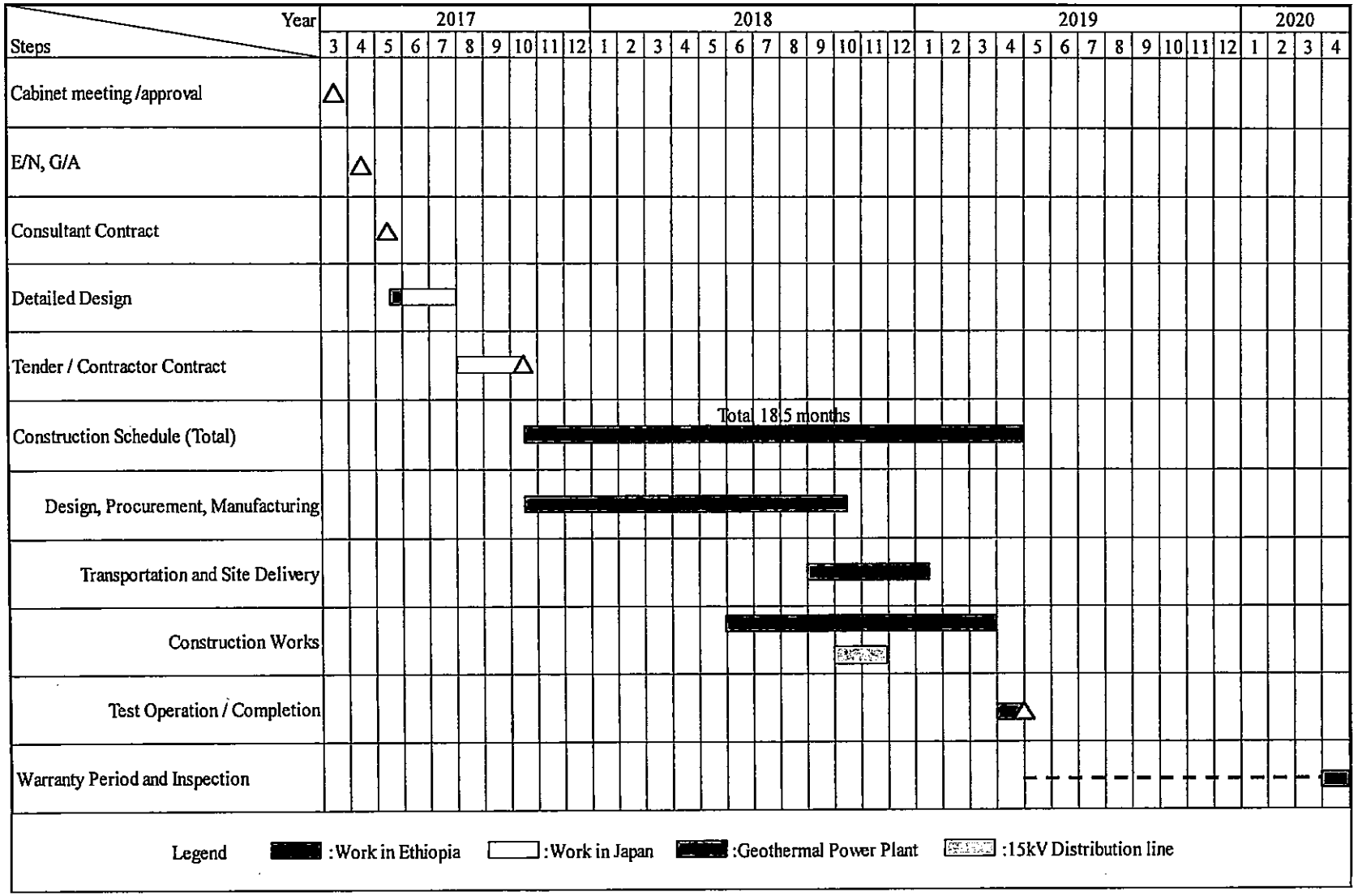
2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

Attachment 2

Financial Flow of Japanese Grant (A/P Type)



Annex 4 Project Implementation Schedule



Annex 5 Major Undertakings to be taken by the Government of Ethiopia

1. Specific obligations of the Government of Ethiopia which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	Estimated Date	In charge	Estimated Cost (Birr in thousand)	Ref.
1	To open bank account (Banking Arrangement B/A)	within 1 month after the signing of the G/A	by end of May, 2017	EEP		
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the G/A	by end of May, 2017	EEP		
3	To bear the following commissions to a bank in Japan for the banking services based upon the B/A 1) Advising commission of A/P 2) Payment commission for A/P	within 1 month after the signing of the Banking Agreement	by middle of June, 2017	EEP	375	
4	To obtain an approval of Environment Impact Assessment	before the signing of G/A	by end of March	EEP		
5	To secure the necessary budget and implement land acquisition, and compensation with full replacement cost in accordance with RAP	before start of the construction	by end of May, 2018	EEP		
6	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	before land acquisition is completed		EEP		
7	To secure and clear the following lands 1) project site 2) construct access roads to the site 3) remove any obstructions if those are at the project site	before the commencement of installation work of the portable geothermal wellhead power plant	by end of May, 2018	EEP		
8	To obtain the required permit	before notice of the bidding document	by middle of July, 2017	EEP		

9	To submit Project Monitoring Report	before preparation of bidding documents	by middle of July, 2017	EEP		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost (Birr in thousand)	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	EEP		
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A 1) Advising commission of A/P 2) Payment commission for A/P	within 1 month after the signing of the contract(s)	EEP	375	
3	To assist prompt unloading and customs clearance at Mojo dry port of disembarkation in recipient country 1) Tax exemption and customs clearance of the products at the port of disembarkation 2) Internal transportation from the port of disembarkation to the project site	during the Project	EEP		
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	EEP		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, Income tax, Corporate tax and Withholding tax but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	during the Project	MoFEC EEP	5,170	
6	To submit Project Monitoring Report after each work under the contract(s) such as transportation, construction, installation and operational training	within one month after completion of each work	EEP		
7	To construct a part of access road from Adami Tulu to project site	before the commencement of installation work of the	EEP	3,954	

		portable geothermal wellhead power plant			
8	To Repair existing 15 kV grid connection line between Adami Tulu substation and the existing pilot plant	before the commencement of installation work of the portable geothermal wellhead power plant	EEP	1,353 *Repair for 100 poles	
9	To provide facilities for the distribution of electricity, water, drainage and other incidental facilities. a) Electricity b) Water Supply c) Drainage d) Fence e) Thermal Pound	before the commencement of installation work of the portable geothermal wellhead power plant	EEP	a) 22 b) 397 c) 335 d) 1,373 e) 3,195	
10	To implement EMP and EMoP	during the construction	EEP		
11	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	EEP		
12	To implement RAP (livelihood restoration program, if needed)	for a period based on livelihood restoration program	EEP		
13	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected personsesults to JICA, by using the monitoring form, on a quarterly basis as a part of decided based on agreement between EEP and JICA.	- until the end of livelihood restoration program (In case that livelihood restoration program is provided) - for two years after land acquisition is completed (In case that livelihood restoration program is not provided)	EEP		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost (Birr in thousand)	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	EEP		
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between EEP and JICA.	for three years after the Project	EEP		
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	EEP		
4	To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	EEP		
5	To submit a report concerning completion of the Project	within six months after completion of the Project	EEP		

2. Other obligations of the Government of Ethiopia funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct facility and provide equipment	April, 2019	
	1) To conduct the following the following transportation a) Marine(Air) transportation of the products from Japan to the recipient country b) Internal transportation from the port of disembarkation to the project site		
	2) To procure and install Geothermal Wellhead Power System including Steam gathering system, Separator, Wellhead generator and Step up transformer.		
	3) To construct 15 kV grid connection line from the portable geothermal wellhead power plant to the existing 15 kV grid connection line		
2	To implement detailed design, tender support and construction supervision (Consulting Service)		
	Total		**

*The Amount is provisional. This is subject to the approval of the Government of Japan.

** This column is closed due to the confidentiality.

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX
20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:
Executing Agency	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:
Line Ministry	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant (Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc.,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spare parts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*
Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:

	Action required during the implementation stage:
	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A□B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●e	●	●	●	●	●
2	Item 2	●●e	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●stms of Spe-	2nd ●ndms of Spe-	3rd ●rdms of Spe-	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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-
-

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Annex 7 Environmental Check List

The below is the Environmental Checklist of the Project based on the JICA Guidelines for Environmental and Social Considerationis is shownin the table below.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a), (b) Environmental and Social Considerations Study Report prepared by JICA study team has been scheduled to be revised by EEP, and to be submitted to MoWIE for approveal prior to project signing. (c) Approval of the EIA report, etc. by MoWIE without any preconditions. (d) No additional approval is required.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including	(a) Y (b) Y	(a) Meeting was held on July 28, 2016 1:00 p.m. at the project site. About 80 community members from Abeyi Deneba, Golba Aluto and Aluto Kebeles participated in a meeting

	information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?		organized by the study team to explain to the stakeholders project impact and the proposed mitigation measures and to receive comments from the stakeholders on the proposed measures. The assessment team has discussed the following positive and negative impacts of the project with the stakeholders and communities representatives of the project area. 1) The erection of power station near the newly drilled wells near LA 9 is one of the project components. The location selected for the power station is already owned by the Aluto Geothermal Expansion project and there will not be land acquisition for the erection of the power station. 2) It is planned to construct 700 meter length transmission line from the power station to the existing power plant. The transmission line passes through grazing land there will be temporary impact on the grazing land during construction period. 3) The third component of the project is

			construction and laying of reinjection pipe from the proposed power station area to LA 7. There will be some impacts on farm lands owned by farmers living around LA 7. After having listened the explanation by the study team the stakeholders and the community representatives expressed theier views as follows. 1) The two existing water ponds near the wells have no fence around them and they are potential danger to the surrounding community as well as cattles.They meting participants request for the Project Office to construct fence around these ponds. . During the meeting it was agreed for the Project Office to construct fence around the ponds to minimize the l danger 2) There are two ponds near the wells and they create danger to the surrounding community as well as cattles because water ponds have no fences. Therefore the project office shall make fence around the

			water pond. 3) Participants of the meeting raised the problem of delay in compensation payment. In reponse to For the aboveissues raised under item 1 and 2 the study team provided the following explanation: - The project has the plan toconstruct fences around the water ponds and around the power station compound and geothermal wells. - Ccompensation Payment to the effected farmers will be made prior to project commencement of construction and in accordance with the compensation laws of the country. The Project Office together with the Woreda Administration will facilitate valuation of crop losses and payment of compensation before the construction started. (b) All issues discussed and agreed in the meeting will be reflect in the project plan and EIA document.

	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) JEC has already been scheduled to be reviewed by EEP and to be submitted to MWIE for approval Alternative plans of the of the power plant site, transmission line route and the zero option has already been has already been examined in the JICA's social and environmental considerations report of JICA study team.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as hydrogen sulfide (H2S) emitted from geothermal power plants comply with the country's standards? Is there a possibility that the emitted hydrogen sulfide will have the impacts on the surrounding areas, including vegetation? Are any mitigating measures taken? (b) Do air pollutants emitted from the other project facilities comply with the country's emission standards?	(a) Y (b) Y	(a) Environmental standards guideline value of H_2S is a 150 ($\mu g / m^3$). H_2S concentrations were predicted by using a plume diffusion model and diffusion parameters (Pasquill stabilities). The predicted 24-hour mean of maximum ground level H_2S concentrations is less than 0.1 ppm at the site of the nearest house, which satisfies the guidelines. As the predicted H_2S concentrations in the area around the power plant are less than 1 ppm, the impact of H_2S on workers and the surrounding natural environment is expected to be minimal.

				No complaints regarding H_2S were reported from residents in the surrounding area during operation of the existing pilot power plant and testing of the wells. (b) The existing pilot power plant is not currently functioning due to lack of spare parts. No other facilities that discharge air pollutants in the area does exist. Eexisting facilities are no more functional. One can not therefore tell if these facilities were complying with the Country's emission standards when they were fanctioning.
	(2) Water Quality	(a) Do effluents (including thermal effluent) from the project facilities, such as power generation facilities comply with the country's effluent standards? Is there any possibility that the effluents from the project will cause any areas not to comply with the country's ambient water quality standards? (b) In the case of geothermal power plants, is there any possibility that geothermal utilization will cause water pollution by toxicants, such as Arsenic (As) and Mercury	(a) N/A (b) N/A (c) N/A (d) N/A	(a) The geothermal resource site does not have any water bodies such as rivers or lakes in the project area. (b) Geothermal hot water will be reinjected deep into the underground through the already existing production well. (c) There is no paln to have waste disposal facility at the project site. (d) This project will use the existing production wells; there is no plan for a new well drilling.

		(Hg) contained in geothermal fluids? If the water pollution is anticipated, are adequate measures considered? (c) Do leachates from the waste disposal sites comply with the country's effluent standards and ambient water quality standards? Are adequate measures taken to prevent contamination of soil, groundwater, and seawater by leachates? (d) Is there any possibility that effluent from well excavation would cause water contamination? If water pollution is anticipated, are adequate measures considered?		
2 Pollution Control	(3) Wastes	(a) Are wastes generated by the plant operations properly treated and disposed of in accordance with the country's regulations? (b) Are wastes generated by the effluents from well-excavation properly treated and disposed of in accordance with the country's standards?	(a) N (b) N/A	(a) Small amount of waste generated by the facility operation is disposed of in the existing pilot plant facility. (b) There is no plan for a new well drilling.
	(4) Noise and Vibration	(a) Do noise and vibrations comply with the country's standards?	(a) N	(a) The environmental noise level limits are shown in table below.

Predictions of noise levels at the nearest house, 650 meters away from the planned power plant site, were studied. The results suggested 41.8 dB, which is 0.8 dB greater than the current maximum noise of 41 dB around the house. This value satisfies the environmental criteria for residencial houses in Ethiopia. Thus, the impact of noise from power plant operations on residents in the surrounding area is expected to be minor.
In additonal, noise one meter from an existing equivalent facility is 73 dB, This value satisfies worerplace standard of EHS (Health and Safety Guidelines for Geothermal Projects, July 1 1998).

Noise Standards

Category of area	Limits in dB (A) Le	
	Day time 6:00am. to 9:00pm.	Night ti 9:00pm. 6:00am.
Industrial area	75	7
Commercial area	65	5
Residential area	55	4

	(5) Subsidence	(a) Is there any possibility that the extraction of steam will cause subsidence?	(a) N	(a) The possibility of ground subsidence is considered to be slight, because geothermal fluids will be collected through the production wells by letting the fluids naturally spout from deep underground (roughly 2,000 m), and then, through the injection wells, the entire amount of hot water will be reinjected deep underground at almost the same depth (roughly 2,000 m) as the collection point. In addition,according to EEP, no ground subsidence has occurred at the existing power plants
	(6) Odor	(a) Are there any odor sources such as H2S, and anticipated any effect? Are adequate odor control measures taken?	(a) N	(a) The 24-hour mean of predicted H2S concentrations generated by the power plant when it is put into service came to less than 0.1 ppm in the area around the nearest house. In this area, the wind blows from the northeast from October to May, and from the southwest or south-southwest from June to September. Since the nearest house is located to the west of the planned power plant site, it will rarely be downwind throughout the year and, therefore, the impact of odor is expected to be

				insignificant.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no national park or conservation or protected area in the project area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) Is there a possibility that the project will adversely affect downstream aquatic organisms, animals, plants, and ecosystems? Are adequate protection measures taken to reduce the impacts on the ecosystem?	(a) N (b) N (c) N	(a) As the results of the existing survey, the project sites do not encompass primeval forests, tropical rain forests or ecologically valuable habitats. (b) According to the information obtained from the local community, Adami-Tulu Jido kombelcha werda Agriculture office and ESIA report, the project sites do not encompass protected habitats of endangered species designated by the country's laws or internaional treaties and conventions. (c) Most of vegetation in the project area is grassland, and scattered trees around 2 to 5 meters in height consisting of few varieties, with Acacia sp. being dominant which is used for grazing. The power plant facilities are expected to impose no impact on animals or

				plants, as the facilities will be located on the existing well pad and no vegetation will be removed, due to implementation of the project. Although pipeline and transmission line construction will involve the felling of a dozen or so trees, the impact on plants is considered to be minor for the reason that the area has no distinctive environmental features.
	(3) Topography and Geology	(a) Is there any possibility that the project will cause a large-scale alteration of the topographic features and geologic structures in the surrounding areas?	(a) N	(a) The projects will not cause large scale alteration of the topographic features and geologic structures in the surrounding areas. There is not any civil works plan in the project site to be large scale alteration of the topographic features and geologic structures. Power plant will be constructed at well pad (LA-9).
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected	(a) N (b)N/A (c) N/A (d) N/A (e) N/A (f) N/A	(a) There is no resettlement of residents plan for the project. (b) (c) (d) (e) (f)

		people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement?	(g) N/A (h) N/A (i) N/A (j) N/A	(g) (h) (i) (j)

		(j) Is the grievance redress mechanism established?		
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water (e.g., surface water, groundwater) used and discharge of effluents by the project will adversely affect the existing water uses and water area uses?	(a) N (b) N	(a) Roughly 0.5 hectares of farmland will be needed for installation of the hot water reinjection pipeline for this project, and this is part of a farmland used by a total of eight households. The EEP will pay compensation in accordance with the laws concerning compensation and after consulting with the Government compensation laws and consultation with with the Adami Tulu Woreda Admistration as well as and the heads of local communities (Kebele) and affected residents. Impact from the use of pastureland is expected to be minimal because the loss in pastueland is small(roughly 0.4 hectares), compared to the vast area pasturelands around the project site. In

			summary, although construction of the power plant and the related facilities will involve some alterations of land use, only a small area of land is required, and social impact on community residents is expected to be limited. (b) There is no river or lake and wells in and around the the project area. The reason being small amount of water that will be needed for construction will be drawn from the existing water pond provided for well drilling. The power plant system does not use water and the employees will use water from the storage tank of the existing pilot plant installed to collects rainwater
(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N/A	(a) The project area has no known registered sites of culturally, historically or archaeologically important heritage, or important landmarks.
(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Project is a small-scale geothermal power generation facility, and there will not be serious effect on the easthetic view of the nearby landscape.

	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a), (b) In the project area, no settlements of indigenous people or ethnic minorities who need particular consideration have been identified.
4 Social Environment	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure	(a) Y (b) Y (c) Y (d) Y	(a) Health and safety of the project will be accordance with Occupational Safety and Health Act (OSHA). Furthermore, there is a unit (EHS & Quality: Environmental Health, Safety and Quality) within EEP dealing with Health and Safety issues. The EHS & Quality of EEP will carry out inspections and meet regularly to review health and safety performance of projects such as this one. (b) At the time of tender, the EEP shall confirm that the health, safety, and social environment management plan, submitted by the construction management consultant and contractors, and is in accordance with the environmental and social safety guidelines for constructors. The construction management consultant and contractor will implement

		that security guards involved in the project not to violate safety of other individuals involved, or local residents?		safety management in accordance with this plan to avoid or reduce the risk of workers or residents getting involved in an accident. (c) Safety training and orientation will be given to the host community and workforce regularly. (d) During well drilling local people were working as security guards, and regularly carried out education, security guards involved in the project had been building a good relationship with the local residents. Also for this this project local people are working as security guards of EEP, and will regularly carry out education.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce the impacts? (c) If construction activities adversely affect	(a) Y (b) Y (c) Y	(a) Impact of the project during construction is is expected to result mainly due to noise and waste pollution. The biggest source of noise and vibration during construction of the power plant, pipelines and transmission lines is the operation of heavy machinery and vehicles transporting generators and other equipment and materials. For power plant construction, a well pad where the ground has already been

		the social environment, are adequate measures considered to reduce the impacts?		prepared will be used, and the heavy machinery needed for foundation work will be limited to backhoes, cranes and the like. The traffic of vehicles transporting equipment and materials including portable generators, and vehicles used to transport construction workers are expected to amount to several vehicles per day. As there is no house near the planned power plant site or the road, the impact of noise and vibration during construction on residents living in the surrounding area is expected to be minor. However, there is a plan to implement the monitoring of noise. Construction of the power plant, pipelines and other relevant facilities will generate small amounts of waste soil from civil engineering work, as well as concrete, wood, scrap metal, etc. Waste soil and concrete will be used to back-fill the pond used for drilling well LA-9D and for repairing roads in the vicinity. The small volume of wood (wooden crates for equipment) and scrap metal created is in demand locally, and will be collected for reuse

				or recycling. In the Environmental and Social Considerations Study Report by JICA's study team there is a plan to conduct monitoring for waste generation and waste disposal (b) The power plant facilities are expected to impose no impact on animals or plants, as the facilities will be located on the existing well pad and no vegetation will be removed. Most of vegetation in the project area is grassland, and few trees around 2 to 5 meters in height consisting of few varieties, with Acacia sp. being dominant which is used for grazing. Although pipeline and transmission line construction will involve the felling of a dozen or so trees, the impact on plants is considered to be minor or the reason that project area extending around it and the project area has no distinctive environmental features in biodiversity. (c) There are mitigation measures to check on noise and vibration, and wastes. As a

				requirement, the levels of noise, vibration and waste during construction and operation phases have to be within the acceptable limits of the approving body (MoWIE), environment and workplace standards.
	(2) Accident Prevention Measures	(a) Does the project have any accident prevention equipments and scheme to store, emit and transport toxic and hazardous materials? Are any pollution preventive measures for drinking water taken for example the facilities discharge liquid wastes to the rivers in an emergency?	(a) Y	(a) Vehicles related to the EEP observe the speed limit and the project will delinate passages of livestock and other animals at the time of the construction and operation phases of the project. At the time of tender, the EEP shall confirm that the health, safety, and social environment management plan, submitted by the construction management consultant and contractors, is in accordance with the environmental and social safety guidelines for constructors. The construction management consultant and contractor will implement safety management in accordance with this plan to avoid or reduce the risk of workers or residents getting involved in an accident that are thought to be potentially exposed to accident.

				In accordance with labor laws, safe working environments shall be prepared by providing workers with personal protective equipment and mandating its use. Near the wells, a hot water reservoir provided with permeation prevention measures shall be provided to temporarily store hot water that may flow out from the production wells in case of an accident. The reservoir shall hold the water until the flow is stopped by a valve. Procedures that have to be followed when rescuing those affected by high-concentrations of H_2S gas shall be prepared. Fences shall be installed around the construction sites (particularly material yards), production wells, and hot water reservoir, and security guards will be allocated to prevent theft and accidents.
	(3) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	(a) Y (b) Y (c) Y (d) Y	(a) Based on the potential impacts indicated in the report of Envirnmental and Social Considerations prepared by JICA study team the proponent is expected to develop and

		(b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?		implement monitoring program during the construction and in service period. The plan is expected to be implemented during constration and operation phases of the project. During operation phase continuously monitoring and as annual environment audits will need to be undertaken. (b) The methods and frequency of monitoring are explained in the environmental and monitoring plan of the study prepared by WEST JEC . The methodology is well advanced. The monitoring plan has the aspects include; H_2S, Noise level, Waste, Soil Erosion, Induced socio-economic benefits, Land use, Accidents. (c) EEP has got adequate monitoring framework and has established within it environmental and social expert group in EHS & Quality Department. The main duties and responsibilities of this Department is carry out environmental monitoring during the construction and operation of power plants and also oversee monitoring activities that will

				be conducted by the proponent. The the budget of the monitoring activities the responsibility institutions itself. (d) EEP is expected to submit annual environment monitoring report to the regulatory body of Ministry of Water, Irrigation and Electricity (MoWIE). But in practice this has never happened due to lack of capacity
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) The project will have the components (items) such as e electric transmission lines but not electric distribution facilities.The overall length of the transmission line will be approximately 700 meters and about 16 power poles will be installed to support the propsed transmission lines. About a dozen trees will be felled during the installation of the transmission line.However, there is vast grassland and plenty of trees in and around the project site and the impact of felling these few trees will cause insignificant impact on the environment.

	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) Y	(a) As this is small facility (i.e 5MW) the impact on global warming is expected to be minimal.

Annex 8 Environmental Management Plan/Environmental Monitoring Plan

Environmental monitoring paramenters		Monitoring site	Methods	Frequency	Responsible body	Cost (USD)
Construction phase						
Noise	Noise Level	Construction site and nearest residence/community site	Measurement by the noise meter	・Daily (Construction implementation area) ・Once/week (nearest residence/community)	Contractor/EEP	Including the construction costs
Wastes	Waste management	Construction site	Type and quantity of the generated amount waste (Weight or volume), and site investigation.	Once/month	Contractor/EEP	Including the construction costs
Soil erosion	Soil erosion situation	Project site	Site observation and photographic recording	Once/month	Contractor/EEP	Including the construction costs
Land use	Living conditions (household income) and compensation situation of agricultural crops	Residents affected	Interviews with affected people	4 times/year	EEP	2,500 USD
Disproportionate distribution of benefits and damage	Employment of local residents and regional employment	Contractor	Confirmation from contractors on employment contract and payments	4 times/year	EEP	2,500 USD
Accidents	Occurrence and frequency of accidents and the training to be provided to prevent accidents	Contractor	Confirmation of the occurance of accidents using the accident report and through Interviewing the contractors and employee	Biannually	EEP	1,500 USD
In-service period						

Air pollution	H_2S	Power plant site (East, north, south, west) of 4 point, and the nearest residence/community site	H_2S measurement meter (use of measuring instrument that can measure up to 0.01 ppm)	Once/month(First year), then 4 times/year	EEP	Including the operating cost
Noise	Noise Level	Power plant site (East, north, south, west) of 4 point, and the nearest residence/community site	Measurement by the noise meter	Once/month(First year), then 4 times/year	EEP	Including the operating cost
Soil erosion	Soil erosion situation	Areas arriound power plant and related facilities	Site visist to ckeck the occurrence soil erosion and photographic recording	Once/month	EEP	Including the operating cost
Accidents	Occurrence and frequency of accidents and the training to be provided to prevent accidents	Confirmation of the occurance of accidents using the accident report and through Interviewing the contractors and employee	Confirmation of the accident report and the training record	Biannually	EEP	Including the operating cost

(1) Monitoring implementation system

The EEP has EHS & Quality (Environmental Health, Safety and Quality) Department, which takes charge of formulating and administering policies on quality control, environmental impact assessments and management, health, and safety. Under the EHS & Quality Department, the Environmental and Social Office has also been established. uties and responsibilities of this Office is to carry out regular monitoring to ensure proper implementation of the proposed mitigation measures during the construction and operation of projects related tot eh generation of power . However, during the visit it was confirmed that this Office has no capacity and perience in relation to the monitoring of geothermal power plants, and has no appropriate monitoring devices useful for the monitoring purposes. Guring the visit the Office requested to have some support from Japan Government to improve their technological skills and enhance their means of monitoring. To this effect the Office specifically requested to receive the following type of supports:

- The inclusion of environmental engineer in the technical support team of the Office
- The provisions of technical guidance and training for monitoring by JICA's specialists to enable them properly carry out environmental monitoring on the proposed project.
- Support in the form of environmental monitoring devices (sound level meters and H_2S measuring instruments)

Annex 9 Environmental and Social Monitoring Form

MONITORING FORM

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
ex.) Responses/Actions to Comments and Guidance from Government Authorities	

2. Mitigation Measures

- Air Quality (Emission Gas / Ambient Air Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
SO_2						
NO_2						
CO						
O_3						
Soot and dust						

SPM						
Dust						

- Water Quality (Effluent/Wastewater/Ambient Water Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
pH						
SS (Suspended Solid)						
BOD/COD						
DO						
Total Nitrogen						
Total Phosphorus						
Heavy Metals						
Hydrocarbons / Mineral Oils						
Phenols						
Cyanide						
Temperature						

- Waste

Monitoring Item	Monitoring Results during Report Period

- Noise / Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level						
Vibration level						

- Odor

Monitoring Item	Monitoring Results during Report Period

3. Natural Environment

- Ecosystem

Monitoring Item	Monitoring Results during Report Period
ex.) Negative effects/Actions to Valuable species	

4. Social Environment

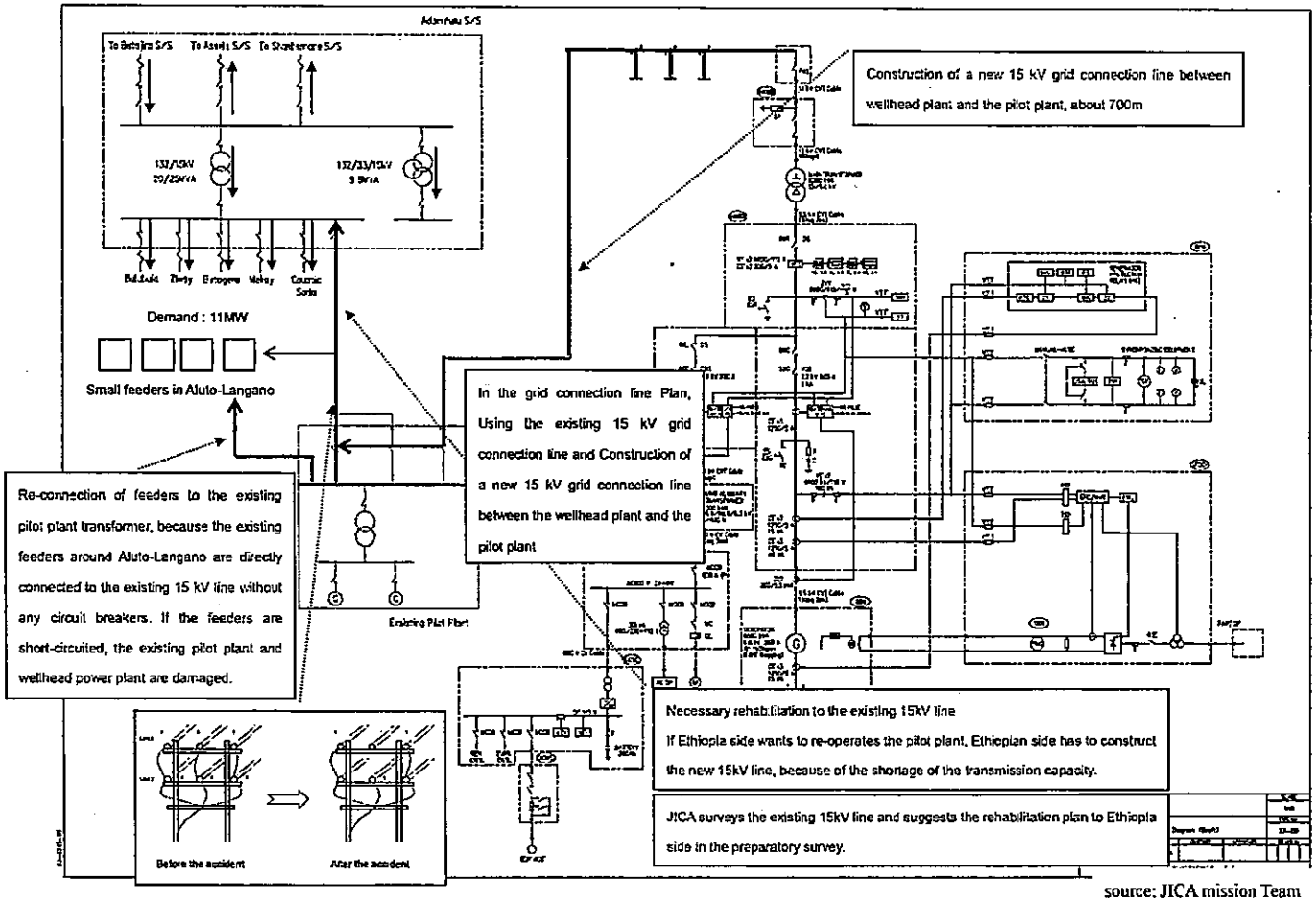
- Resettlement

Monitoring Item	Monitoring Results during Report Period

- Living / Livelihood

Monitoring Item	Monitoring Results during Report Period

Annex 10 Grid Connection Plan from wellhead power plant to Adami Tulu S/S



source: JICA mission Team

5 Soft Component Plan

1. Background for Planning of Soft Component

The Project for Geothermal Wellhead Power System is to install a wellhead geothermal power plant at the Aluto Langano area in Republic of Ethiopia (hereinafter referred to as "the country" or "Ethiopia"), which will allow power generation to commence earlier stage of the geothermal development. Therefore, the Project aims to promote and improve the development effect of the geothermal business in the country. The wellhead geothermal power plant will utilize the wells successfully drilled using the Japanese Grant Aid for Environment and Climate Change and will commence the power generation ahead of the construction of a future large-scale geothermal power plant in Aluto Langano area.

The country attains more than 90% of its annual generated electric energy (10,464 GWh in 2015) through hydroelectric power generation; however, power supply stability problems surge in the dry season. In addition, the supply-demand gap between the maximum predicted power load for 2020 and the capacity of generation facilities existing in 2016 is about 4.800 MW, and the actual rate of electric power access is low at 23.3% (the average for Sub-Saharan Africa is approximately 43%); hence, stable power supply is also a challenge in Ethiopia's Second Growth and Transformation Plan (hereinafter referred to as "GTP2").

Geothermal resources in the country are expected to hold the equivalent to 5,000 MW of potential generation capacity (GTP2) and, as a base-load electricity source different from hydropower, their development is expected to solve both the quality and quantity issues regarding the power supply. The first pilot geothermal power plant (binary formula 7.3 MW) was built in Aluto Langano in 1998, however, due to repeated failures since the operation of the plant commenced, the pilot plant has not been in operation for a long period of time. At present, there are no geothermal power plants operating in the country. The Electric Power Corporation (hereinafter referred to as "EEP") and the Geological Survey Institute (hereinafter referred to as "GSE") are the agencies responsible for geothermal development in the country. The promoting the capacity development of the geothermal development agencies is a challenging task.

The purpose of the Soft Component is to support a smooth launch of the project's commencement and to ensure that the equipment procured through the Grant Aid project will be sustainably operated and maintained. The transfer of technical expertise related to the management of the operation and maintenance of the geothermal power generation facilities and the geothermal wells will be implemented for the existing Aluto Langano geothermal power plant office in charge of the O&M of the geothermal wellhead power system of the project.

2. Soft Component Objectives

The goals of this Soft Component are listed below and it is expected that the Japanese Grant Aid Project will have a sustainable effect if these goals are achieved:

(1) After the completion of the project, the sponsoring country (EEP) will carry out the establishment of an operation and maintenance system for the geothermal wellhead power system and the formulation of an operation and maintenance management manual.

(2) The operation and maintenance of the geothermal wellhead power system will be implemented sustainably.

(3) The monitoring and maintenance of the wells and the geothermal reservoirs will be implemented sustainably.

3. Results of the Soft Component

The results that must be achieved through the Soft Component are shown in Table 3-1 below.

Table 3-1 Results of the Soft Component

Objectives	Result of Soft Component	Targeted Personnel
1. After completion of the project, EEP will carry out the establishment of an operation and maintenance system for the geothermal wellhead power system and the formulation of an operation and maintenance management manual.	1-1 Establishment of the system for operation and maintenance of the geothermal wellhead power system. 1-2 Understanding of the system configuration and design concept of the geothermal wellhead power system. 1-3 Preparation of the O&M management manual, operation management log and the turbine security logbook.	EEP main office: Power Generation Executive Officer, Aluto Langano Geothermal Power Plant: Plant Manager, O&M Head, and personnel responsive for O&M.
2. The operation and maintenance of the geothermal wellhead power system is implemented sustainably.	2-1 Based on the O&M management manual and the logbook formulated in 1.3, daily operation management and appropriate judgment of the unit situation are carried out in order to predict problems before they occur. 2-2 Based on the daily operation management situation, the formulation of a periodic overhaul cycle and the concrete inspection items are studied and determined.	EEP Aluto Langano Geothermal Power Plant: Plant Manager, O&M Head, Operation Team, Leader Maintenance Team Leader, sixteen (16) operators, and six (6) maintenance personnel.
3. The monitoring and maintenance management of the wells and the geothermal reservoir is implemented sustainably.	3-1 The monitoring regarding fluctuations of the physical characteristics of the wells and the geothermal reservoir is performed as planned. 3-2 The monitoring regarding fluctuations of the chemical properties of the wells and the geothermal reservoir is performed as planned. 3-3 The results of the monitoring of the wells and the geothermal reservoir are reflected in relation to the operation and maintenance of the geothermal wellhead power system.	EEP Aluto Langano Geothermal Power Plant: Plant Manager, O&M Head, Operation Team Leader, Maintenance Team Leader, sixteen (16) operators, and six (6) maintenance personnel.

4. Method for Confirming the Degree of Achievement

The outcomes of this Soft Component are grasped after the one-year inspection by confirming the created operation and maintenance manual, the logbook format and the periodical overhaul plan. Table 4-1 shows the results confirmation method by activity content.

Table 4.1 Method for Confirming the Results of the Soft Component

Objective Personnel	Result of Soft Component	Confirmation Method
EEP main office: Power Generation Executive Officer, Aluto Langano Geothermal Power Plant: Plant Manager, O&M Head, and personnel responsible for O&M.	1-1 A system for the operation and maintenance of the geothermal wellhead power system is developed. 1-2 The system configuration and design concept of the geothermal wellhead power system is understood. 1-3 The O&M management manual, the operation management log and the turbine security logbook are prepared.	• Establishment of an organizational structure for O&M and for safety and quality systems (assigned roles, staff names, and 15 year operation plan) • Preparation of reports and system flow diagrams • The format of the created manuals and dairy contain all the necessary items.
EEP Aluto Langano Geothermal Power Plant: Plant Manager, O&M Head, Operation Team Leader, Maintenance Team Leader, sixteen (16) operators, and six (6) maintenance personnel.	2-1 Based on the O&M management manual, the operation management log, and turbine security logbook formulated in 1.3, daily operation management and appropriate judgment of the unit situation are carried out in order to predict problems before they occur. 2-1 Based on the daily operation management situation, a periodic overhaul cycle is formulated and concrete inspection items are studied and determined.	• Monthly report and summary report of the operation management of the unit. • A periodic overhaul plan and an inspection management table have been prepared and are reliable operated.
EEP Aluto Langano Geothermal Power Plant: Plant Manager, O&M Head, Operation Team Leader, Maintenance Team Leader, sixteen (16) operators, and six (6) maintenance personnel.	3-1 The monitoring regarding fluctuations of the physical characteristics of the wells and the geothermal reservoir is performed as planned. 3-2 The monitoring regarding fluctuations of the chemical properties of the wells and the geothermal reservoir is performed as planned. 3-3 The results of the monitoring of the wells and the geothermal reservoir are reflected in relation to the operation and maintenance of the geothermal power generation system.	• Recording of the monitoring results is reliably executed and the contents are sufficient. • Recording of the monitoring results is reliably executed and the contents are sufficient. • Review of the study reports on the causes of the fluctuations and the countermeasure studies.

5. Soft Component Activities (Input Plan)

5.1 Soft Component Contents and Activities

As shown in Table 5-1, the contents of the activities of the Soft Component covers items from the basics related to O&M of geothermal power generation equipment, the management of the operation and maintenance, the preparation of manuals and the formulation of a periodic overhaul plan, to the well and reservoir monitoring. The method of the technology transfer is focused on the development of the operation & maintenance management plan by the executing agency itself (EEP), and the contents of the activities aim to promote the continuous implementation of the operation and maintenance management by the executing agency.

Currently, geothermal power generation facilities and wellhead equipment are the jurisdiction of EEP, while well drilling and geothermal development planning are the jurisdiction of GSE. In the future geothermal power projects, the establishment of a system framework for the monitoring of the wells and the geothermal reservoir is a future task for the executing agency.

In anticipation for the planning of future technical cooperation projects, in order to transfer the technology for the quantitative evaluation of wells and reservoir, which is necessary for the operation of the geothermal power generation plants, the consultant will hold lectures in accordance with the structure of the executing agency and the technical level of its targeted personnel.

Table 5.1 Contents of Soft Component Activities and Technical Transfer

Objectives	Result of the Soft Component	Activity Contents	Method of Technical Transfer	Targeted Personnel
1. After completion of the project, EEP will carry out the establishment of an O&M system for the geothermal wellhead power system.	1.1 Development of the system for operation and maintenance of the geothermal wellhead power system	• Establish an O&M system • Provision of duties to the O&M personnel • Establish a safety and quality system	• Formulation of the system structure and job description based on the consultant's advice	<u>EEP main office:</u> Power Generation Executive Officer, <u>Aluto Langano Geothermal Power Plant:</u> Plant Manager, O&M Head, and personnel responsible for O&M.
	1.2 Understanding of the system configuration and design concept of the geothermal wellhead power system	• Understanding of the system configuration and design concept • Understanding operation concept of the Plant (removal, movement, reinstallation, basic procedure for re-operation)	• Lectures	
	1.3 Preparation of the O&M management manual, operation management log and turbine security logbook	• Formulation of an O&M Manual • Scrutinizing plant monitoring items and preparation of a logbook format	• Formulation of monitoring items & format based on the consultant's proposal	
2. The operation and maintenance of the geothermal wellhead power system is implemented sustainably.	2.1 Based on the O&M management manual and Logbook drawn-up in 1.3, daily operation management and appropriate judgment of the unit situation are carried out in order to predict facility problems in advance	• After checking the O&M status of the generation equipment and the monthly power generation report, review of the equipment status on a monthly basis	• On site practical guidance and review of monthly reports both in Ethiopia and in Japan	<u>EEP Aluto Langano Geothermal Power Plant:</u> Plant Manager, O&M Head, Operation Team Leader, Maintenance Team Leader, sixteen (16) operators, and six (6) maintenance personnel.
	2.2 Based on the daily operation management situation, formulate a periodic overhaul cycle and establish concrete inspection items.	• Formulation of the periodic overhaul cycle after one year of operation • Preparation of a management plan of equipment inspection	• Formulation of a concrete inspection plan based on the consultant's proposal	

3. The monitoring and maintenance management of the wells and the geothermal reservoir is implemented sustainably.	3.1 The monitoring regarding fluctuations of the physical characteristics of wells and geothermal reservoir is performed as planned.	• Analyzing the data obtained by the various monitoring methods, and understanding the fluctuations of the wells and the geothermal reservoir	• Establish a monitoring method based on the consultant's proposal	<u>EEP Aluto Langano Geothermal Power Plant:</u> Plant Manager, O&M Head, Operation Team Leader, Maintenance Team Leader, Sixteen (16) operators, and Six (6) maintenance personnel.
	3.1 The monitoring regarding fluctuations of the chemical characteristics of wells and geothermal reservoir is performed as planned.	• Analyzing the data obtained by the various monitoring methods, and understanding the fluctuations of the chemical characteristics of the wells and the geothermal reservoir	• Establish a monitoring method based on the consultant's proposal	
	3.3 Reflect the results of the monitoring of wells and geothermal reservoir in relation to the operation and maintenance of the power generation facility	• Investigating the causes of fluctuations in the characteristics of the wells and the geothermal reservoir, and studying the countermeasures	• Formulate a method for reflecting the monitoring results on the operation and maintenance of the power generation facility based on the consultant's proposal	

5.2 Input Planning

(1) Planning of the Input from the Japanese Side

In this Soft Component, through the implementation of the activities found in Table 5-1, the technology will be transferred to the executing agency (EEP) in order to understand how to manage the operation and maintenance of the geothermal wellhead power system and to implement the above actions. The entrusted consultant will implement the technology transfer throughout the dispatch of two of its personnel, an O&M management guidance engineer of the geothermal power plant and a well / reservoir management instructor, to Ethiopia during the periods shown in Table 5-2.

Table 5.2 Input Plan related to Soft Component

Name	Period	Times	Work Content
1. Establishment of Organization Structure and Technology Transfer for an O&M Management System			
Power Plant O&M Management Guidance Engineer	1.5 months (0.27m.x1) (0.93m.x1) (0.27m. x1)	Three times	1-1-1 Establishment of operation and maintenance management system • Establishment of an O&M management organization structure • Provision of duties for operation and maintenance management personnel • Establishment of a safety and a quality management system 1-1-2 Lecture regarding the overview of a geothermal wellhead power system • Lectures regarding plant system configuration and plant design concepts 1-1-3 Formulation of an operation and maintenance management manual • Formulation of the operation and maintenance management manual • Scrutiny of plant monitoring items and preparation of the format for the diary of the monitoring 2-2-2 Formulation of a periodic overhaul plan • Formulation of a periodic overhaul plan after one year of operation • Preparation of a management plan for equipment inspection
3. Construction of a Geothermal Reservoir Monitoring and Evaluation System			
Well / Reservoir Management Instructor	1.6 months (0.3m.x1) (1.0m.x1) (0.3m. x1)	Three times	3-3-1 Understanding of the fluctuations of the physical characteristics of the wells and geothermal reservoir 3-3-2 Understanding of the fluctuations of the chemical characteristics of the wells and geothermal reservoir 3-3-3 Investigation of causes of fluctuations of the characteristics of the well and geothermal reservoir, and study of the countermeasures

(2) Planning of the Input of the Ethiopian Side

In order to promote the smooth implementation of the Soft Component, it will be necessary for the Ethiopian side to; establish an operating entity for the geothermal wellhead power system at EEP's Aluto Langano geothermal power plant, appoint trainees who will participate in the Soft Component lectures, ensure the participation of the trainees, and implement the launch of an O&M organization. The details of this ate as follows:

It is necessary to secure operators and maintenance personnel in order to establish the operation and maintenance system of the geothermal wellhead power system. To this end, the consultant will discuss and decide with the Generation Operation Department at EEP main office and the Plant Manager, and O&M Head of the Aluto geothermal power plant, where the Wellhead geothermal power plant will be installed, the selection of necessary personnel, the maintenance system, etc.

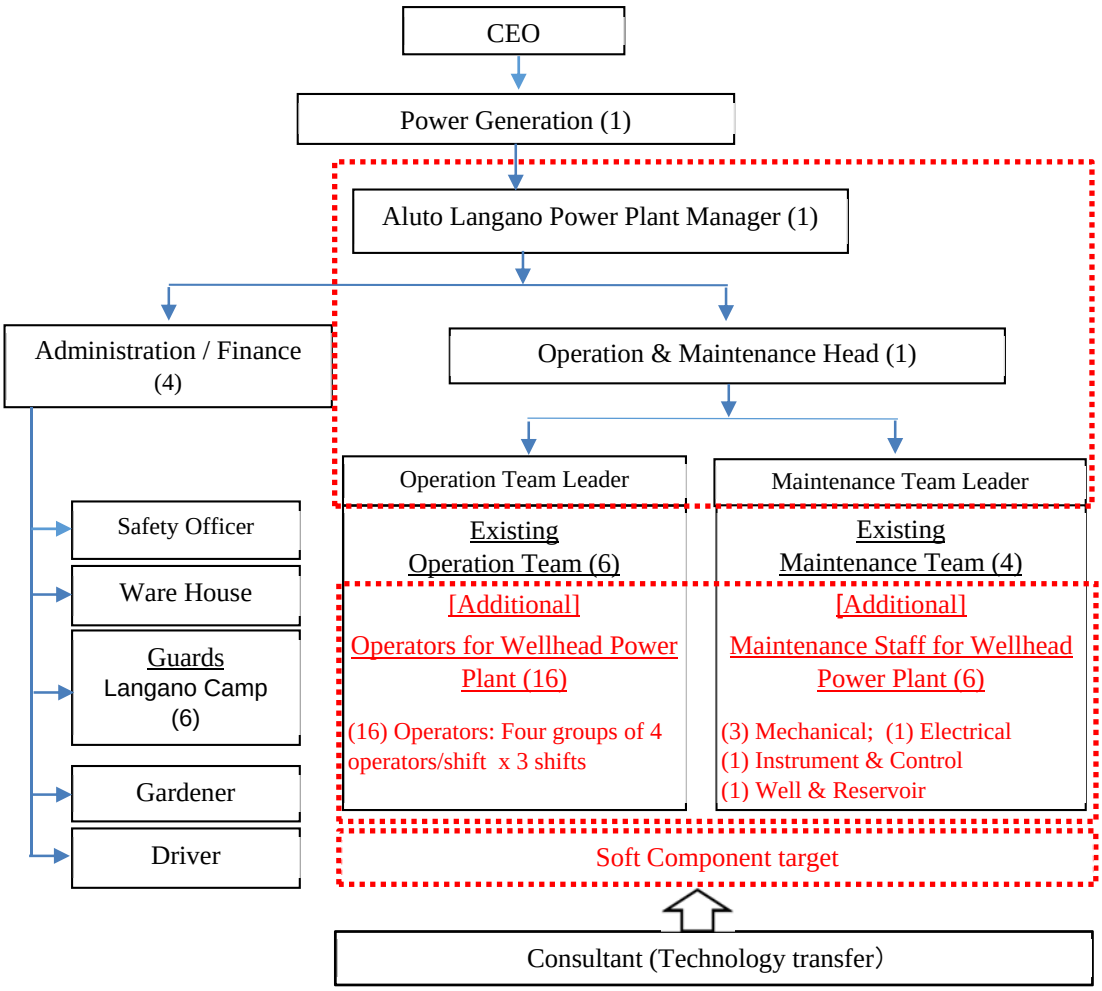


Figure 5.1 Implementation Structure of Soft Component

Based on the operation and maintenance system to be constructed, the consultant will attempt to implement the transfer of technical expertise to the Plant Manager of the Aluto Langano geothermal power plant and the operation and maintenance personnel (the O&M Head, the Operation Team Leader, the Maintenance Team Leader, and the appointed operation and maintenance personnel). The technical expertise will include the operation and maintenance management of the wellhead power generation facility and the control technology for monitoring and maintenance of the wells and the geothermal reservoir.

In order to achieve effective technology transfer, the target personnel will be limited to that actually engaged in the operation and maintenance of the geothermal wellhead geothermal power system.

6. Procurement Method for the Implementation of the Soft Component

This Soft Component is implemented in order to transfer operation and maintenance management technology for the geothermal wellhead power system procured and installed by the Japanese Grant Aids. Therefore, as an entrusted consultant holding abundant management experience regarding the O&M of geothermal plants in addition to geothermal well and reservoir management, the consultant will directly carry out the Soft Component.

7. Implementation Schedule of the Soft Component

The Soft Component implementation schedule is shown in Figure 7-1.
The engineers dispatched from Japan will implement the Soft Component for each category as shown in Figure 7-1. The following is the timing of the implementation of each category:

(1) Construction of the Operation and Maintenance System

The purpose of this activity is to support EEP to establish the organization structure of the operation and maintenance system for the geothermal wellhead power system. The operation and maintenance system should have been established prior completion of installation work and the commencement of the plant commissioning. This activity had better be started before the installation of plant major equipment; turbine and generator, and completed before commencement of the plant commissioning since the EEP O&M personnel will participate in the contractor's commissioning activities and it also can raise awareness of parties at the time of facility installation. Regarding the personnel planning for the Operation and Maintenance Management system, the consultant will discuss the matter with the Power Generation Executive Officer at EEP's main office, and the related personnel of the Aluto Langano Geothermal Power Plant; the Plant Manager, the O&M Head, the Operation Team Leader, and the Maintenance Team Leader. . It is estimated that the consultant personnel schedule will be: domestic preparation 0.25 months, local dispatch 0.27 months.

(2) Management Manual of Operation and Maintenance

The O&M manuals submitted by the manufacturers make recommendations regarding the inspection items and frequencies (daily, weekly, monthly or each periodic overhaul) for the supplied equipment and devices. Based on these manufacturers' O&M manuals, a management manual of operation and maintenance will be prepared in the Soft Component. The management manual of operation and maintenance will specify the concrete and specific implementation and management method for EEP's geothermal wellhead power system. The management manual of operation and maintenance specifies the concrete activities and recording format regarding the inspection items recommended in the manufacturers' manuals; who will execute the inspection among the EEP operation

and maintenance staff of the power plant, when and how it will be implemented, how to record and report the inspection results, and who will review and approve the record reports. The management manual of operation and maintenance will be prepared before the commencement of the plant operation. In addition, since the start-stop procedures of the manufacturers' operation manual is prepared as a general guide, more detailed and practical procedures will be prepared specifying the numbers and names of operation switches, their operation motion at each step, and clearly indicating who will operate them at which times. The timing of management manual preparation will be during the plant commissioning and after the commencement of the commercial operation. It is estimated that the consultant personnel schedule will be: domestic preparation 0.3 months and local dispatch 0.93 months.

(3) Preparation and Review of the Monthly Generation Report

The monthly generation report of the geothermal wellhead power system will be created by the Aluto Langano O&M team from the start of the unit operation and will be sent to the consultant. In Japan, the consultant will review the report and check the operation management situation during this period. Time estimated is 10 months in Japan. The main contents of the monthly generation report are the following:

- Operation diary data (pressure and temperature at the production well, brine flow level at the separator, pressure, pressure loss and temperature at the demister, steam pressure, temperature, flow at turbine inlet, generated power (kW), generated electric energy (kWh), steam consumption rate (kg/kWh), in-house power consumption, vibration values of the turbine and generator, H_2S concentration).

- Daily and weekly inspection information (noise, vibration, temperature, steam leaks, brine/ hot water leaks, odor, scaling, etc.).

- Routine operation records (turbine main valve opening / closing test, turbine oil trip test, turbine oil pump start test, alarm test, battery equal charge, excitation circuit ground relay test, etc.)

- Records regarding problems and corrective treatment.

- Records of accidents, failures and reports.

(4) Formulation of Periodic Overhaul Plan

The first overhaul inspection will be carried out after one (1) year of unit operation. The future maintenance plan will be finalized based upon the confirmation of the overhaul inspection results and the overhaul plan based on the operation management situation of the one-year operation. The timing of this Soft Component activity will be at the inspection, before the expiration of manufacturer's warranty period, and it is estimated to take for 0.37 months of local dispatch of the consultant personnel.

(5) Well and Reservoir Monitoring Method and System Construction

Before commencement of operations at the facility, the consultant will consider a system framework and monitoring methods in order to prepare a draft of the system and the monitoring method of the wells and the geothermal reservoir. The consultant will confirm at the project site how the monitoring of the wells and reservoir is carried out under actual circumstances, and the consultant will explain and discuss the monitoring system and

methods.. It is estimated the time for preparation of draft system and monitoring methods to be 0.2 months in Japan and 0.3 months in Ethiopia.

(6) Guidance and Planning of Well and Reservoir Monitoring

The consultant will study and prepare a draft of the monitoring plan for the physical and chemical properties of the wells and the geothermal reservoir. The consultant will explain and discuss the monitoring plan with EEP staff, giving guidance and advice on their monitoring activities at the site, and the monitoring plan will be finalized in collaboration between EEP staff and the consultant. In addition, the consultant will confirm the method used to send the monitoring data from the Aluto Langano to Japan. Time necessary, during the trial operation and after operation commencement, is estimated to be 0.5 months for domestic preparation and 1.0 month for staffing at the project site.

(7) Preparation of the Wells and Reservoir Monitoring Monthly Report, Its Review, and the Consideration of Causes and Countermeasures in Case of Fluctuation

The consultant will review (in Japan) the monthly reports on well and reservoir monitoring prepared by EEP staff at the site after the commencement of the plant operation, and then confirm the management status of the wells and the geothermal reservoir during this period of 10 months in Japan. The main contents of the monitoring report shall be the following:

- In order to ensure the sustainable management of operation and maintenance of the geothermal wellhead power system, measurement of the temperature inside the wells and sampling of geothermal fluid (steam / hot water) and its chemical analysis shall be carried out at the rate of once a month. These monitoring data will be reviewed in Japan, where the consultant will investigate the causes of fluctuations, if any, and advise countermeasures as necessary.

(8) Well and Reservoir Maintenance Management (Monitoring Results, Causes of Fluctuation and Countermeasures)

The consultant will check the monitoring data sent from the Aluto Langano power plant for one year after the commencement of operation of the geothermal wellhead power system, and confirm that the monitoring is being executed as planned. The consultant will explain and discuss the causes of fluctuations of well / reservoir characteristics, the countermeasures, and their influence on the operation and maintenance of the geothermal wellhead power system. Period estimated for the consultant personnel at the project site is 0.3 months.

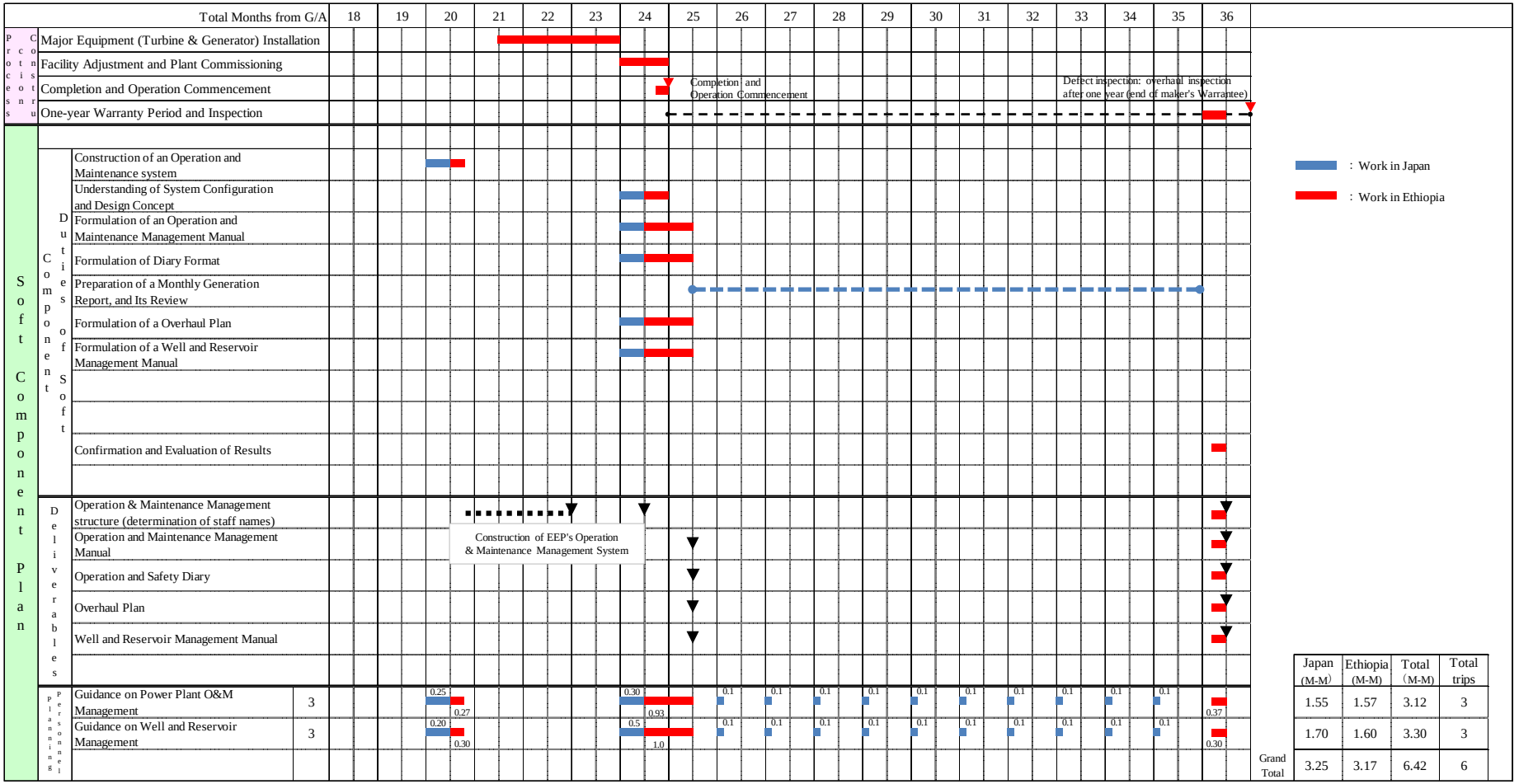


Figure 7.1 Implementation Schedule of Soft Component

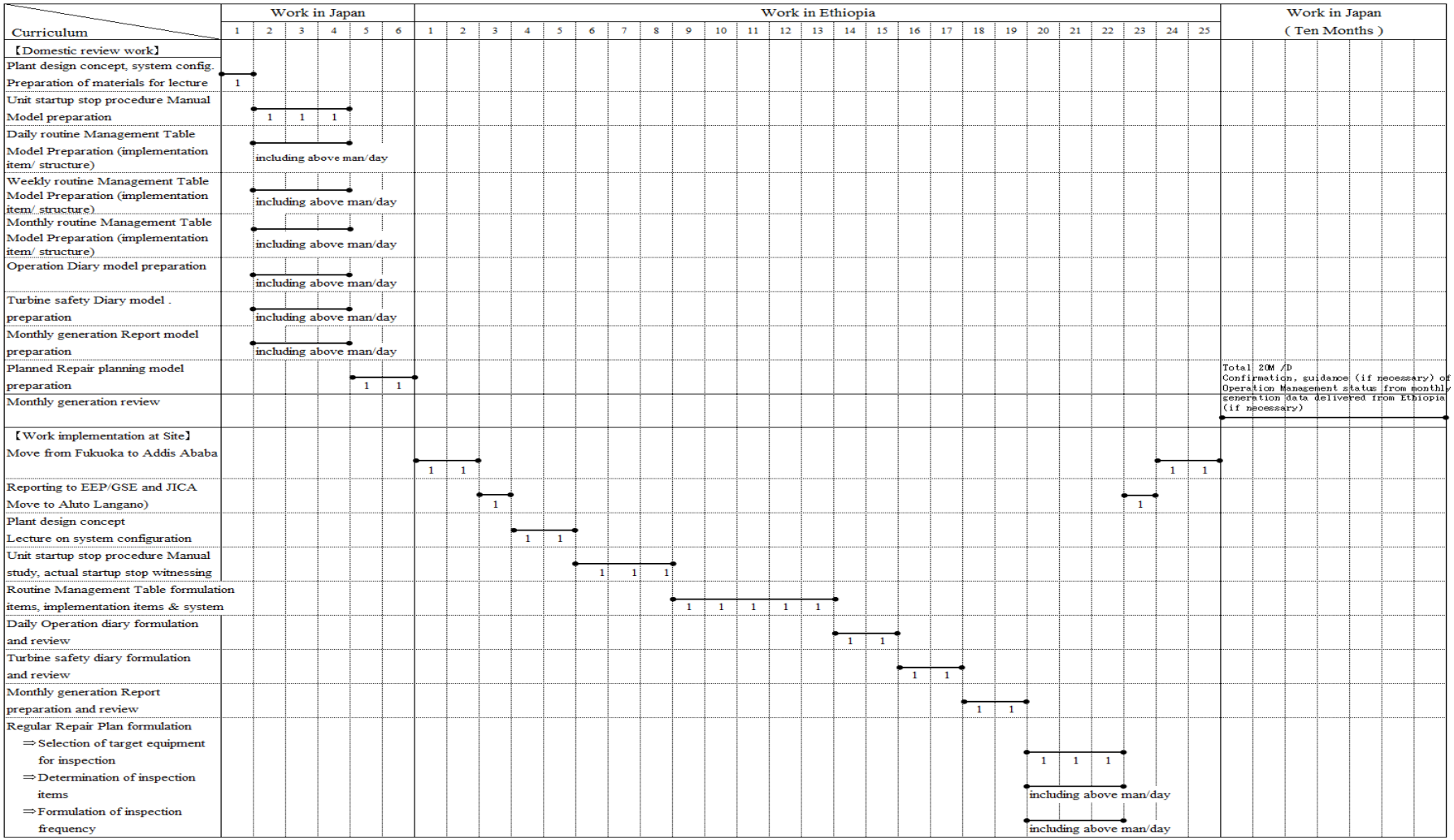
Schedule for Soft Component Plan of the Wellhead Geothermal Generation Project in the Republic of Ethiopia
【Construction of an Operation and Maintenance System】

Curriculum	Work in Japan					Work in Ethiopia (Addis Ababa)							
	day 1	day 2	day 3	day 4	day 5	day 1	day 2	day 3	day 4	day 5	day 6	day 7	day 8
【 Domestic review work 】													
Preparation of the Operation and Maintenance System (draft)	1	1											
Preparation of contents provisions for Management staff duties (draft)			1	1									
Safety Quality System (draft)					1								
【Work implementation at Site】 Moving (Fukuoka to Addis Ababa)						1	1					1	1
Proposed system, explanation of content of duties								1					
Guidance/assistance along the review of the organization & duties content									1	1			
Review of content considerations											1		

Schedule for Soft Component Plan of the Wellhead Geothermal Generation Project in the Republic of Ethiopia
【Well / Reservoir Monitoring method and System construction】

Curriculum	Work in Japan				Work in Ethiopia								
	day 1	day 2	day 3	day 4	day 1	day 2	day 3	day 4	day 5	day 6	day 7	day 8	day 9
【 Domestic review work 】													
Considerations on Well Monitoring and system construction	1	0.5											
Considerations on Reservoir monitoring and system construction		0.5	1										
Summarizing of the results of each review				1									
【 Field implementation work 】													
Move from Fukuoka to Addis Ababa					1	1						1	1
Move to Aluto Langano							0.5		0.5				
Confirmation of the status of monitoring at site							0.5	1	0.5				
Explanation and discussion on the method and system for monitoring										1	1		

Schedule for Soft Component Plan of the Wellhead Geothermal Generation Project in the Republic of Ethiopia
【Formulation of Operation and Maintenance Manual and others】



Schedule for Soft Component Plan of the Wellhead Geothermal Generation Project in the Republic of Ethiopia
【Monitoring Plan, Guidance and Study of fluctuations & measures】

Curriculum	Work in Japan										Work in Ethiopia																												Work in Japan (Ten months)
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
【Domestic review work】																																									
Well and Reservoir Monitoring Plan Preparation (draft)	●									●																															
Well / Reservoir physical properties Monitoring Plan preparation	● 1	1	1	1 ●																																					
Well/ Reservoir chemical properties Monitoring Plan preparation				●	1	1	1	1 ●																																	
Summary of the Monitoring Plan (draft)									● 1	1 ●																															
Review of Monitoring results and Study of fluctuations and Measures																																							Total 20M /D Confirmation of delivery of Monitoring data from Ethiopia, origin of fluctuatio and measures (if necessary) ●
【Site Implementation work】 Move from Fukuoka to Addis Ababa											● 1	1 ●																										1	1	
Reporting to EEP/GSE and JICA Move to Aluto Langano)													● 1 ●																									1			
Explanation and discussion of the draft Monitoring Plan														● 1	1 ●																										
Attendance to Monitoring guidance and advice preparation of Monitoring Plan confirmation of delivering method of the Monitoring data																● 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1 ●			

Schedule for Soft Component Plan of the Wellhead Geothermal Generation Project in the Republic of Ethiopia
【Check after Overhaul Inspection】

Curriculum	Work in Ethiopia (Plant site)										
	day 1	day 2	day 3	day 4	day 5	day 6	day 7	day 8	day 9	day 10	day 11
【Work implementation at Site】											
Moving									Moving and Reporting (EEP/JICA)		
(Fukuoka to Addis Ababa)	1	1								1	1
(Addis Ababa to Aluto Langano)			0.5						1		
Confirmation of overhaul inspection before expiration of manufacturer's warranty period			0.5	1	0.5						
Review of the Operation and Management system					0.5						
Operation & Maintenance Manual review (routine table, etc.)						0.5					
Review of the Operation diary, safety diary review (if necessary)						0.5					
Review of periodic repair plan (based on operation experience)							1	1			

Schedule for Soft Component Plan of the Wellhead Geothermal Generation Project in the Republic of Ethiopia
【Check after Overhaul Inspection】

Curriculum	Work in Ethiopia (Plant site)										
	day 1	day 2	day 3	day 4	day 5	day 6	day 7	day 8	day 9	day 10	day 11
【Work implementation at Site】											
Moving									Moving and Reporting (EEP/JICA)		
(Fukuoka to Addis Ababa)	1	1								1	1
(Addis Ababa to Aluto Langano)			0.5						1		
Confirmation of overhaul inspection before expiration of manufacturer's warranty period			0.5	1	0.5						
Review of the Operation and Management system					0.5						
Operation & Maintenance Manual review (routine table, etc.)						0.5					
Review of the Operation diary, safety diary review (if necessary)						0.5					
Review of periodic repair plan (based on operation experience)							1	1			

Schedule for Soft Component Plan of the Wellhead Geothermal Generation Project in the Republic of Ethiopia
【Discussion on causes and measures in case of fluctuations of Well/ Reservoir characteristics】

Curriculum	Work in Ethiopia								
	day 1	day 2	day 3	day 4	day 5	day 6	day 7	day 8	day 9
【Work implementation at Site】									
Moving									
(Fukuoka to Addis Ababa)	1	1						1	1
(Addis ababa to Aluto Langano)			0.5				移動+報告 (EEP/GSE/JICA) 1		
Confirmation of Monitoring results			0.5						
Explanation and discussion on the cause of fluctuation of properties of Well / Reservoir and measures				1	1				
Relate and reflect on the Operation and Maintenance of the Wellhead Geothermal Power Generation facility						1			

8. Deliverables

As is shown in Figure 7-1, the deliverable products of this Soft Component include an operation & maintenance management manual (with troubleshooting), operation & safety diary, the medium to long term overhaul plan, the well and reservoir monitoring plan, implementation status reports (English progress report for EEP), a completion report (English final report for EEP), and teaching materials used for technology transfer.

9. Approximate Cost of the Soft Component Project

The estimated cost of this Soft Component Plan is 21.124 Million Japanese Yen, the breakdown of which is shown in Table 9-1.

Table 9.1 Estimated Cost of the Soft Component Plan

Item	Cost (Million Japanese Yen)
Personnel costs	5.585
Direct costs	3.921
Overhead costs	11.618
Grand total	21.124

10. Responsibilities of the Executing Agency

(1) EEP will establish a management organization related to the implementation of this Soft Component Plan.

(2) EEP will prepare conference rooms for the implementation of this Soft Component Plan whenever necessary.

(3) EEP will provide the necessary personnel for this Soft Component Plan.

(4) EEP will consult with the consultant and will implement self-implementation of an operation and maintenance management manual and a periodic overhaul plan. Also, after starting the operation of the geothermal wellhead power system, EEP will revise and update the Manual according to the actual circumstances.

(5) EEP will maintain and manage the geothermal wellhead power system based on the O&M management manual and the periodic overhaul plan. In cases where personnel in charge of the operation maintenance, etc. are transferred, EEP will utilize the results of the Soft Component Plan and will ensure the transfer of the technical knowledge to their successor.

6 References

6-1 Drawings for Outline Design

JAPAN INTERNATIONAL
COOPERATION AGENCY

PREPARATORY SURVEY FOR
GEOTHERMAL WELLHEAD POWER SYSTEM PROJECT
IN ETHIOPIA

DRAWINGS FOR OUTLINE DESIGN

JANUARY 2017

WEST JAPAN ENGINEERING CONSULTANTS, INC.

PREPARATORY SURVEY FOR GEOTHERMAL WELLHEAD POWER SYSTEM PROJECT IN ETHIOPIA

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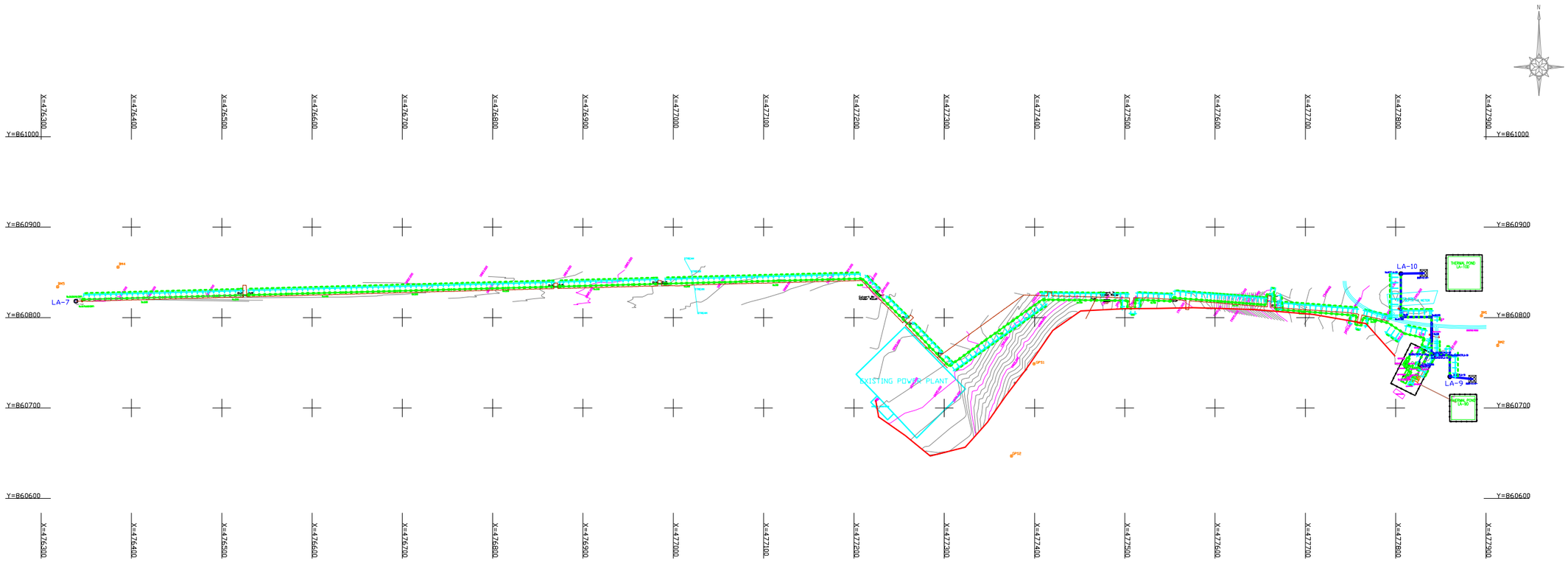
17	MV Switchgear Foundation	
18	15kV Switchgear Foundation	
19	Silenser Foundation	
20	Radiator Foundation	
21	Scrubber Foundation	
22	Control Container Foundation	
23	Wellhead Steam and Brine Flow	
24	Piping Arrangement Around Wellhead Power Plant	
25	General Piping Arrangement Around T/G	
26	Single Line Diagram	
27	Line Material Bill of Quantity	
28	15kV Terminal Structure (DL1-1)	
29	15kV Tension Structure (DL1-2)	
30	15kV Light Angle Structure (DL1-3)	
31	15kV Heavy Angle Structure (DL1-4)	
32	15kV Suspension Structure (DL1-5)	
33	Cross Arm Arrangement Detailing (DL1 AUX1)	
34	Pole Foundation (DL1 AUX2)	
35	15kV Distribution Line Route Plan	
36	LA9D Thermal Pond (Concrete)	
37	LA10D Thermal Pond (Concrete)	
38	LA9D Thermal Pond (Stone Masonry)	
39	LA10D Thermal Pond (Stone Masonry)	

PLAN (1) S=1:5000



CONTROL POINTS

POINT ID	EASTING X (m)	NORTHING Y (m)	ALTITUDE Z (m)
GPS1	477399.458	860748.832	1910.184
GPS2	477374.569	860646.874	1916.796
BM1	477894.961	860802.100	1951.880
BM2	477912.957	860769.284	1952.423
BM4	476385.115	860855.804	1887.060
BM5	476318.353	860833.990	1885.978

LEGEND

- Exisiting Reinjection Pipe Line
- New Brine Reinjection Pipe Line (BRP)
- New Two-phase flow Pipe Line (TP)
- New Steam Pipe Line (SP)
- Distribution Line
- OGL Points
- Existing Power Plant
- Culvert & Over pass
- Contour Lines

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia

Plan (1)

/ | Scale | As Shown

WEST JAPAN ENGINEERING CONSULTANTS, INC.

PLAN（2） S=1:1000

Y=860900

Y=860800

Y=860700

THERMAL POND
LA-10D

THERMAL POND
LA-9D

LA-10

LA-9

WATER POND
AVG. DEPTH =2 METER

EXISTING ROAD

CONTAINER

Existing Silenser

Existing Silenser

BM1

BM2

No.0(TPLA-10)

No.50

No.82.195

No.47.982

No.100

No.100

No.124.288(TPLA-10)

No.126.174(TPLA-10)

No.23.854(TPLA-9)

No.3.942(TPLA-9)

No.06(TPLA-9)

No.133.966

No.141.131

No.300

No.200

1920.000

1925.000

1930.000

1935.000

1940.000

1945.000

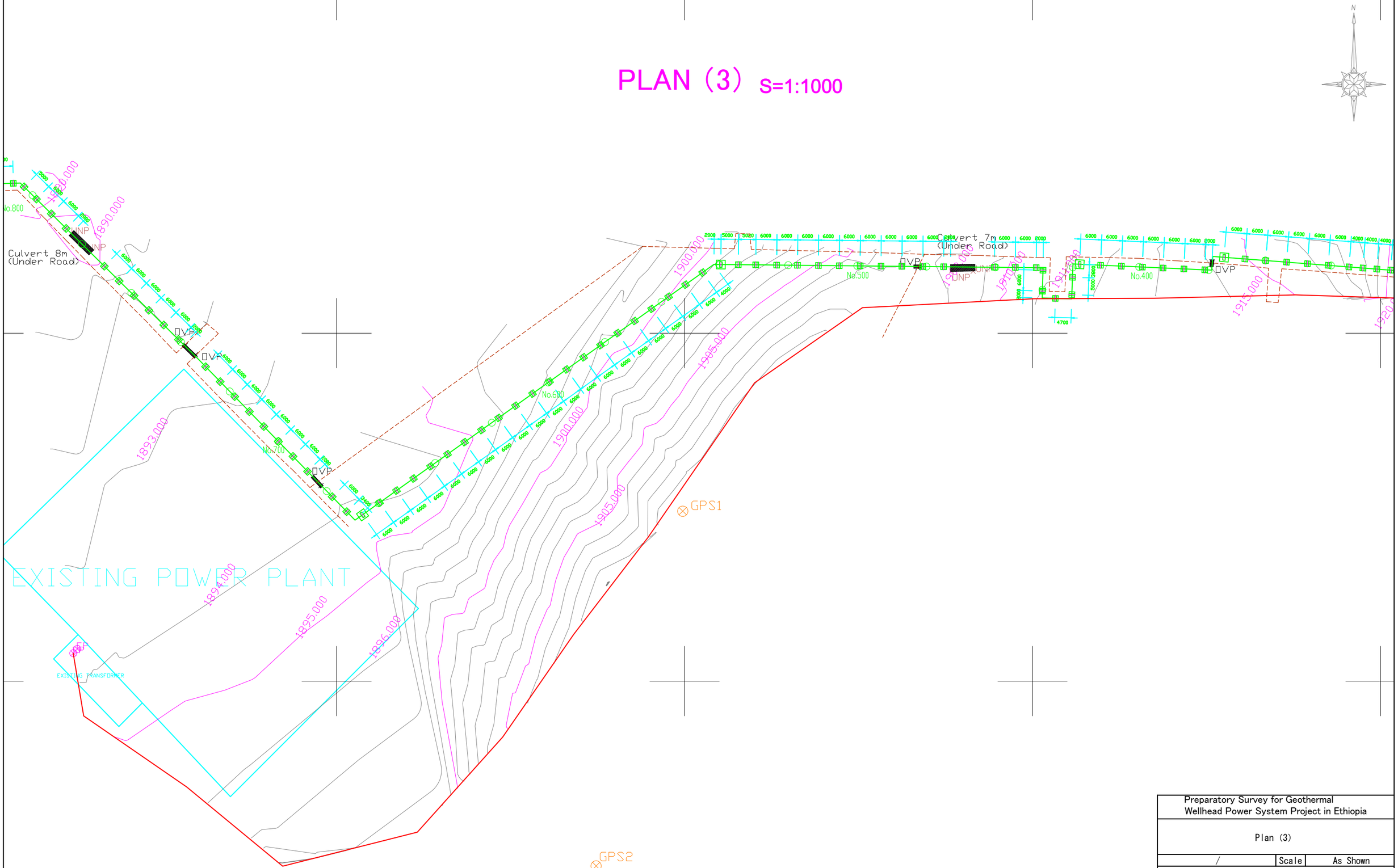
1950.000

1951.000

1952.000

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Plan (2)		
/	Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

PLAN（3） S=1:1000

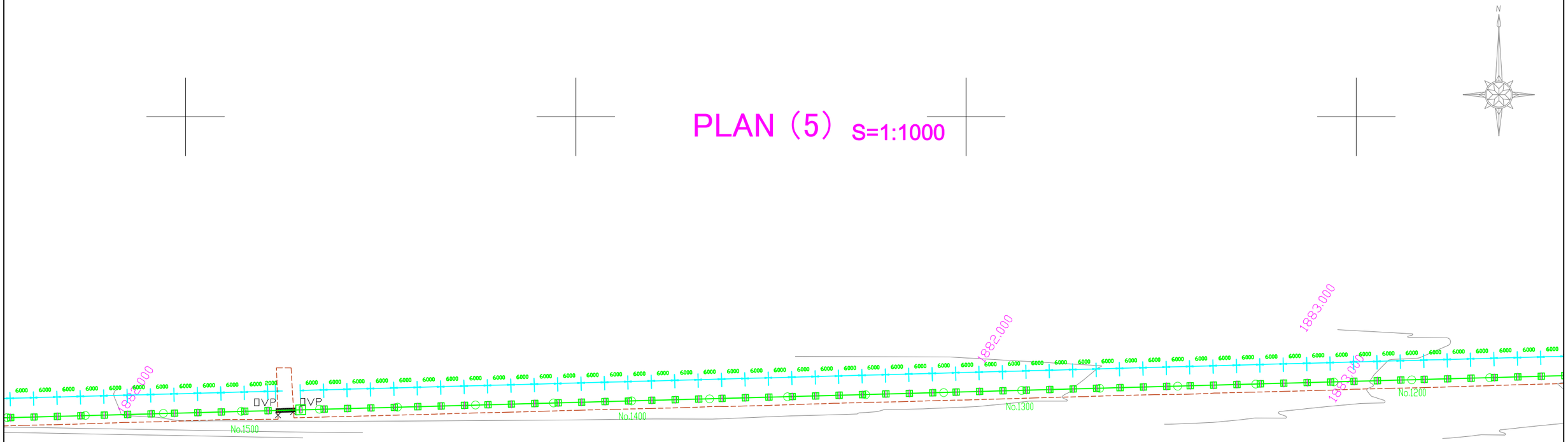


Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Plan (3)		
/	Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

PLAN（4） S=1:1000

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Plan (4)		
/	Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

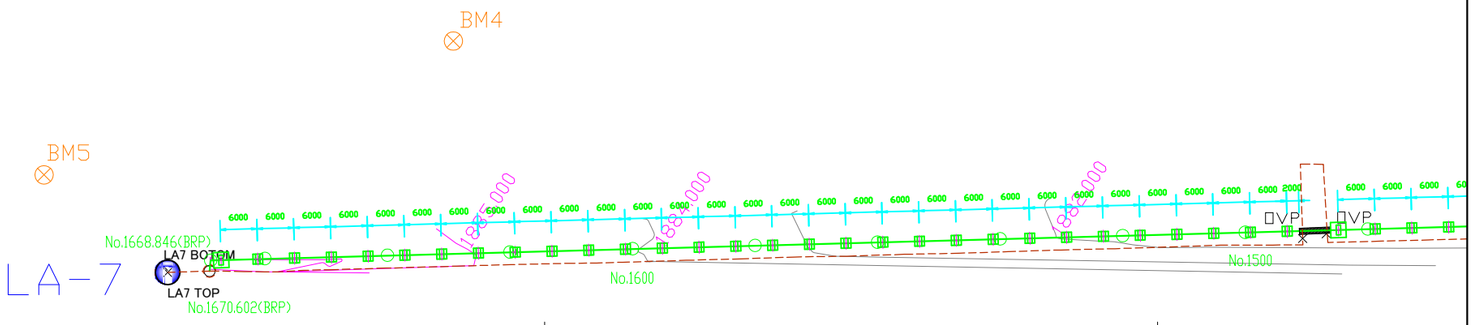
PLAN（5） S=1:1000



Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Plan (5)	
/	Scale: As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

Y=860900

PLAN（6） S=1:1000

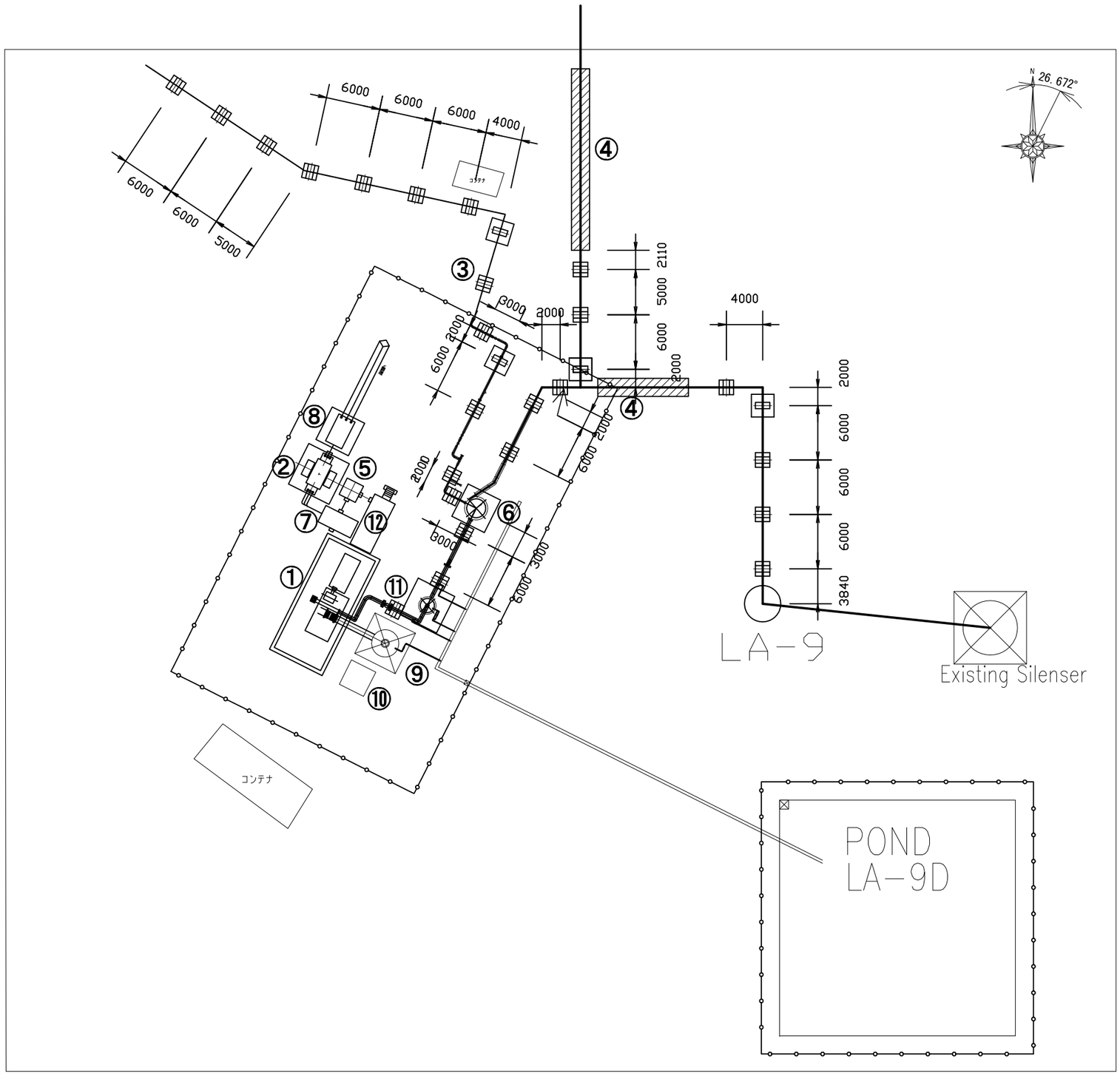


Y=860800

Y=860700

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Plan (6)		
/	Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

POWER SYSTEM PLAN S=1:500

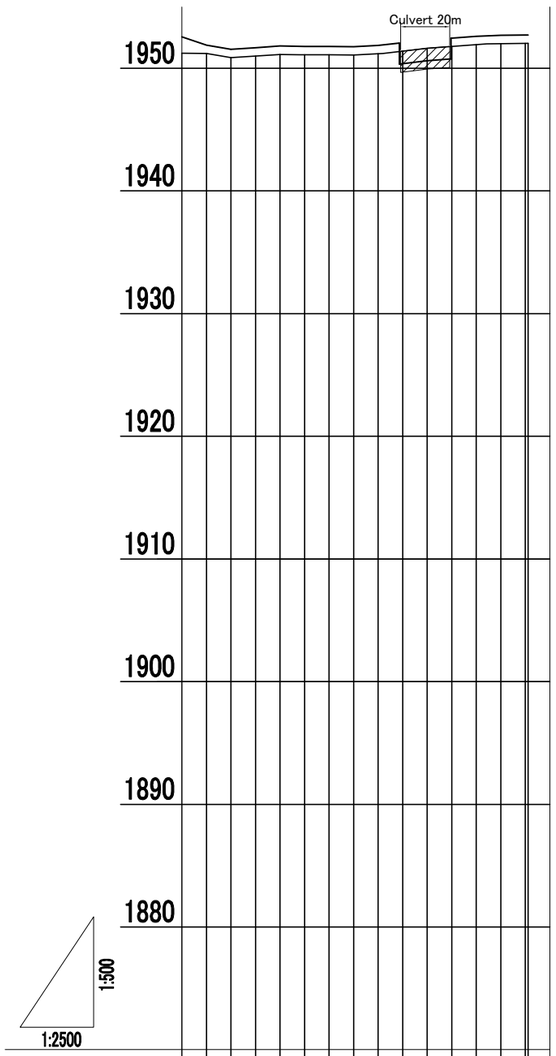


①Turbine Generator
②Step up Transformer
③Pipe Foundation
④Culvert
⑤Station Service Transformer
⑥Separator
⑦MV Switchgear
⑧15kV Switchgear
⑨Silenser
⑩Radiator
⑪Scrubber
⑫Control Container

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Power System Plan		
/	Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

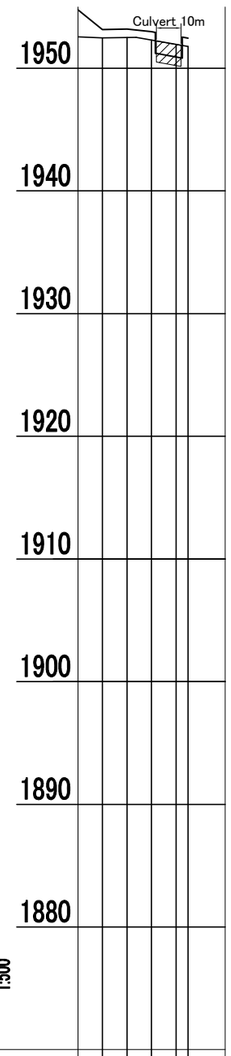
PIPE LINE PROFILES (1)

Two Phase Flow Piping(LA-10)



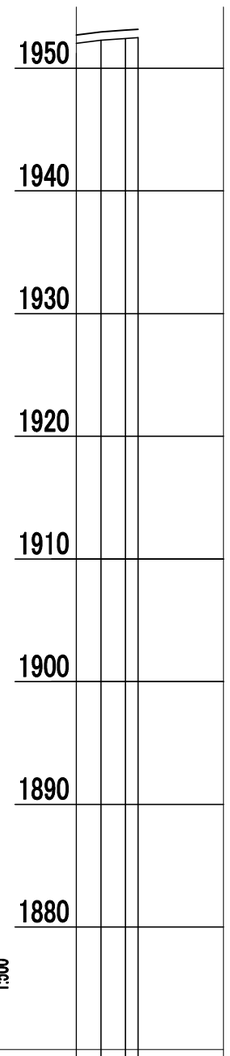
Ground Level	1951.23	1951.20	1950.86	1951.00	1951.13	1951.11	1951.10	1951.07	1951.19	1951.40	1951.64	1951.78	1951.92	1951.88	1952.04	1952.04					
Level of Pipe Center	1952.56	1951.88	1951.54	1951.68	1951.81	1951.79	1951.78	1951.75	1951.79	1950.37	1950.61	1952.46	1952.60	1952.56	1952.72	1952.72					
Distance	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	141.131					

Two Phase Flow Piping(LA-9)



Ground Level	1952.56	1952.47	1952.52	1952.30	1951.95	1951.77															
Level of Pipe Center	1954.76	1953.15	1953.20	1952.98	1950.92	1952.45															
Distance	0.000	10.000	20.000	30.000	40.000	44.371															

Steam Piping



Ground Level	1951.77	1952.29	1952.42	1952.49																	
Level of Pipe Center	1952.45	1952.97	1953.10	1953.17																	
Distance	0.000	10.000	20.000	25.205																	

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia

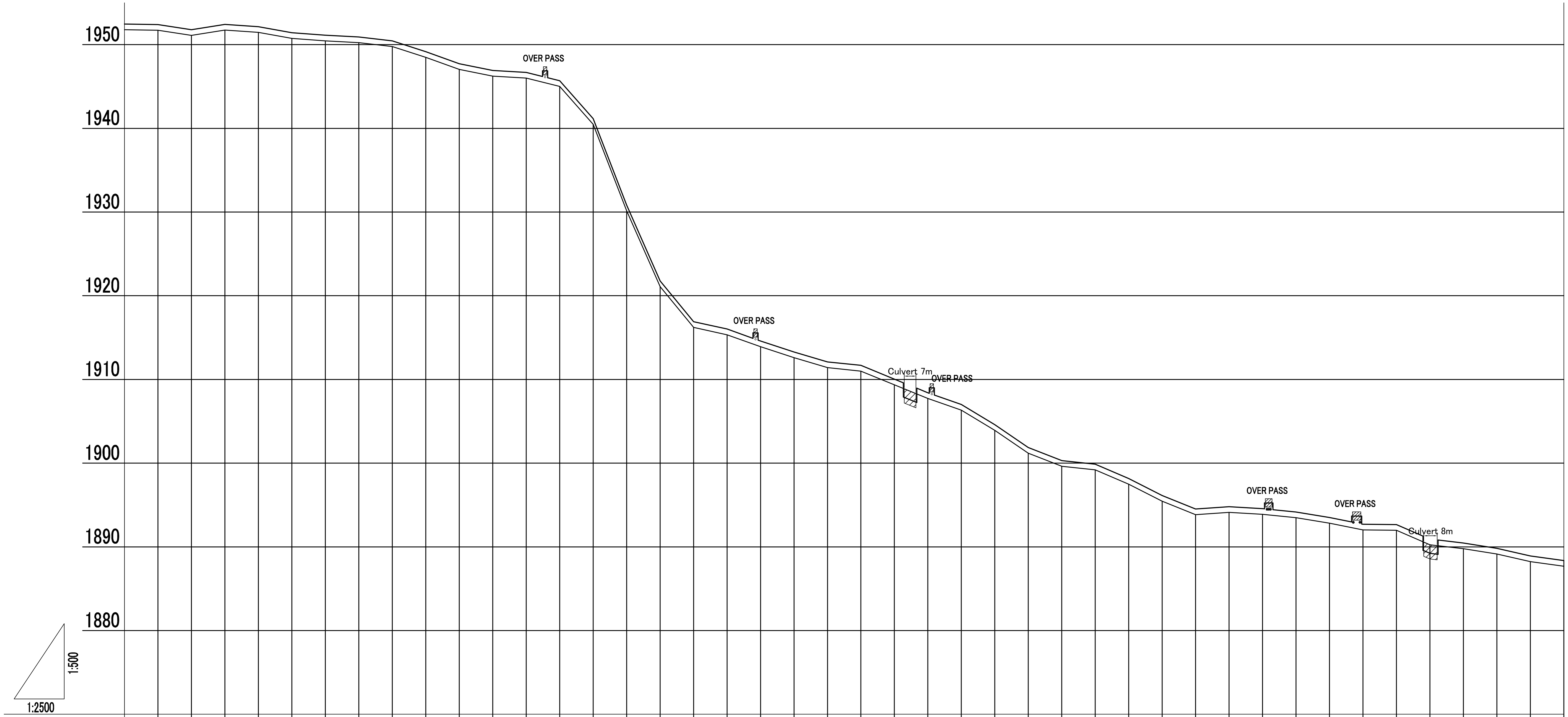
Pipe Line Profiles(1)

/ | Scale | As Shown

WEST JAPAN ENGINEERING CONSULTANTS, INC.

PIPE LINE PROFILES (2)

Brine Reinjection Piping



Ground Level	1951.77	1951.72	1951.11	1951.73	1951.46	1950.75	1950.44	1950.23	1949.77	1948.47	1947.03
Level of Pipe Center	1952.45	1952.40	1951.79	1952.41	1952.14	1951.43	1951.12	1950.91	1950.45	1949.15	1947.71
Distance	0.000	20.000	40.000	60.000	80.000	100.000	120.000	140.000	160.000	180.000	200.000

Ground Level	1946.23	1946.00	1945.00	1940.48	1930.14	1921.08	1916.21	1915.34	1913.91	1912.59	1911.41
Level of Pipe Center	1946.91	1946.68	1945.68	1941.16	1930.82	1921.76	1916.89	1916.02	1913.59	1913.27	1912.09
Distance	220.000	240.000	260.000	280.000	300.000	320.000	340.000	360.000	380.000	400.000	420.000

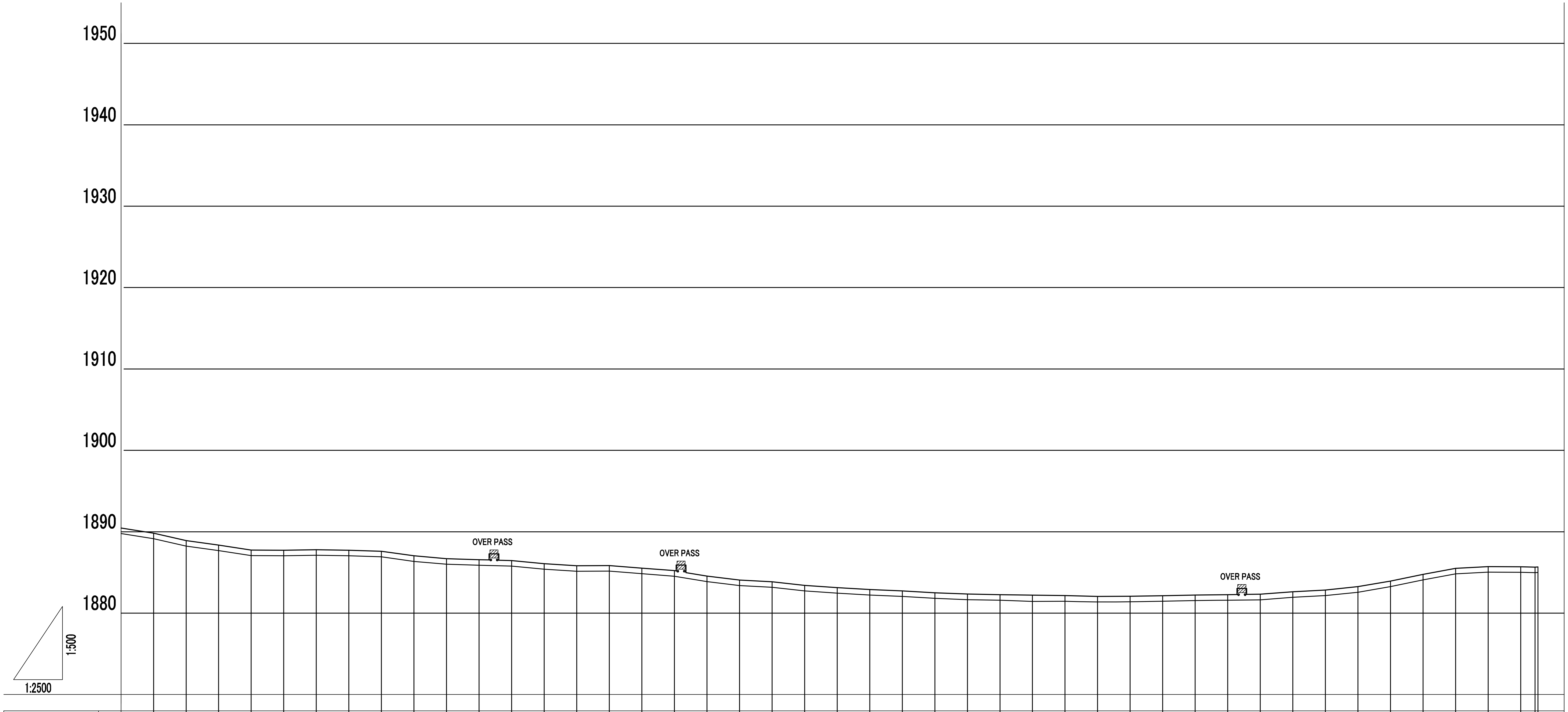
Ground Level	1911.00	1909.36	1907.73	1906.33	1903.91	1901.18	1899.63	1899.20	1897.48	1895.45	1893.85
Level of Pipe Center	1911.68	1910.04	1908.41	1907.01	1904.59	1901.86	1900.31	1899.88	1898.16	1896.13	1894.53
Distance	440.000	460.000	480.000	500.000	520.000	540.000	560.000	580.000	600.000	620.000	640.000

Ground Level	1894.12	1893.89	1893.49	1892.83	1892.02	1891.98	1890.25	1889.77	1889.14	1888.24	1887.68
Level of Pipe Center	1894.80	1894.57	1894.17	1893.51	1892.70	1892.66	1889.23	1890.45	1889.82	1888.92	1888.36
Distance	660.000	680.000	700.000	720.000	740.000	760.000	780.000	800.000	820.000	840.000	860.000

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Pipe Line Profiles (2)		
/	Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

PIPE LINE PROFILES (3)

Brine Reinjection Piping



Ground Level	1889.77	1889.14	1888.24	1887.68	1887.07	1887.05	1887.12	1887.05	1886.92	1886.36	1886.02	1885.89	1885.77	1885.40	1885.15	1885.16
Level of Pipe Center	1890.45	1889.82	1888.92	1888.36	1887.75	1887.73	1887.80	1887.73	1887.60	1887.04	1886.70	1886.57	1886.45	1886.08	1885.83	1885.84
Distance	800.000	820.000	840.000	860.000	880.000	900.000	920.000	940.000	960.000	980.000	1000.000	1020.000	1040.000	1060.000	1080.000	1100.000

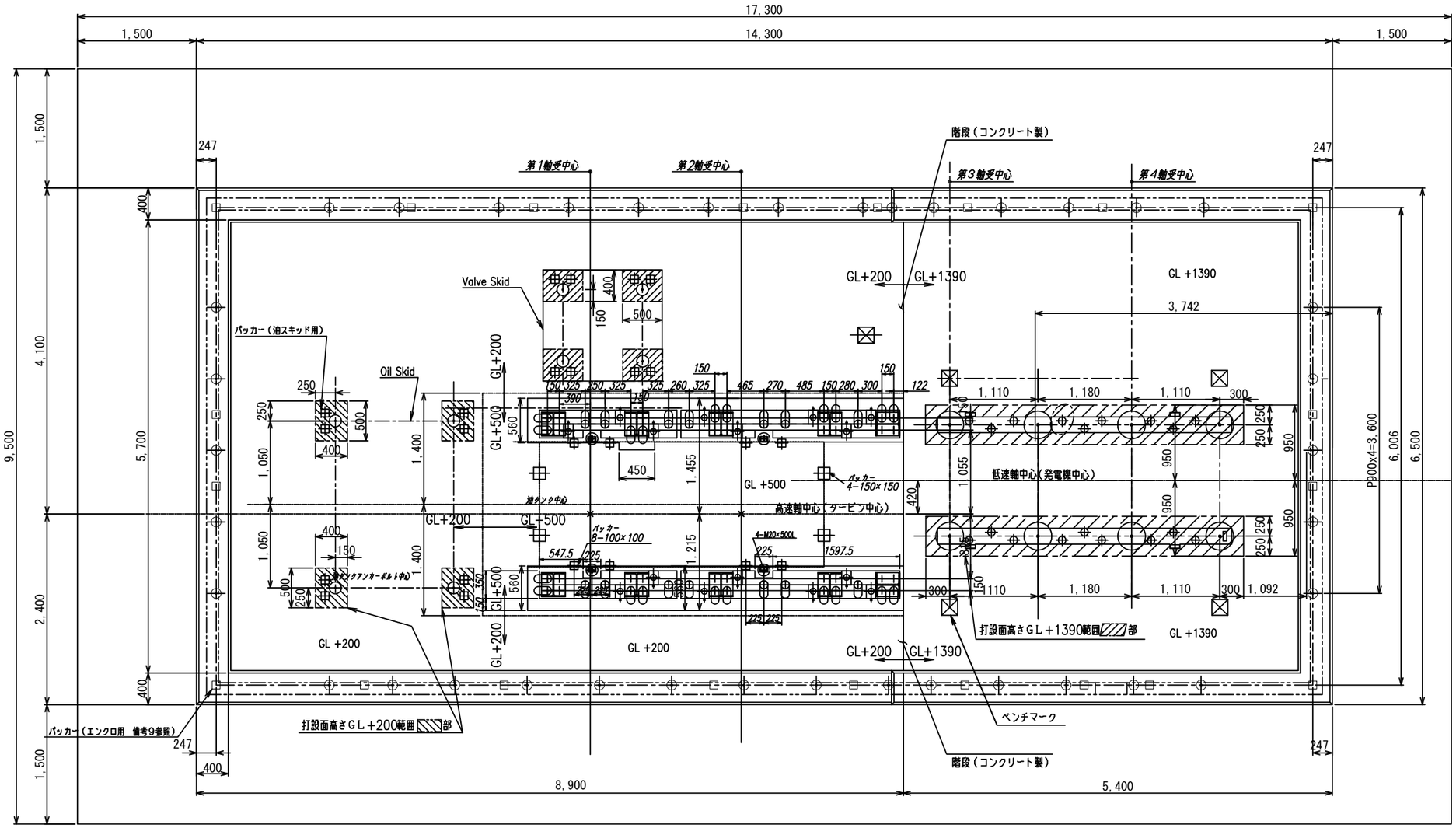
Ground Level	1884.85	1884.54	1883.87	1883.39	1883.18	1882.73	1882.45	1882.23	1882.05	1881.82	1881.66	1881.59	1881.45	1881.47	1881.38
Level of Pipe Center	1885.53	1885.22	1884.55	1884.07	1883.86	1883.41	1883.13	1883.91	1882.73	1882.50	1882.34	1882.27	1882.13	1882.15	1882.06
Distance	1120.000	1140.000	1160.000	1180.000	1200.000	1220.000	1240.000	1260.000	1280.000	1300.000	1320.000	1340.000	1360.000	1380.000	1400.000

Ground Level	1881.40	1881.46	1881.55	1881.59	1881.64	1881.94	1882.15	1882.57	1883.26	1884.09	1884.82	1885.04	1885.01	1884.98	1885.00
Level of Pipe Center	1882.08	1882.14	1882.23	1882.27	1882.32	1882.62	1882.83	1883.25	1883.94	1884.77	1885.50	1885.72	1885.69	1885.66	1885.68
Distance	1420.000	1440.000	1460.000	1480.000	1500.000	1520.000	1540.000	1560.000	1580.000	1600.000	1620.000	1640.000	1660.000	1668.846	1670.602

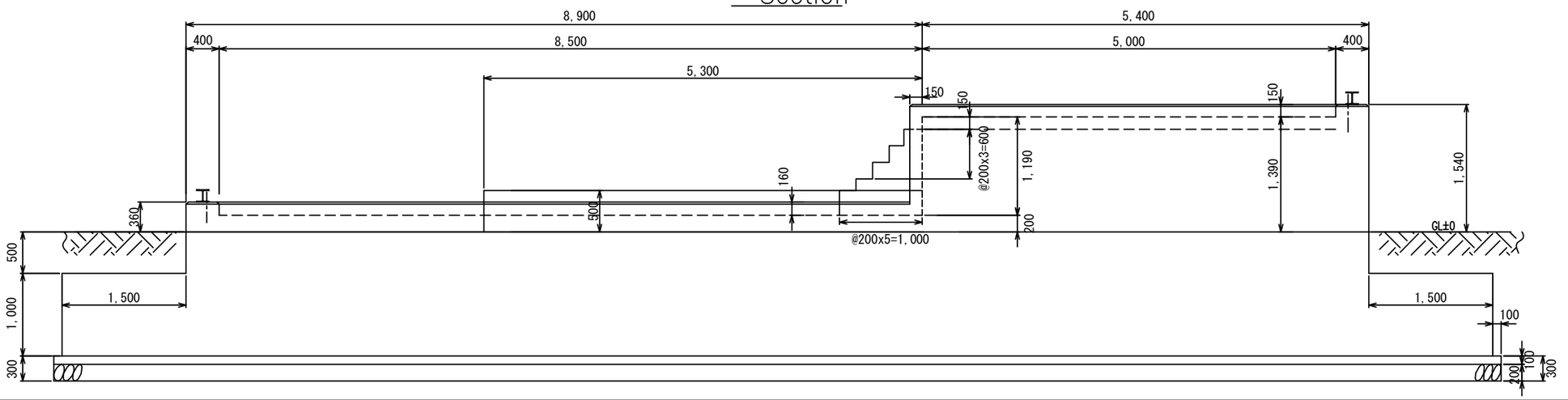
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Pipe Line Profiles (3)		
/	Scale	As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

TURBINE GENERATOR FOUNDATION S=1:60

Plan



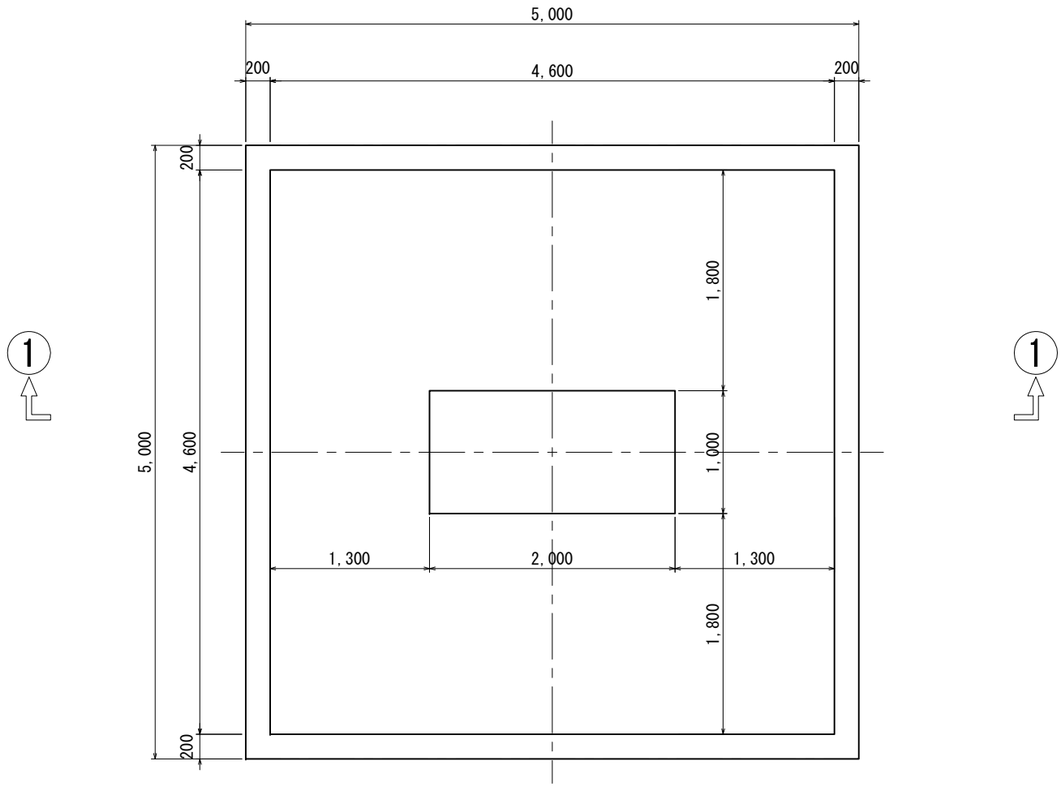
Section



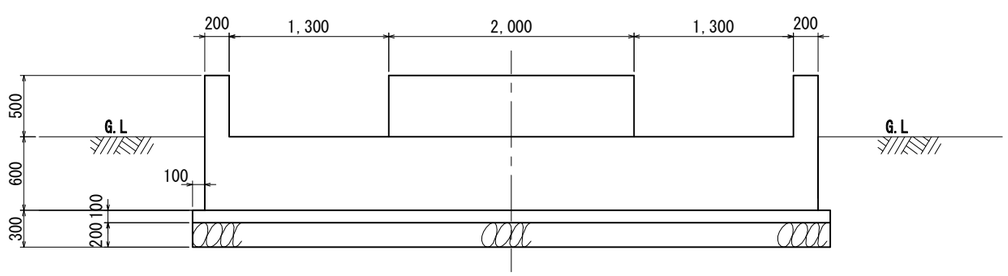
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Turbine Generator Foundation	
/	Scale: As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

STEP UP FOUNDATION

Plan S=1:50



①-①Section S=1:50

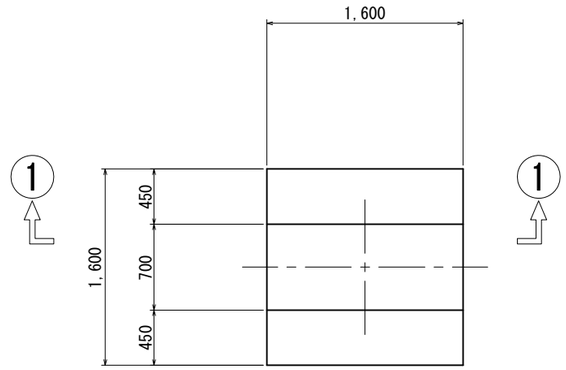


Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Step Up Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

PIPE FOUNDATION

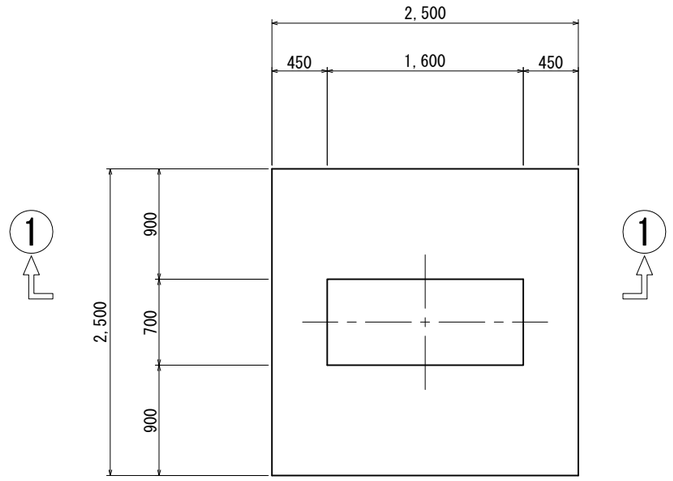
BS1(293Nos) S=1:50

Plan



BS2(15Nos) S=1:50

Plan



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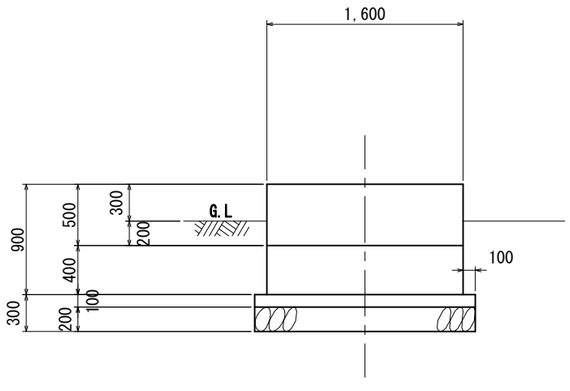
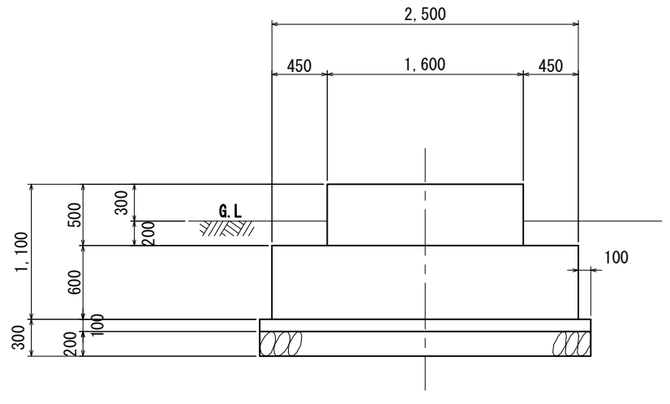


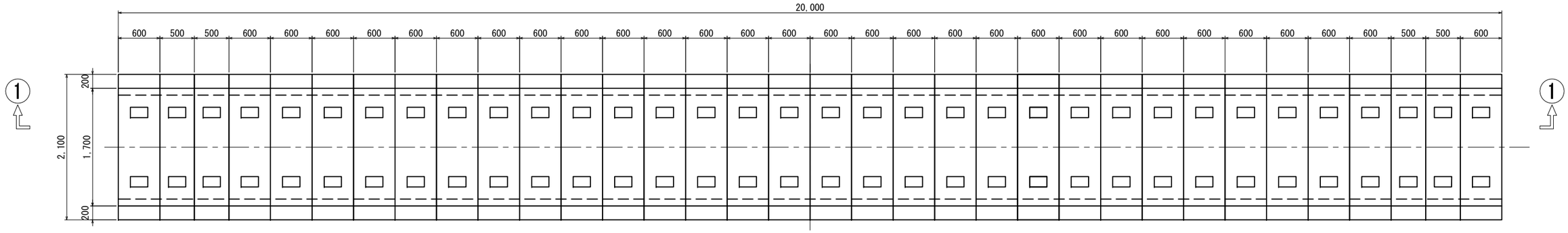
①-①Section S=1:50



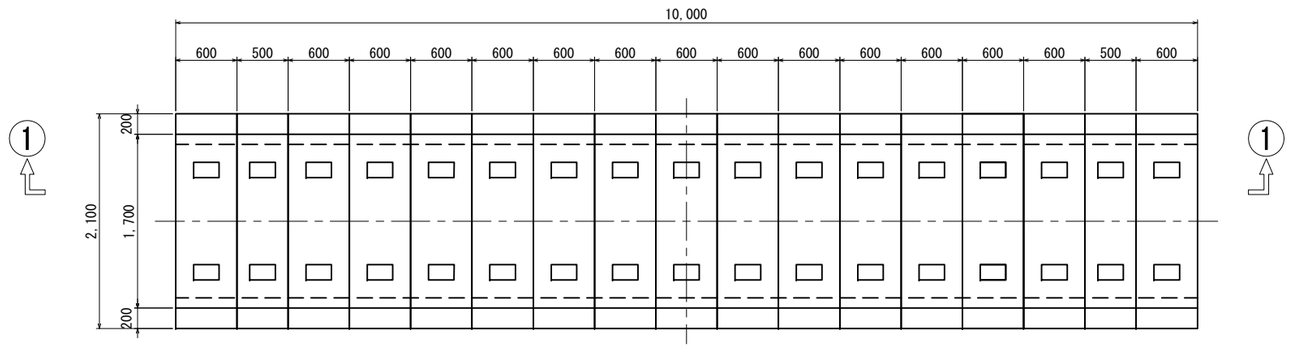
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Pipe Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

CULVERT

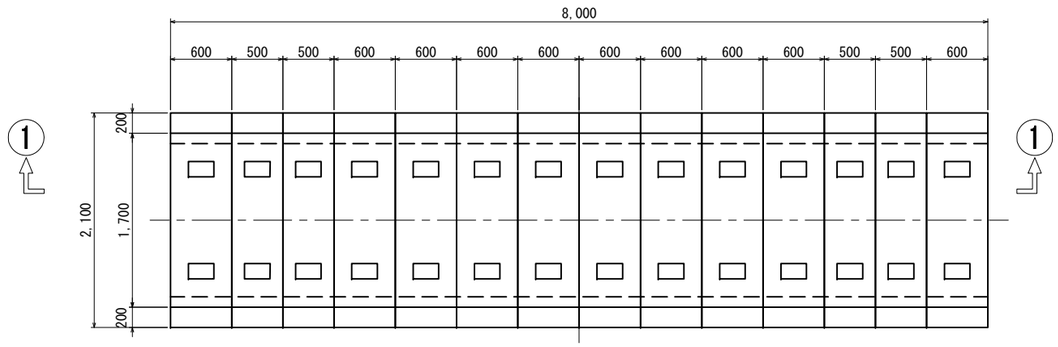
Plan（L=20m） S=1:60



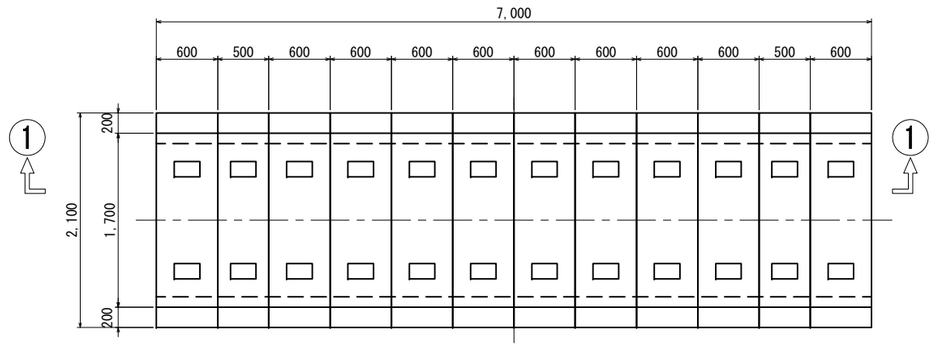
Plan（L=10m） S=1:60



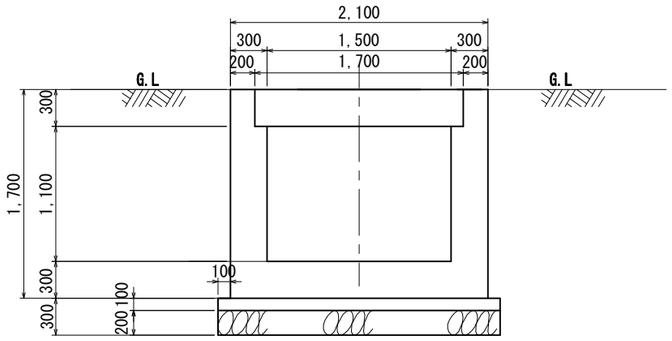
Plan（L=8m） S=1:60



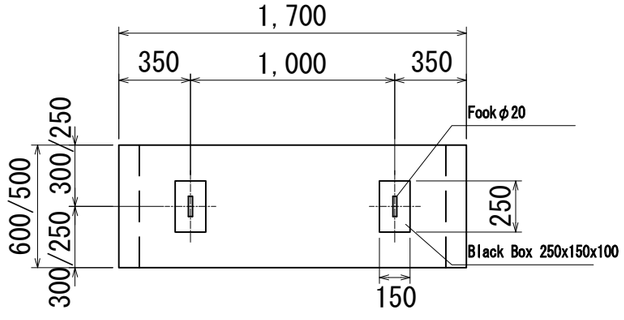
Plan（L=7m） S=1:60



①-①Section S=1:50



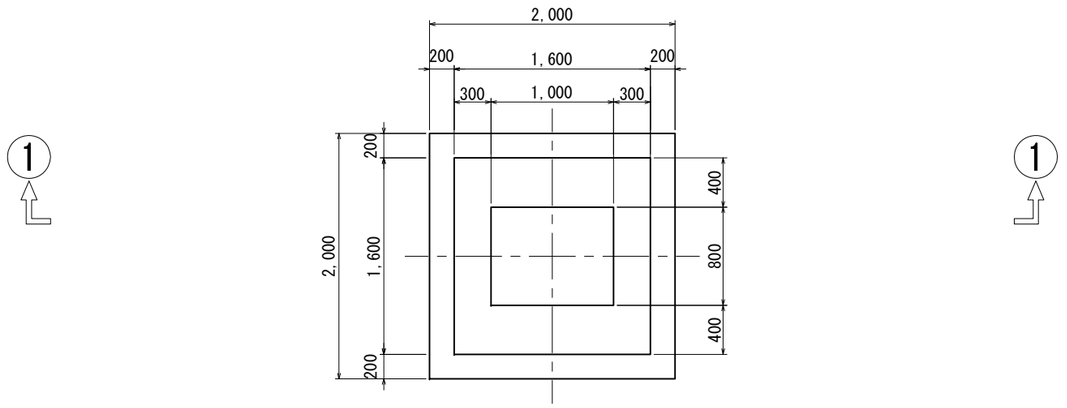
Detail of Cover S=1:30



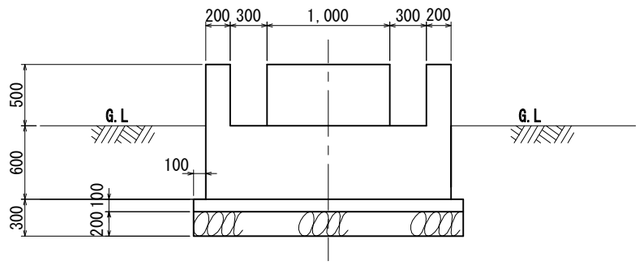
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Culvert	
/	Scale: As Shown
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

STATION SERVICE TRANSFORMER FOUNDATION

Plan S=1:50



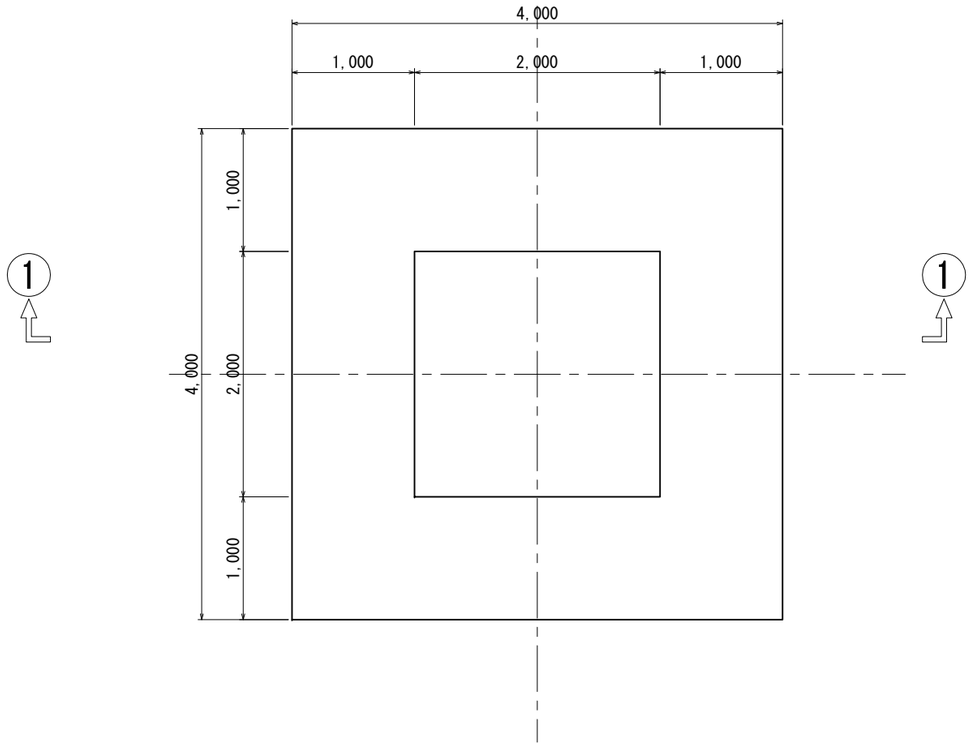
①-①Section S=1:50



Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia		
Station Service Transformer Foundation		
/	Scale	1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

SEPARATOR FOUNDATION

Plan S=1:50



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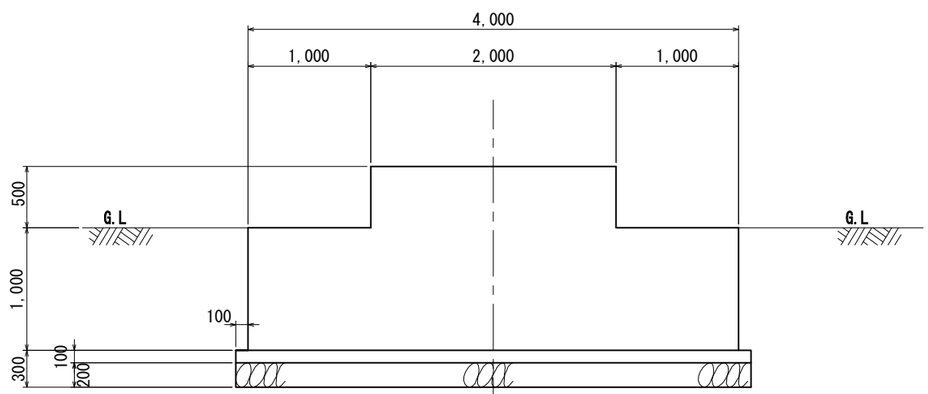
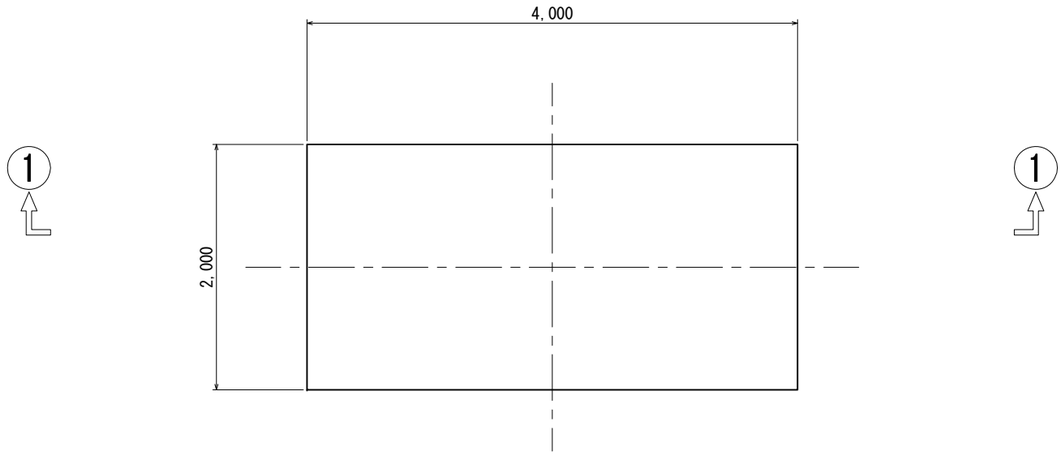


Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Separator Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

MV SWITCHGEAR FOUNDATION

Plan S=1:50



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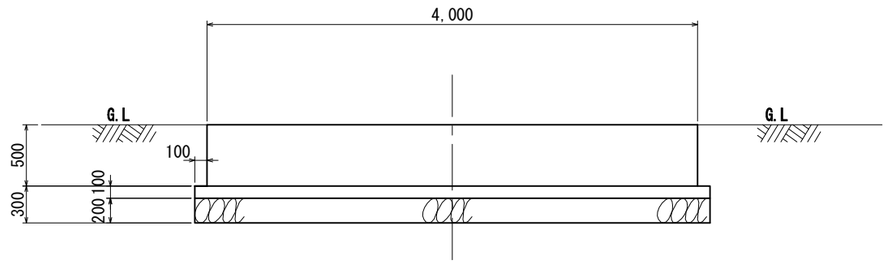
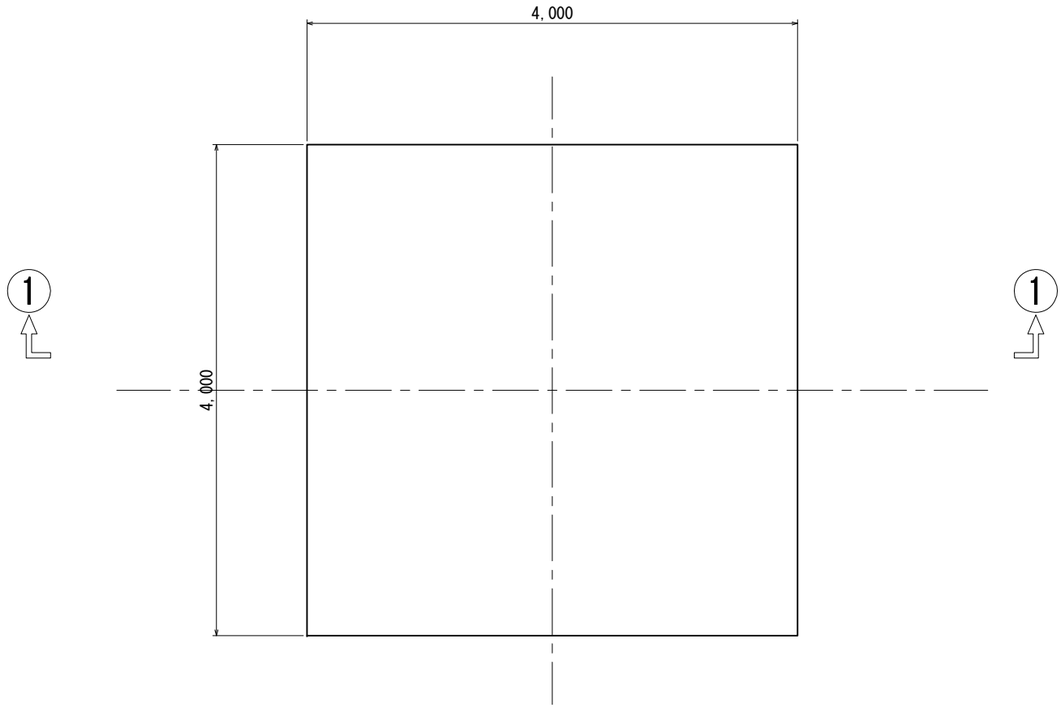


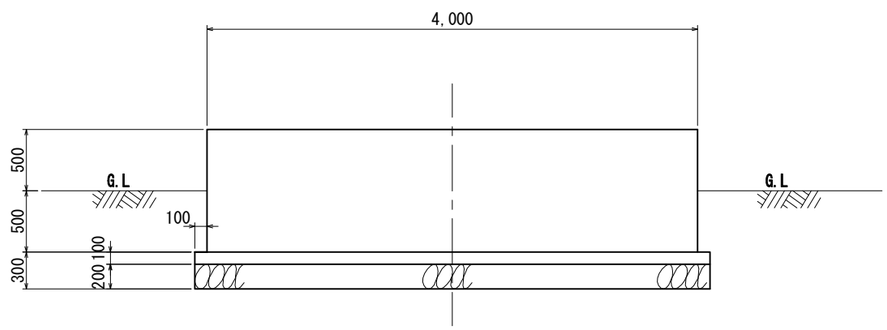
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
MV Switchgear Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

15kV SWITCHGEAR FOUNDATION

Plan S=1:50



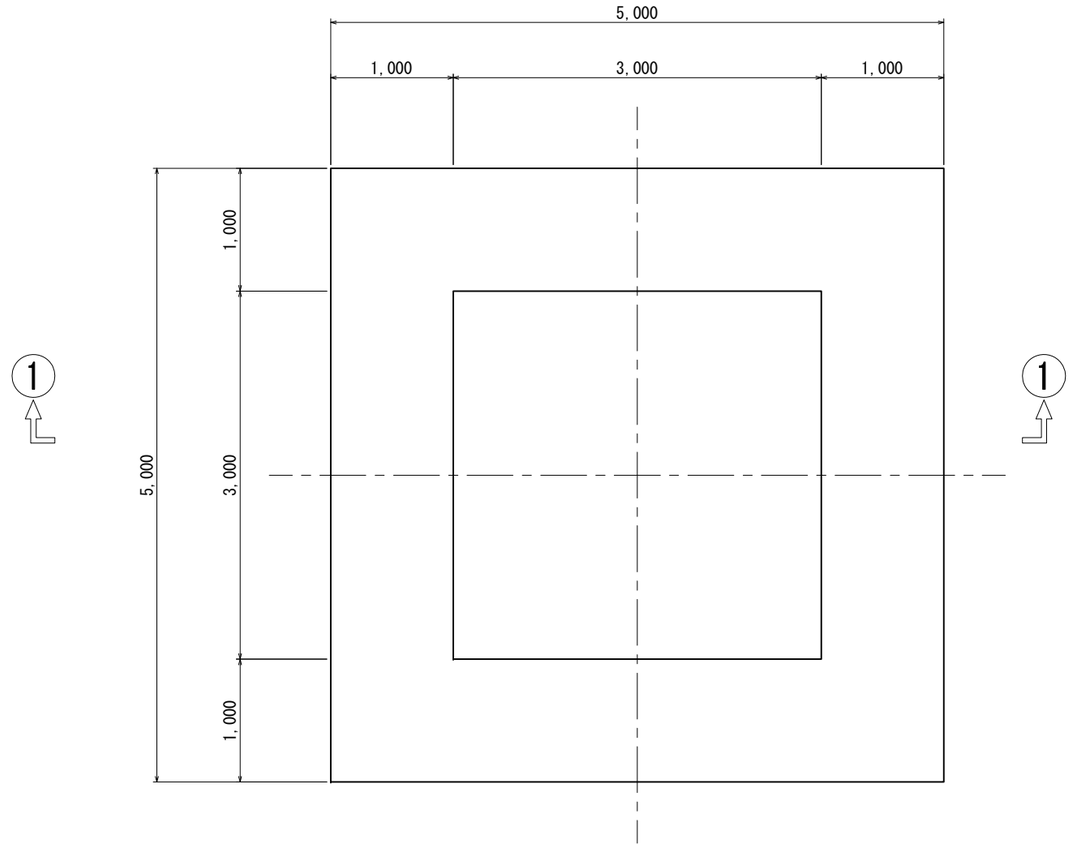
①-①Section S=1:50



Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
15kV Switchgear Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

SILENSER FOUNDATION

Plan S=1:50



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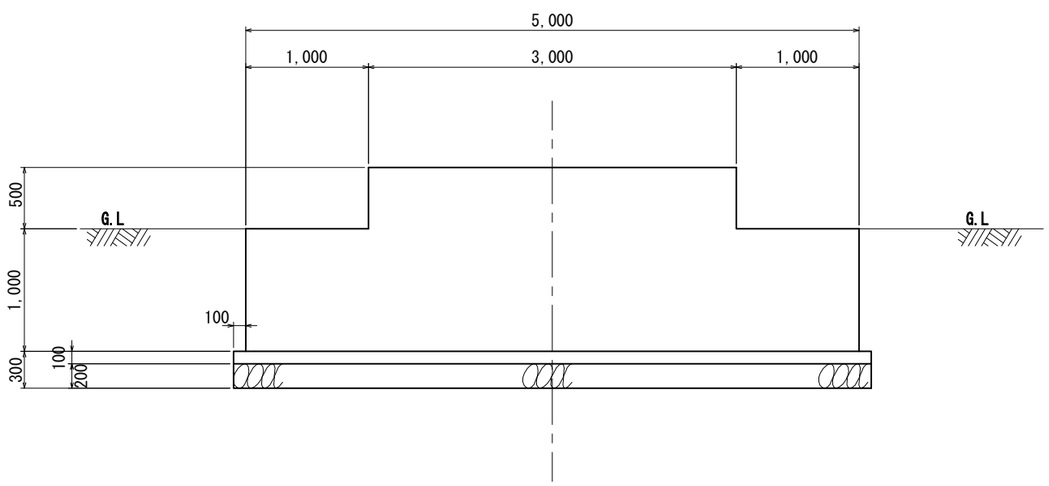
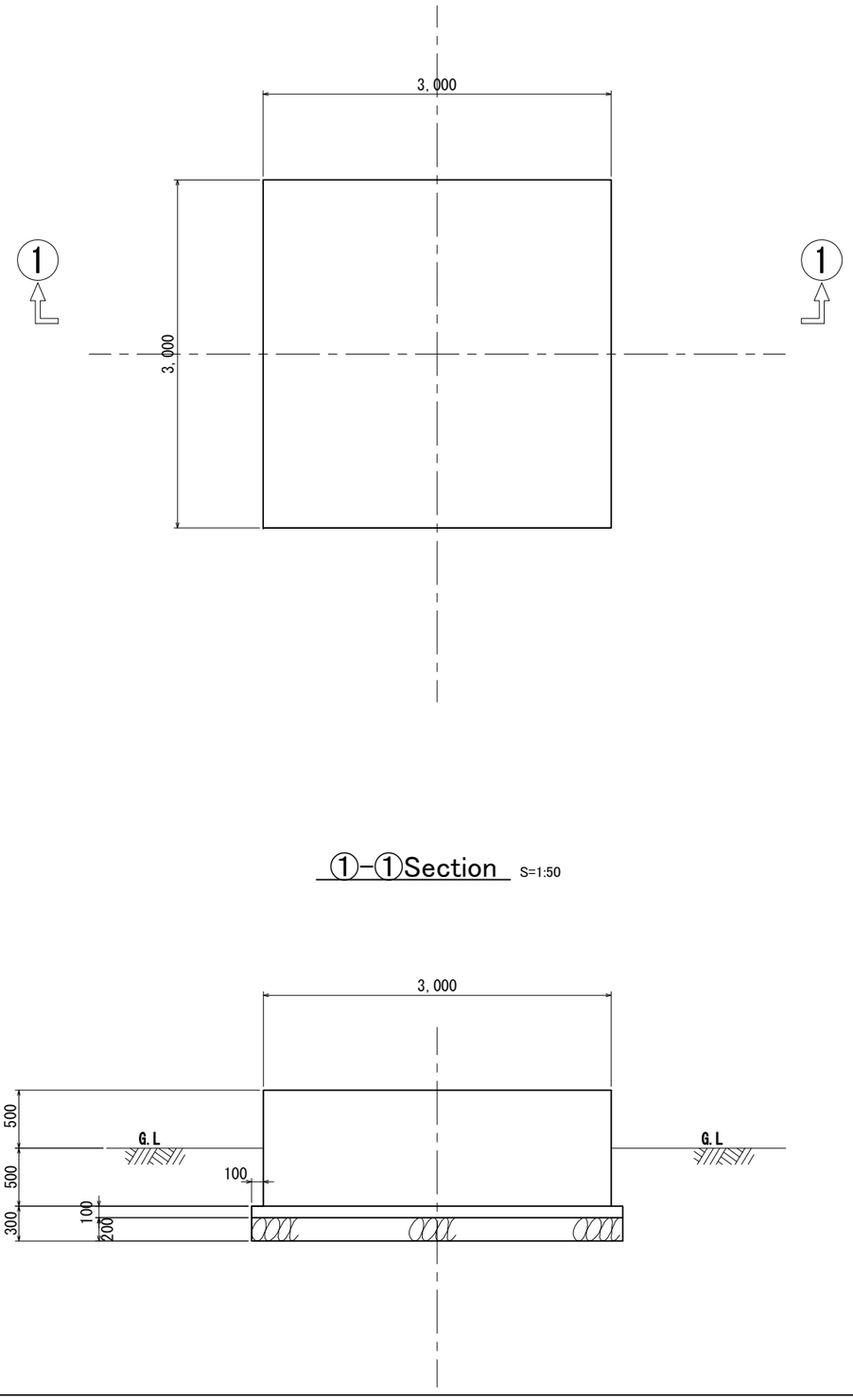


Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Silenser Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

RADIATOR FOUNDATION

Plan S=1:50

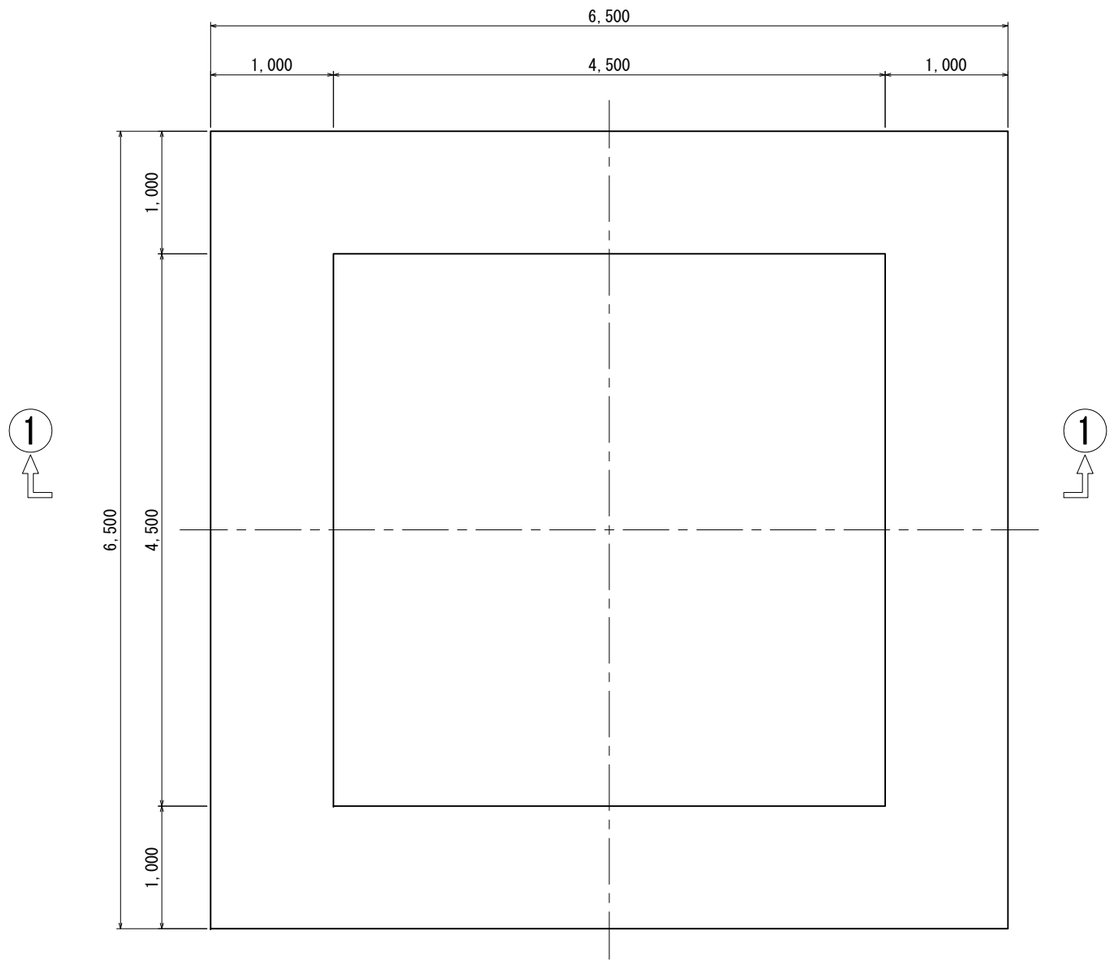


①-①Section S=1:50

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Radiator Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

SCRUBBER FOUNDATION

Plan S=1:50



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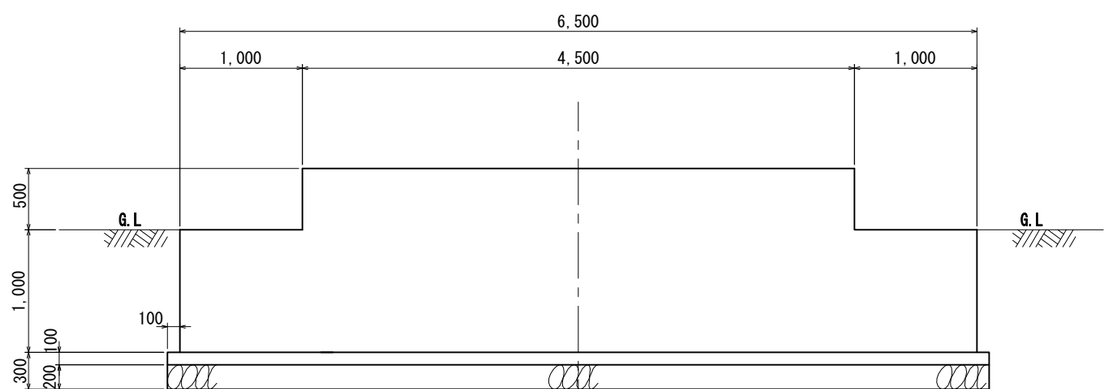
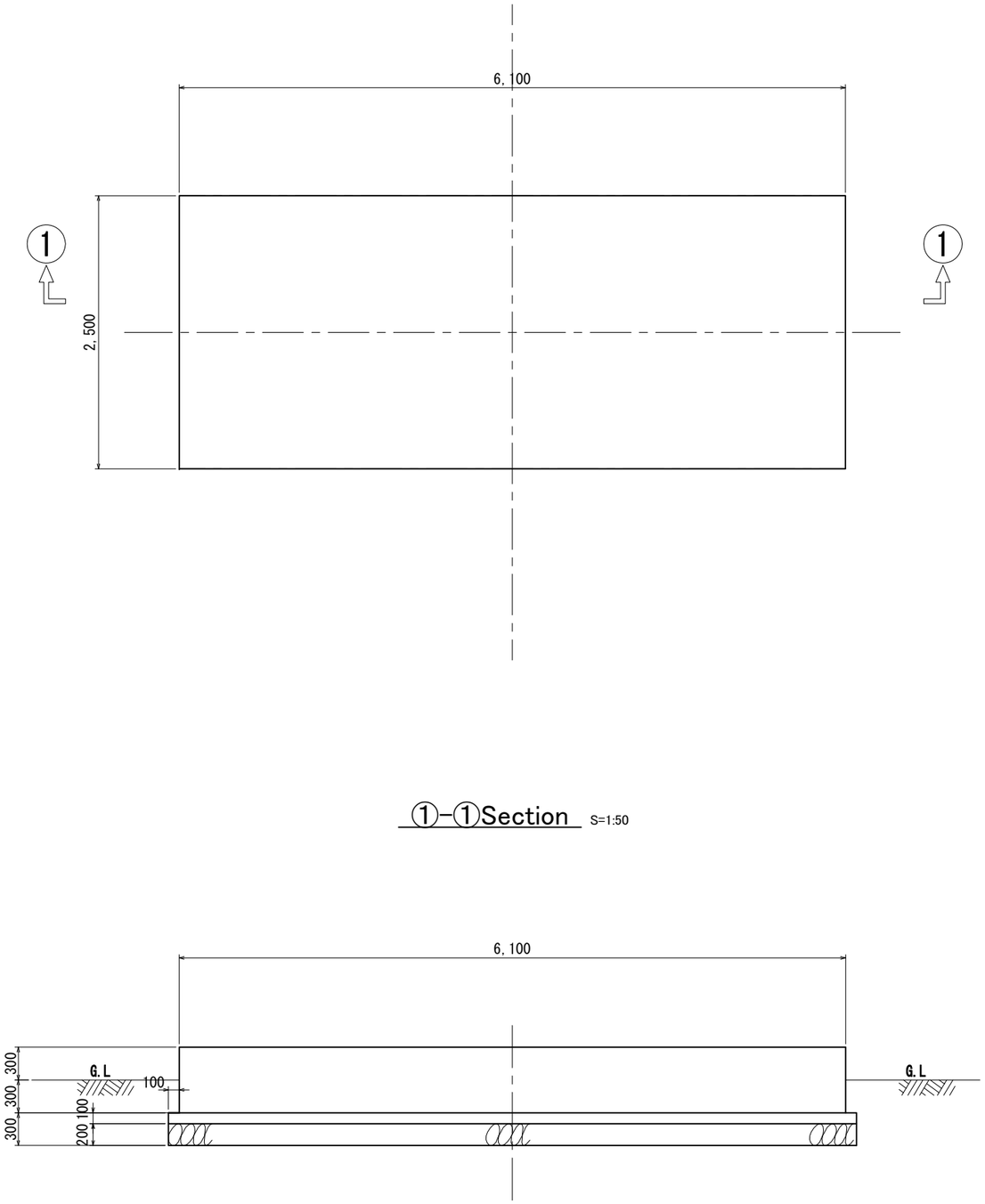


Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Scrubber Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

CONTROL CONTAINER FOUNDATION

Plan S=1:50



①-①Section S=1:50

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Control Container Foundation	
/	Scale 1:50
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

TERMINAL POINT
Ⓒ : CUSTOMER

barG P barG — Design pressure for strength calculation
degC T degC — Design Temperature for strength calculation
Flow direction

LA−10D well area

existing silencer
well logging valve
50A S/80 STPG370
PI
TI
PIT
TE
TW
250A S/80 STPG370
250A
10"
50A S/80
250A S/40 STPG370
50A S/40 SUS304L
LA−10D thermal pond
LA−10D well
68barG P 9.0barG
290degC T 180degC
ground

LA−9D well and power plant area

80A S/40
100A S/40
LS
LCP
LA−9D thermal pond
LCP : Local Control Panel
50A S/40 SUS304L
for pump disassemble
thermal drain sump pump
(1×100%)
head : 58 m
capacity : 0.4 m³/min

LA−9D well
61barG P 9.0barG
285degC T 180degC
LIT
LT
LI
450A S/40 STPG370
brined flange for future connection
250A
separator
drain cooling zone (for anti−flashing)
steam
set pressure=9.0barG
capacity=66t/hr(steam)
250A S/40 STPG370
PDI
PDT
PI
TI
PT
TE
TW
9.0barG P 7.0barG
180degC T 104degC
350A S/40 STPG370
500A S/STP STPY400
turbine exhaust silencer
warming line 50A S/40 STPG370
104degC T 7.0barG
180degC P 9.0barG
stem leak STPG370 40A S/40
80A S/40 gland steam
turbine exhaust
800A S/STD STPY400
700A S/STD STPY400
FI
FT
MSV
CV
casing drain
steam turbine generator
G
well head power plant (inside of enclosure)
50A S/40 SUS304L
T
demister (scrubber)
LI
LT
LIT
(motor operation)
65A SUS304L
100A
65A
50A S/40 SUS304L
ground
seat drain
casing drain
50A S/40 SUS304L
100A S/40 SUS304L
80A S/40 SUS304L

FI
FT
STPG370 SUS304L
50A S/40
200A S/40 STPG370
drain discharge
50A S/40
(motor operation)
150A S/40 SUS304L
(motor operation)
ground
ground
250A S/40 SUS304L
250A S/40 STPG370
STPG370 SUS304L
9.0barG 180degC
P T
15barG 180degC
SUS304L STPG370
restriction orifice (if necessary)
100A S/40 SUS304L
50A S/40 SUS304L
12barG P 15barG
100degC T 180degC
ground

reinjection well area
well logging valve
250A
10"
50A S/40 SUS304L
reinjection well LA−7
ground

Pilot Plant
8"
250A S/40 STPG370
brine reinjection line

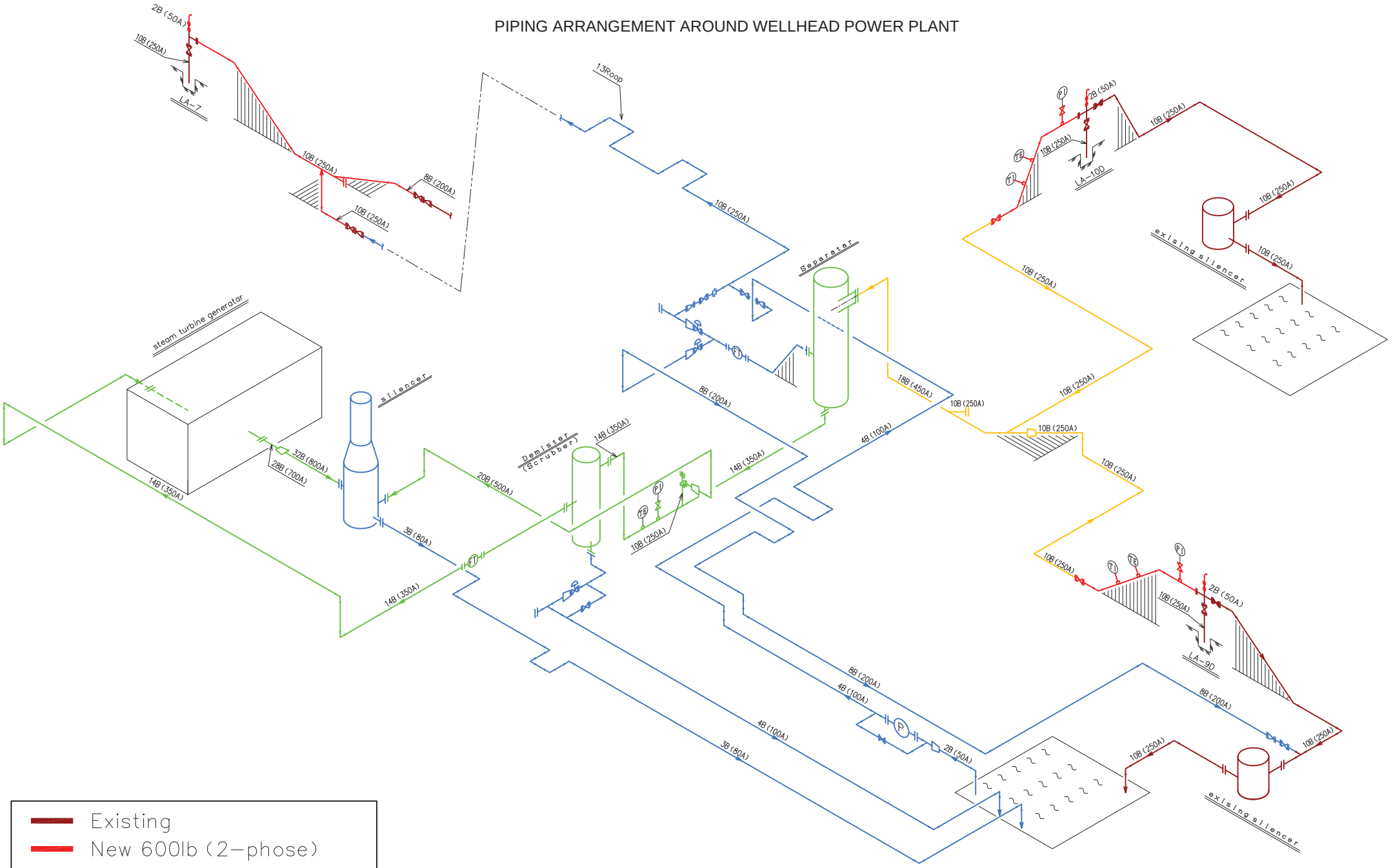
Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia

Wellhead Steam and Brine Flow

/ | Scale | −

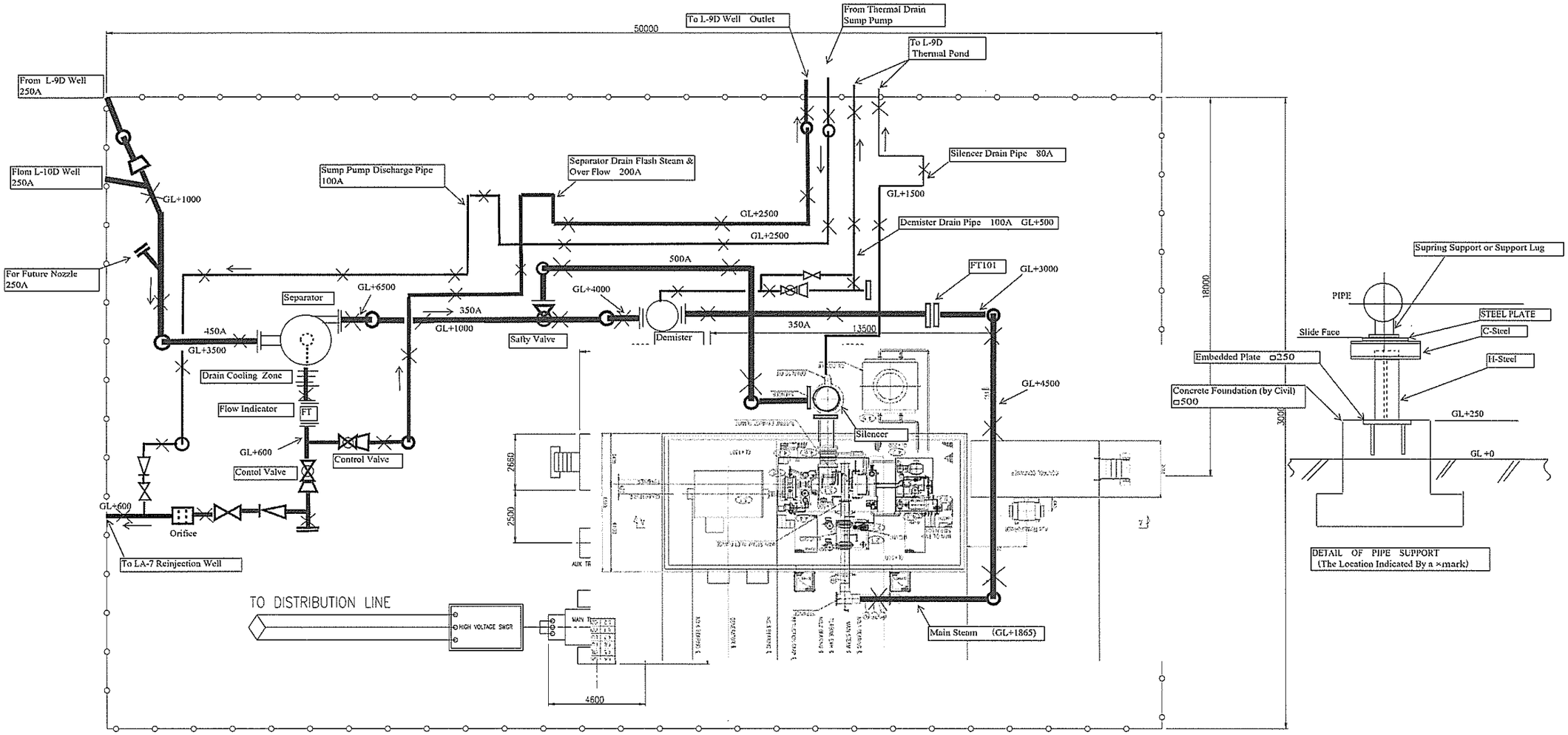
WEST JAPAN ENGINEERING CONSULTANTS, INC.

PIPING ARRANGEMENT AROUND WELLHEAD POWER PLANT



- Existing
- New 600lb (2-phose)
- New 150lb (2-phose)
- New 150lb (Brine or Drain)
- New 150lb (Steam)

Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	
Piping Arrangement Around Wellhead Power Plant	
Scale	–
WEST JAPAN ENGINEERING CONSULTANTS, INC.	



Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia

General Piping Arrangement Around T/G

/ | Scale

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Adamitulu S/S

To Butajira S/S
To Assela S/S
To Shashsmane S/S

132/15kV
20/25MVA

132/33/15kV
9.8MVA

Bulubula
Ziway
Butagera
Mekay
Caustic Soda

LA

Exsisting Pilot Plant

LS
24kV 800A
15 kV CVT Cable

High Voltage Switch Gear
LA
VT x2 6600/110 V
CT x2 750/5 A
VCT
DS
VCB or GCB
24 kV 400 A,12.5kA

15 kV CVT Cable
100sqx1

MAIN TRANSFORMER
6500 kVA
15/6.6 kV

6.6 kV CVT Cable
150sq 2cx3

Midium Voltage Switch Gear
89R DS
VT x2 6600/110 V
CT x2 750/5 A
VCT
ZVT
6600/110/ 110/3 V
F F
VT.T 59N
VT.T 27
ES
ESR

89L DS
88T CBS
7.2 kV 200 A
F

89G
52G VCB
7.2 kV 600 A
8 kA

W/Wh/A
--Wh;PULSE
--W/A;4-20 mA

CT x3
30/5 A
40 VA
For Protection
ZCT
200/1.5 mA

CT x3
750/5 A
ES
ESG

6.6 kV CVT Cable
22sqx1

UNIT AUXILIARY TRANSFORMER
300 kVA
6.9/R6.6/6.3 kV
/400 V

600 V CV Cable
200sq 3cx1

VT x2
6600 kV/110 V
100 VA
F F

CT x3
750/5 A
15 VA

CT x3
750/5 A
40 VA

For Protection
ZCT
200/1.5 mA

6.6 kV CVT Cable
150sq 2cx3

Generator
GENERATOR
6500 kVA
6.6 kV 569 A
4P 1500rpm
0.85PF (lagging)
G
MTR
CT x3
1250/5 A
15 VA

Low Voltage Switch Gear
MCCB
400 A 4P
AC400 V 3φ-4W
MCCB MCCB MCCB
30kVA
400/220-110 V
MC
OL
600 V CV Cable
AC DP
M
AUX. MOTOR

Power Distribution Panel
DC 110 V
MCCB MCCB MCCB ATD VTD F
BATTERY
GEN. CNTL
TURB. CNTL
EOP MOT.

Protection Panel
TRANCE FORMER PROTECTION RELAY UNIT
CT.T
Protection Equipment
GENERATOR PROTECTION RELAY UNIT
VT.T
CT.T
Protection Equipment
CT.T
VT.T
MANUAL-AUTO
SYNCHRONZING EQUIPMENT
F
25A/60
25B
SY
F V
SL
VT.T
F

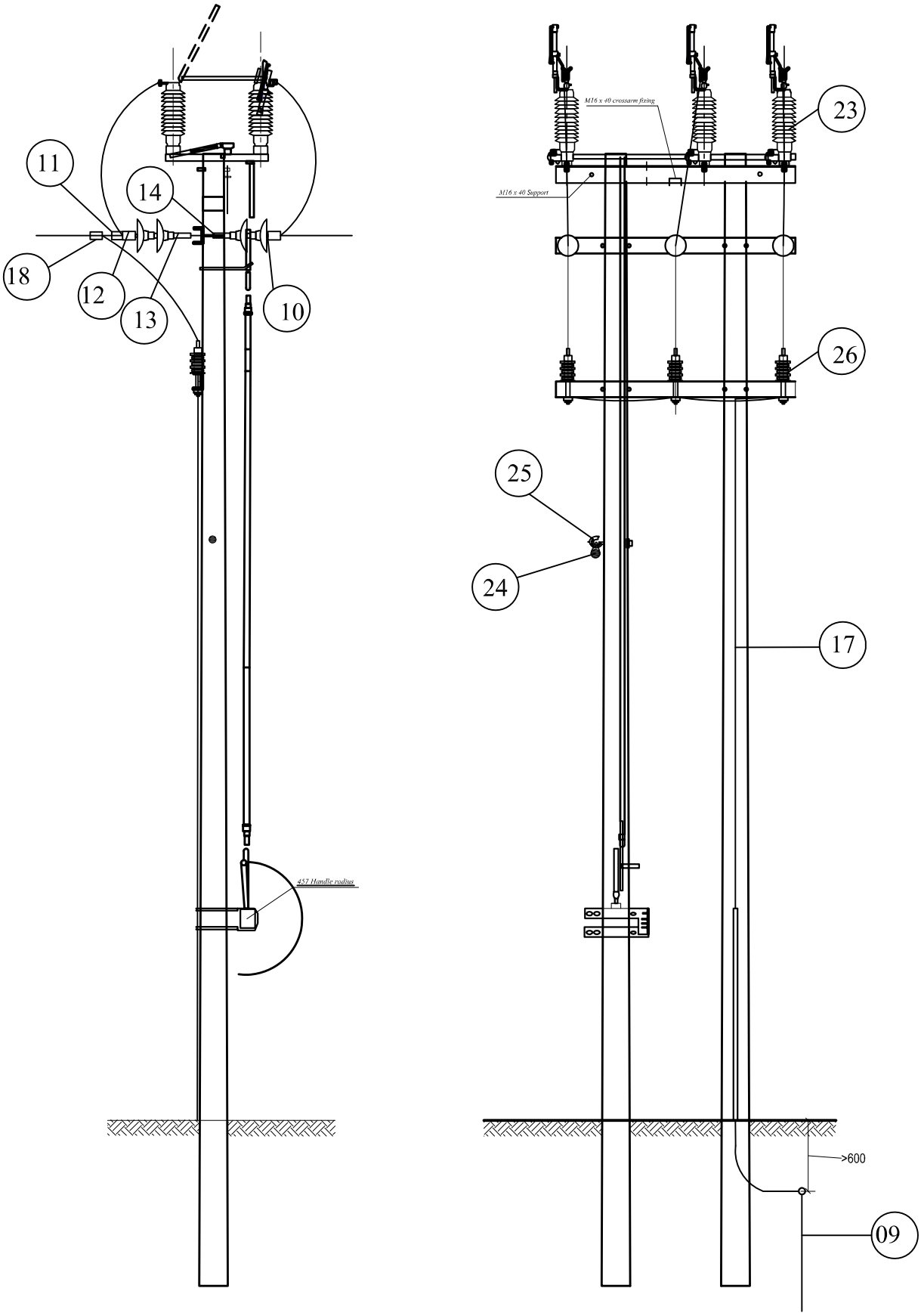
Turbine Control Panel
VT.T
ISO
EHC/AVR
PHC
ISO
VT.T
CT.T
41E
F
PMG

				SCALE
				NON
Title: Single Line Diagram				DWG.No. 26
DATE	DESIGNED	CHECKED	APPROVED	REVISION
Jul 2016	T.NAKAMURA	T.MATSUO	Y.FUNAKOSHI	
West Japan engineering Consultants,inc.				

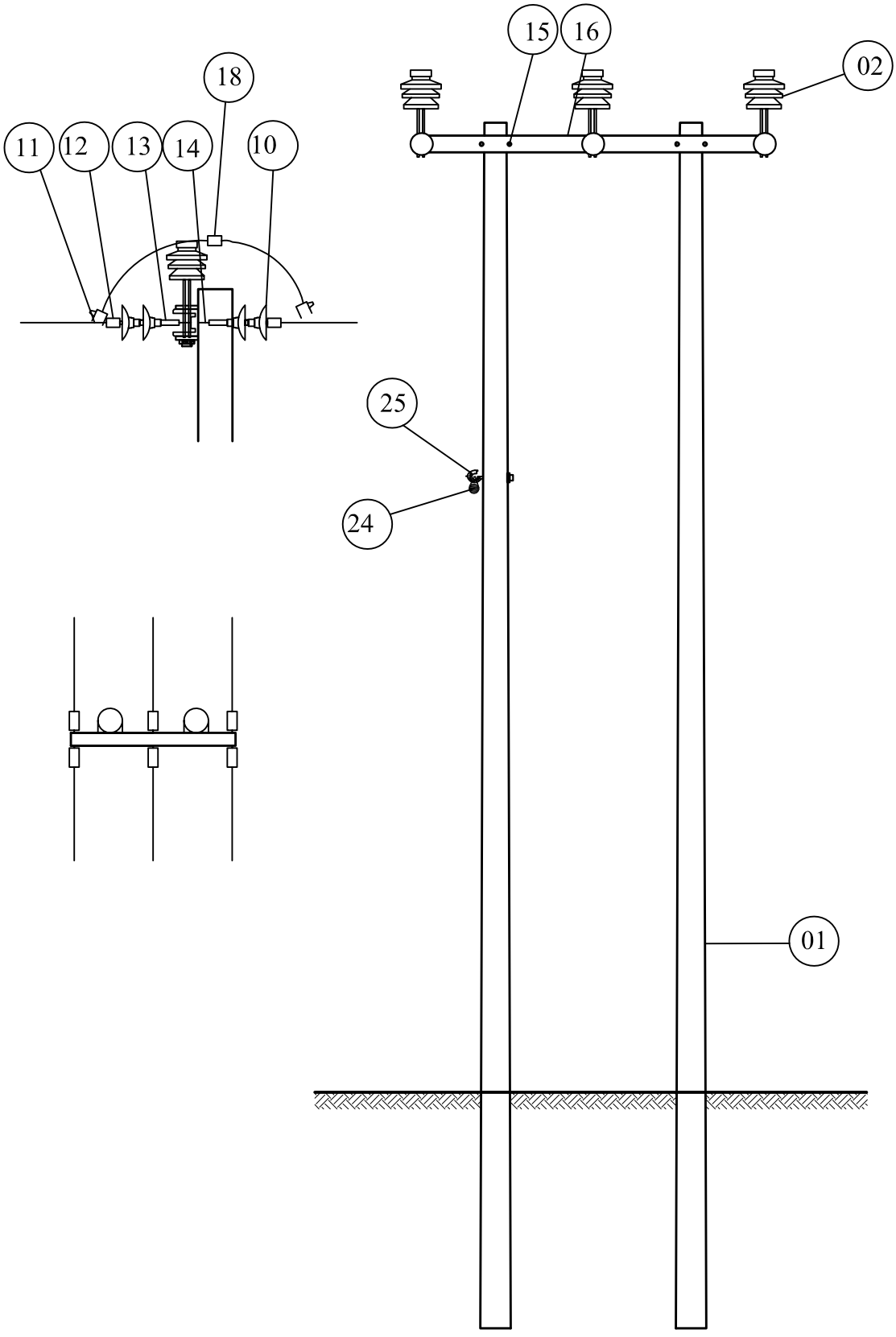
WJ-4245-00

Line Material Bill of Quantity

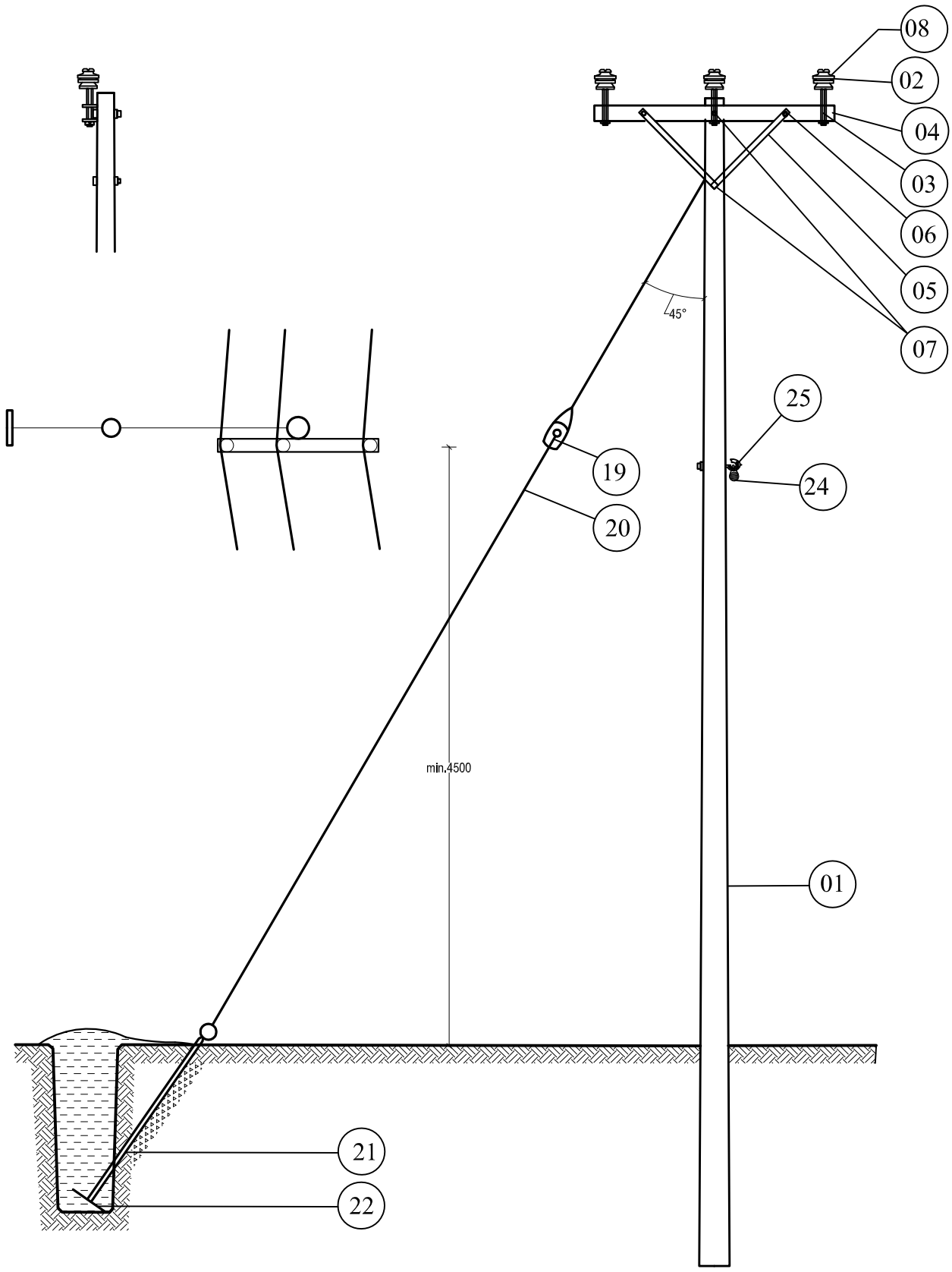
No.	Description	Designation in drawings	Unit	Quantity
1	Conductor AAC 95		M	**2400**
2	Wooden pole 12 m	01	Each	26
3	15 kV Pin insulator	02	each	48
4	15 kV Insulator pin	03	each	48
5	15 kV Cross arm for suspension	04	each	10
6	Cross arm tie strap	05	each	20
7	Bolt M10x30 + Nut M10	06	each	20
8	Long bolt M16x300 + Nut M16	07	each	20
9	Tie wire	08	lot	1
10	15 kV disc insulator (see spec. annex 2.4)	10	each	96
11	Strain clamp	11	each	48
12	Socket eye	12	each	48
13	Ball eye	13	each	48
14	Small collar	14	each	48
15	Big collar	15	each	20
16	15Kv Cross arm HA	16	each	10
17	Parallel grove clamp	18	each	24
18	Stay insulator 15 kV	19	each	11
19	Stay wire	20	lot	11
20	Stay rod MV	21	each	11
21	Stay plate	22	each	11
22	15 kV Load break switch	23	each	2
23	Fiber optics cable support	24	Set	18
24	Fiber optics cable support clamp	25	Set	18
25	Lightening arrestor	23	each	6
26	Earthling rod	09	each	2
27	Copper wire for earthling	17	lot	2



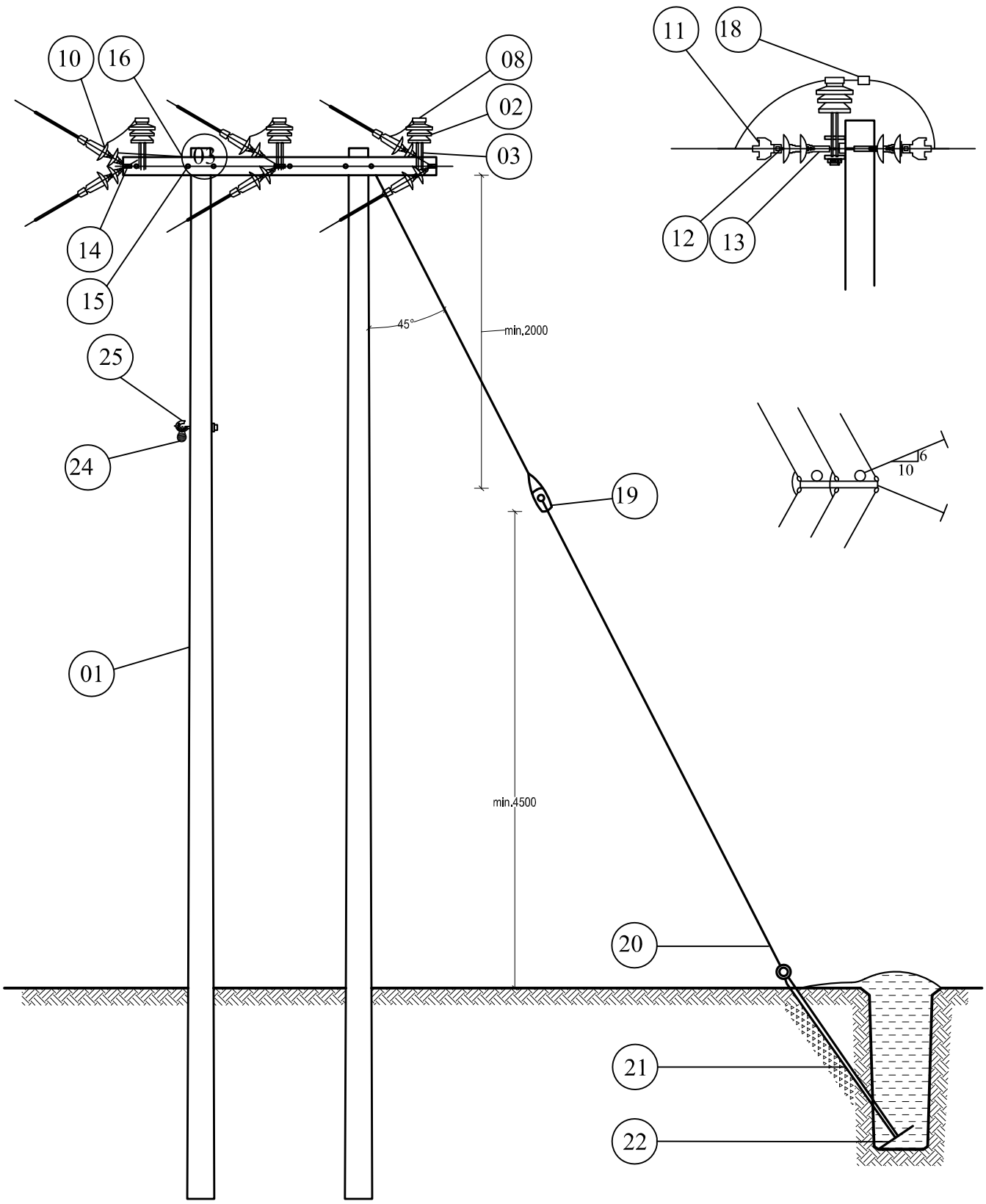
	Project Title	Drawing Title
	Study of 15kv Distribution Line for Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	15 kv Terminal Structure
Date 04-08-2016	Drawing number DL1-1	Rev: 3



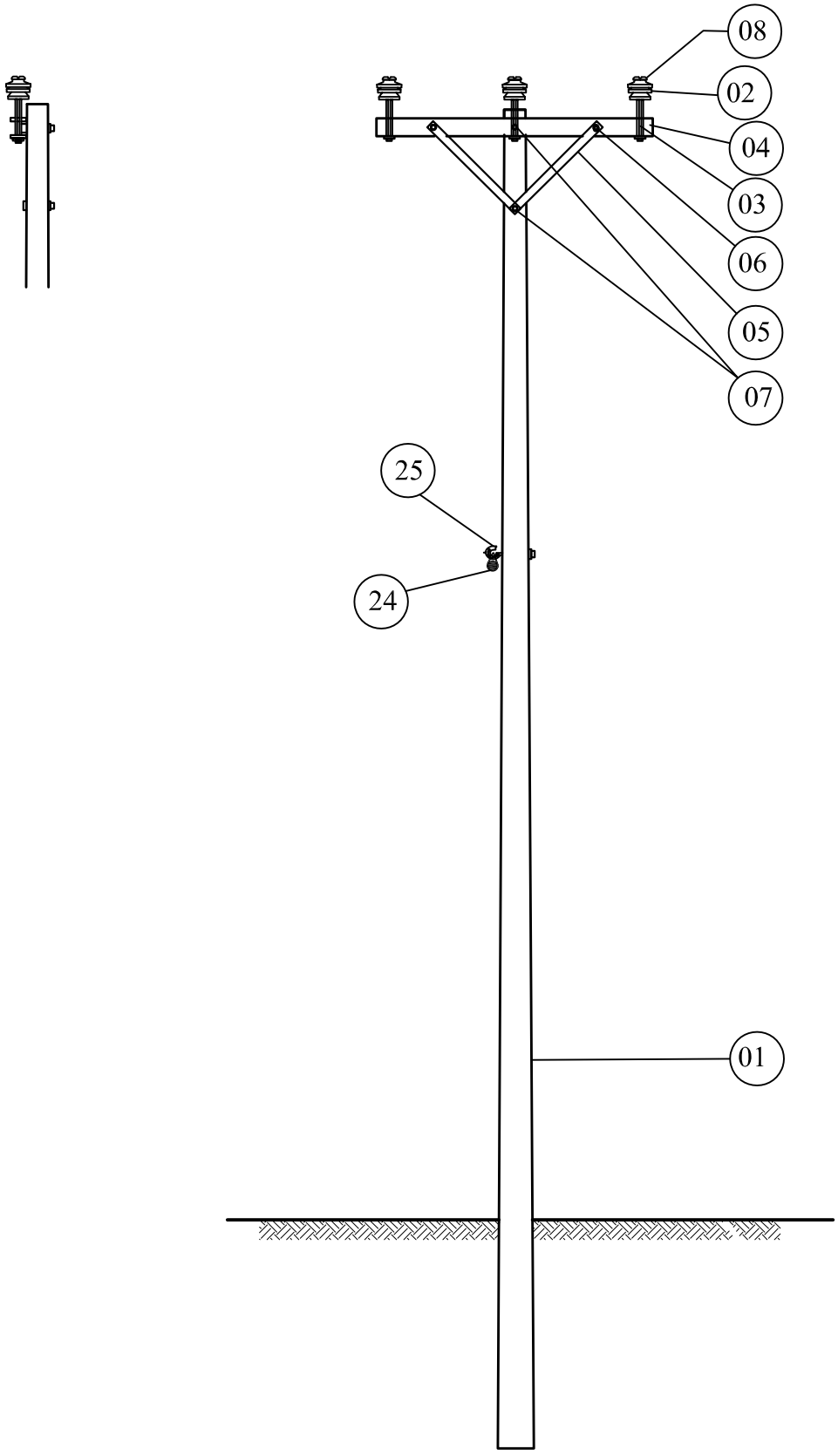
	Project Title	Drawing Title
	Study of 15kv Distribution Line for Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	15 kv Tension Structure
Date 04-08-2016	Drawing number DL1-2	Rev: 3



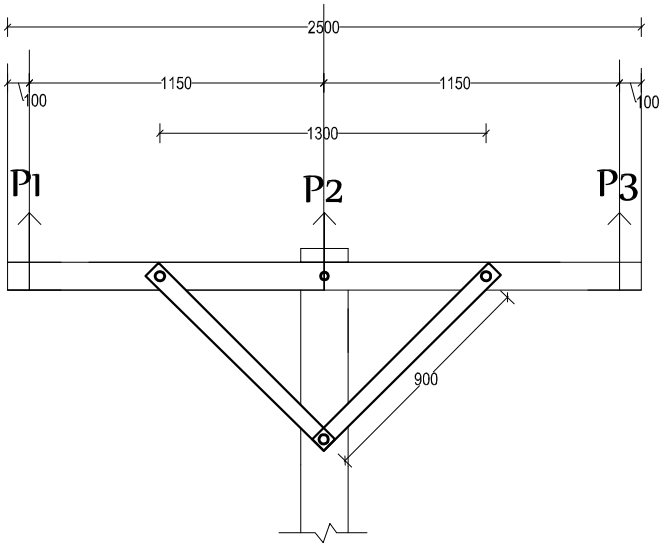
	Project Title	Drawing Title
	Study of 15kv Distribution Line for Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	15 kv Light Angle Structure
Date 04-08-2016	Drawing number DL1-3	Rev: 3



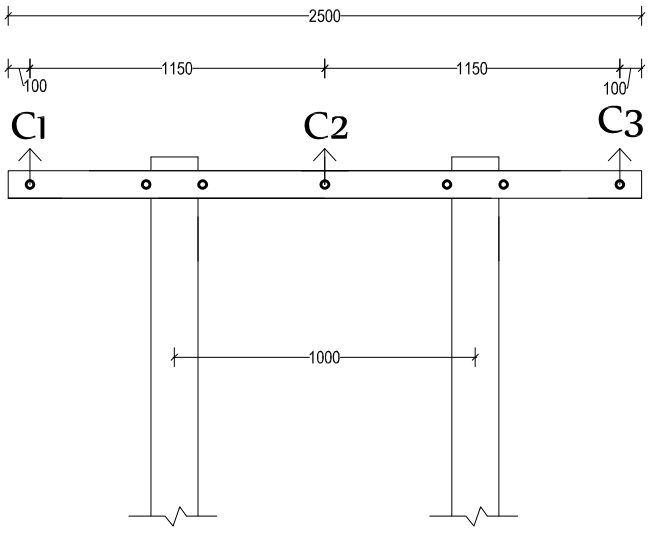
	Project Title	Drawing Title
	Study of 15kv Distribution Line for Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	15 kv Heavy Angle Structure
Date 04-08-2016	Drawing number DL1-4	Rev: 3



	Project Title	Drawing Title
	Study of 15kv Distribution Line for Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	15 kv Suspension Structure
Date 04-08-2016	Drawing number DL1-5	Rev: 3



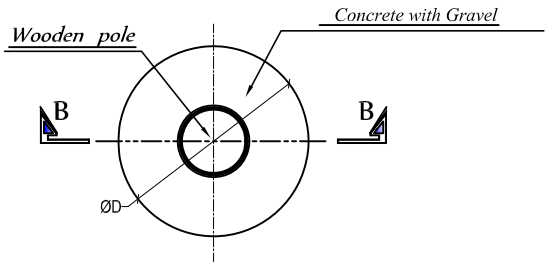
1. Suspension and light angle 15kv cross arm



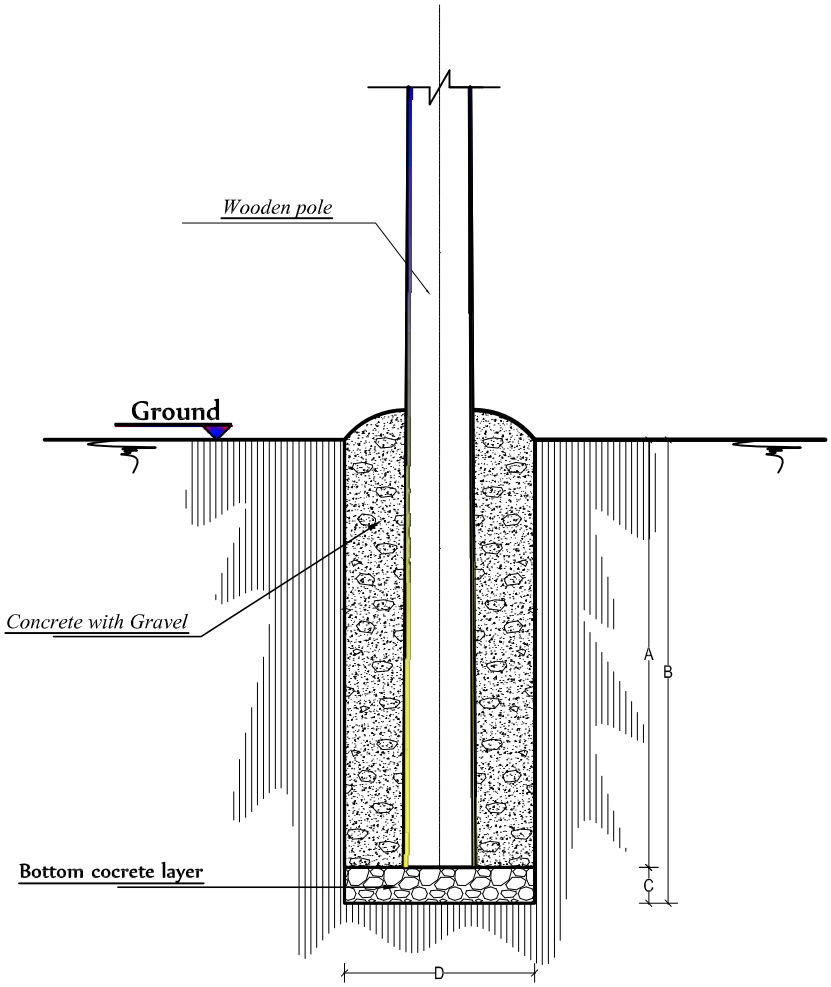
2. Heavy angle, tension and termination 15kv cross arm

Note: All dimensions are in mm

	Project Title	Drawing Title
	Study of 15kv Distribution Line for Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	Cross Arm Arrangment Detailing
Date 04-08-2016	Drawing number DL1 AUX 1	Rev: 3



TOP VIEW



SECTION B-B

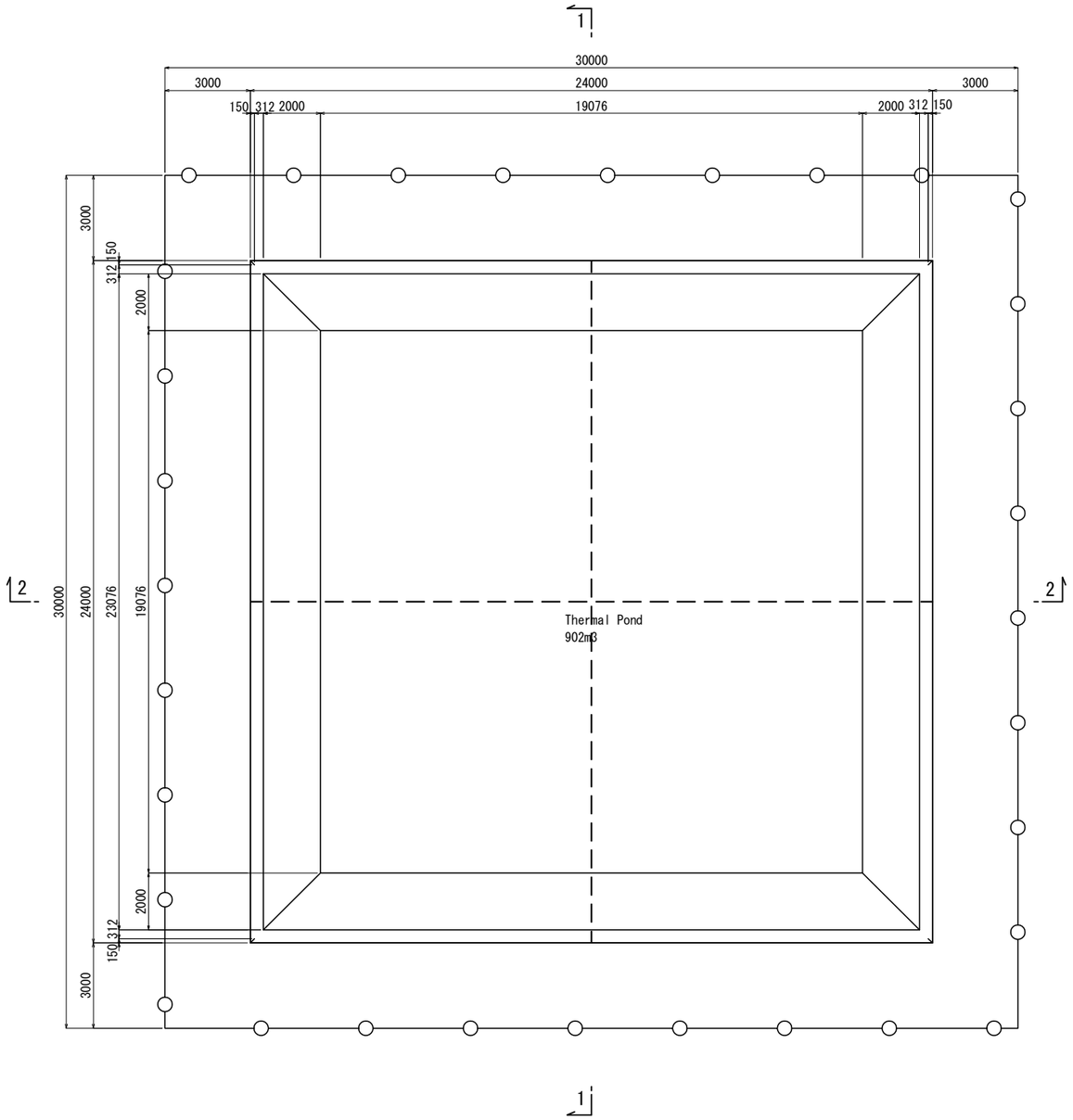
Note: A= Embeded depth
B= Depth of excavation
C= concrete layer thickness
D= Diameter of excavation

	Project Title	Drawing Title
	Study of 15kv Distribution Line for Preparatory Survey for Geothermal Wellhead Power System Project in Ethiopia	Pole Foundation
Date 04-08-2016	Drawing number DL1 AUX2	Rev: 3

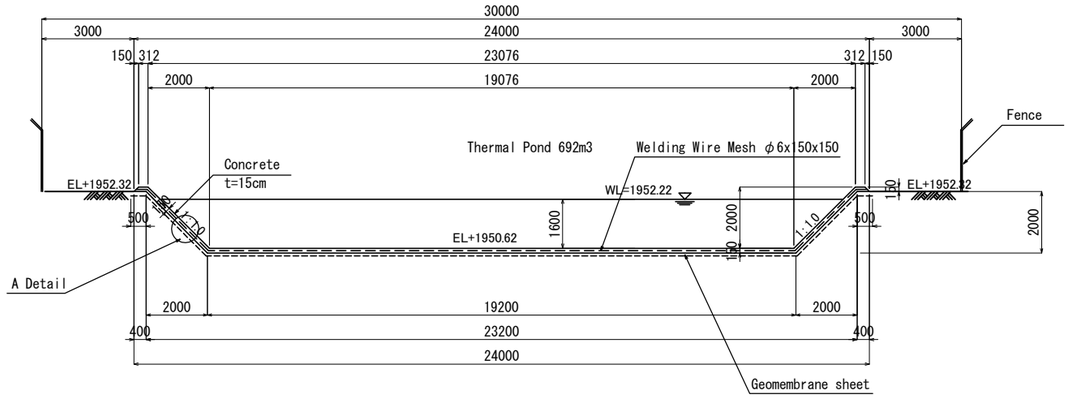
Drawing No.35 : 15kV Distribution Line Route Plan

LA-9D Thermal Pond(Concrete) S=1:200

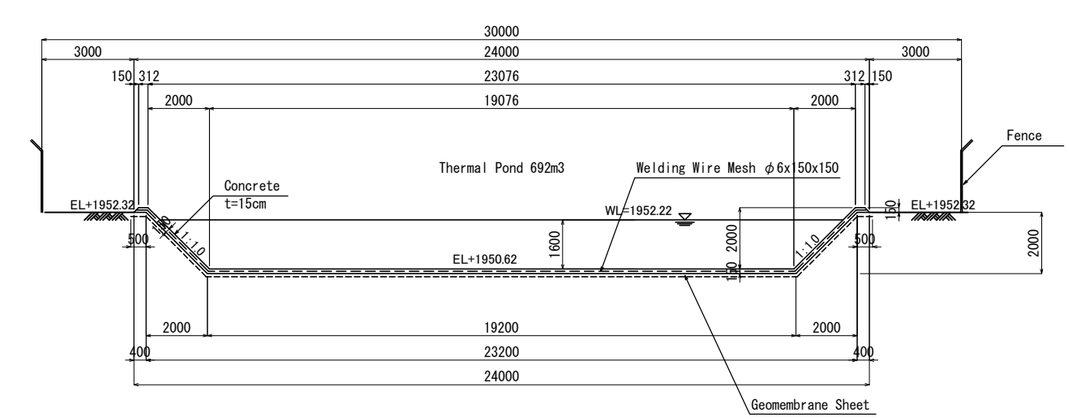
Plan



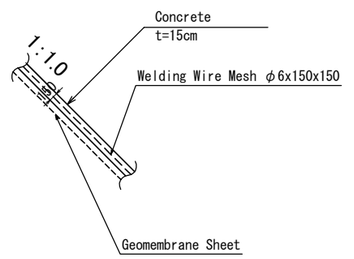
1-1 Section



2-2 Section



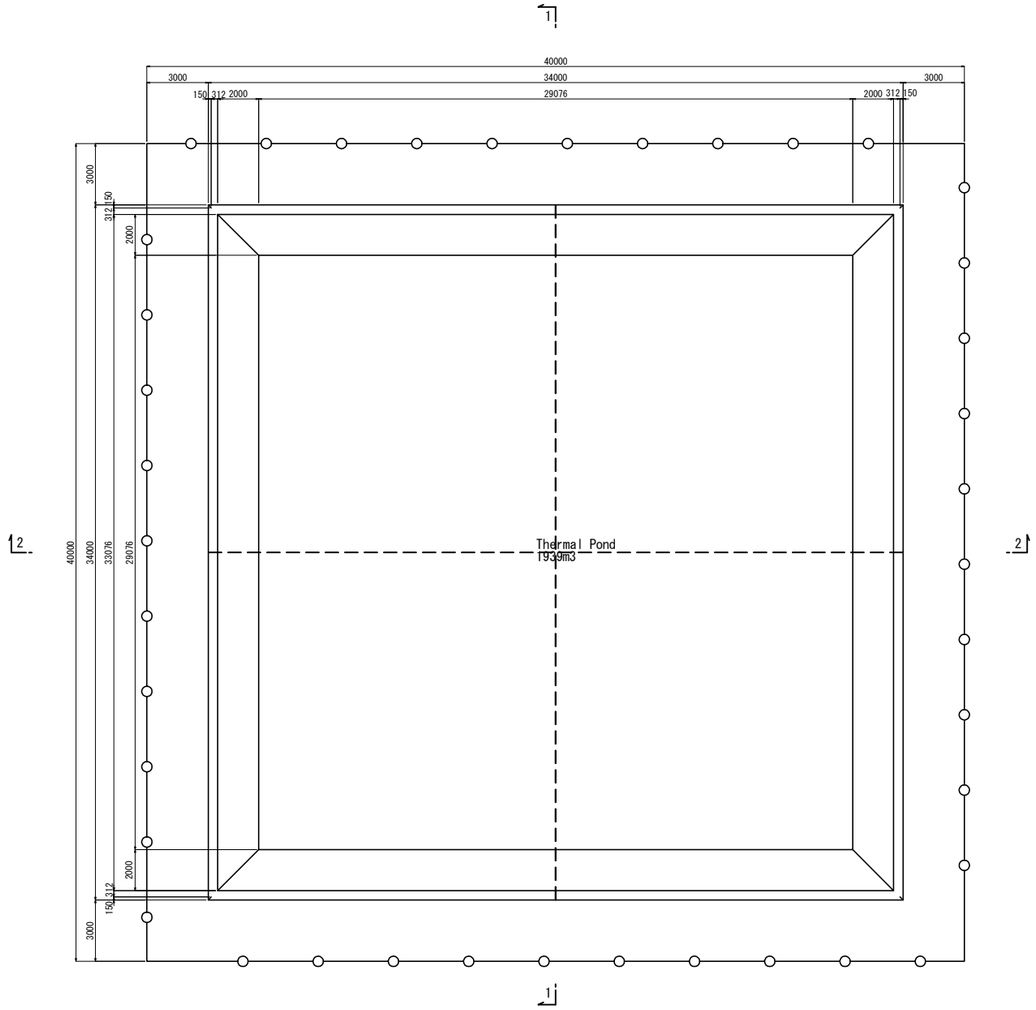
A Deatail S=1:100



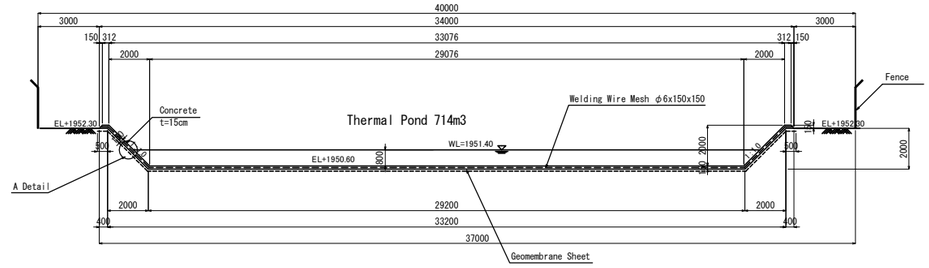
Preparatory Survey for the Project Geothermal Wellhead Power System	
LA-9D Thermal Pond(Concrete)	
/	Scale 1:200
WEST JAPAN ENGINEERING CONSULTANTS, INC.	

LA-10D Thermal Pond(Concrete) S=1:300

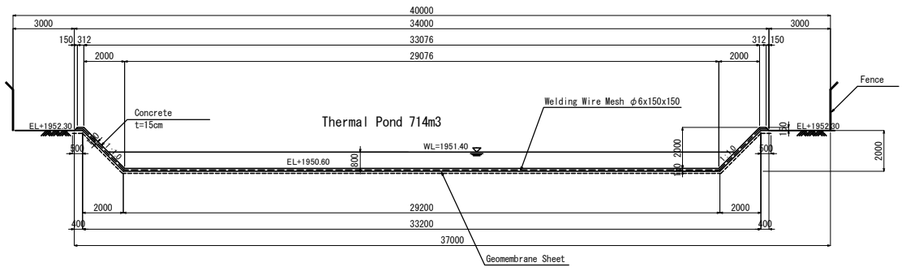
Plan



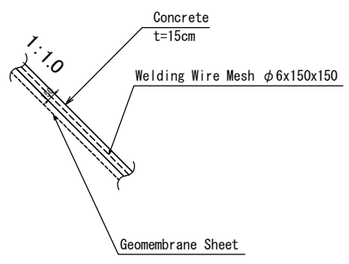
1-1 Section



2-2 Section



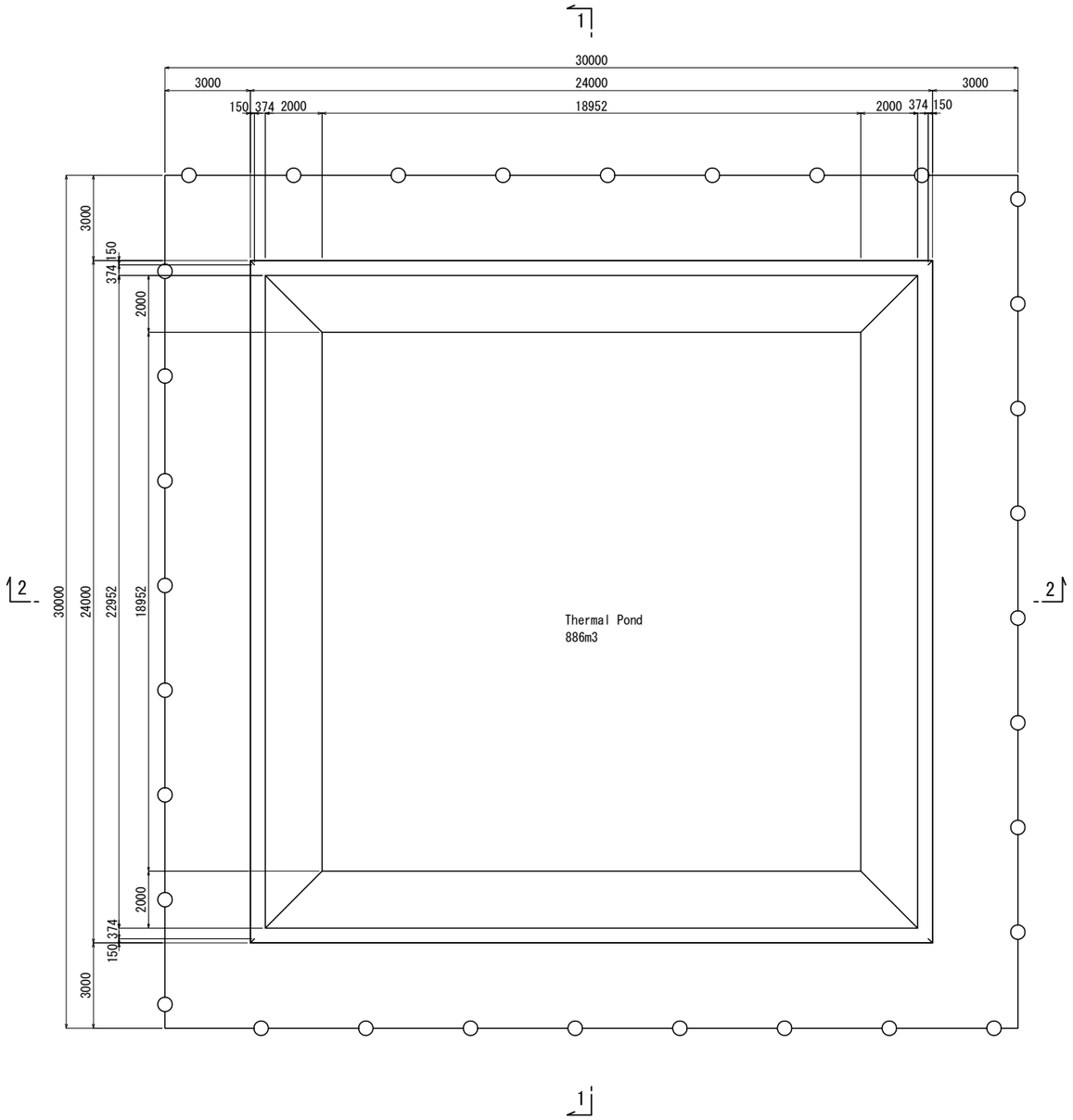
A Detail S=1:100



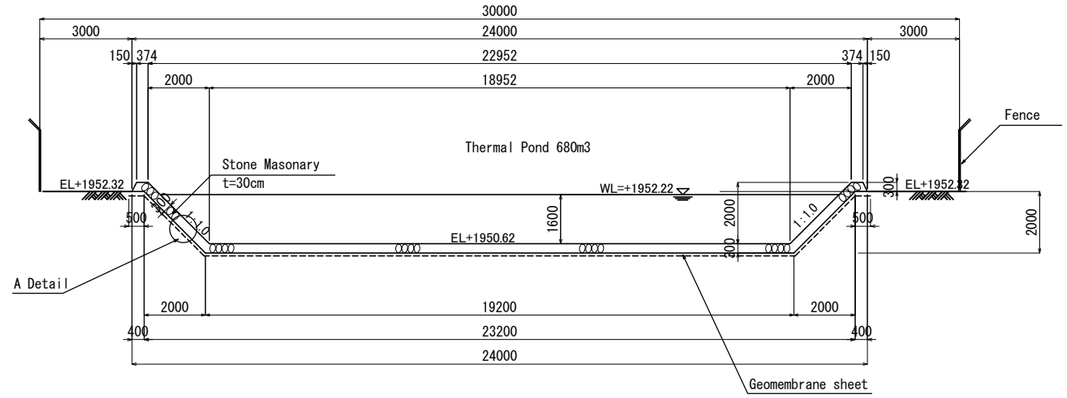
Preparatory Survey for the Project Geothermal Wellhead Power Stystem		
LA-10D Thermal Pond(Concrete)		
/	Scale	1:300
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

LA-9D Thermal Pond(Stone Masonry) S=1:200

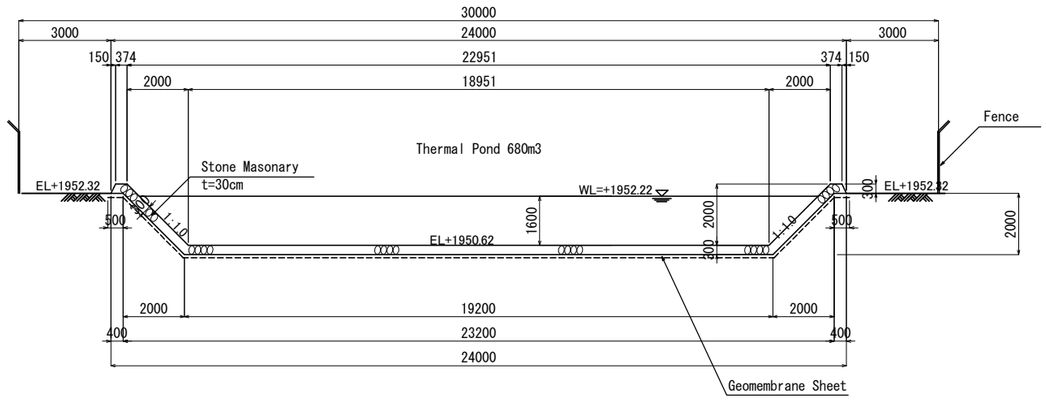
Plan



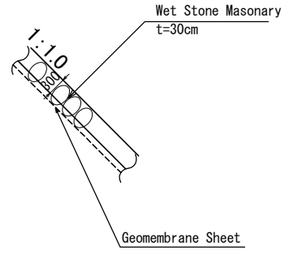
1-1 Section



2-2 Section



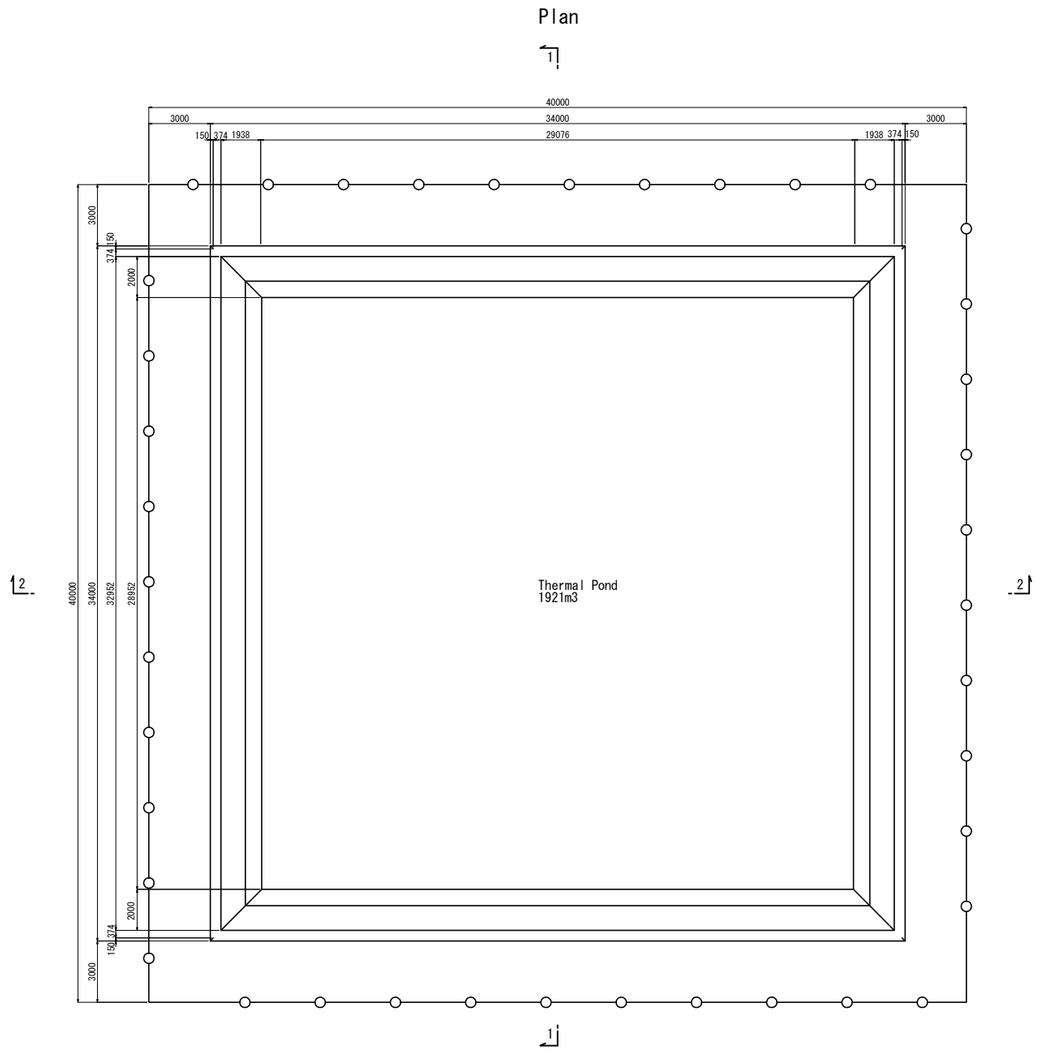
A Deatail S=1:100



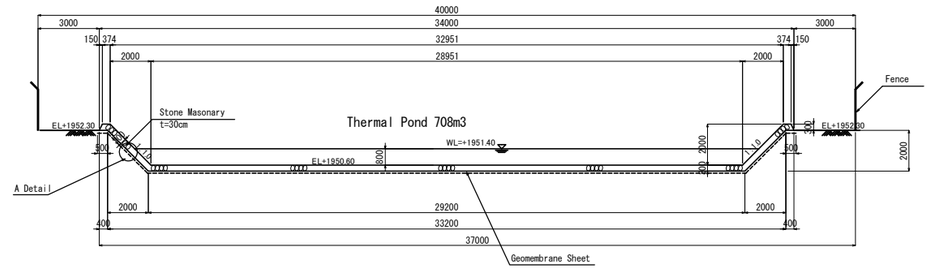
Preparatory Survey for the Project Geothermal Wellhead Power System		
LA-9D Thermal Pond(Stone Masonry)		
/	Scale	1:200
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

LA-10D Thermal Pond(Stone Masonry) S=1:300

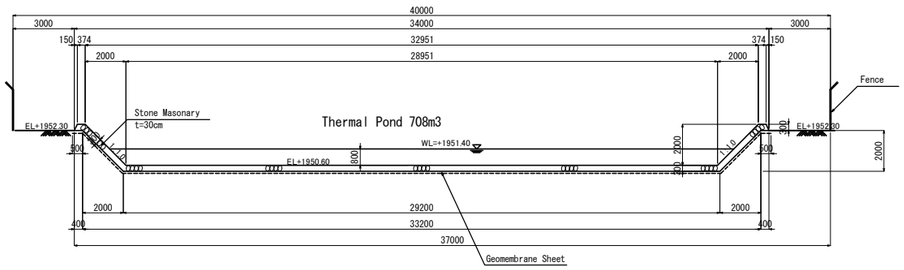
Plan



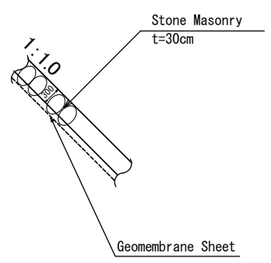
1-1 Section



2-2 Section



A Detail S=1:100



Preparatory Survey for the Project Geothermal Wellhead Power Stystem		
LA-10D Thermal Pond(Stone Masonry)		
/	Scale	1:300
WEST JAPAN ENGINEERING CONSULTANTS, INC.		

6-2 Geothermal Resources Development Proclamation No. 981/2016

የኢትዮጵያ ፌደራላዊ ዲሞክራሲያዊ ሪፐብሊክ

ፌዴራል ነጋሪት ጋዜጣ

FEDERAL NEGARIT GAZETTE

OF THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

ሃያ ሁለተኛ ዓመት ቁጥር ፩፻፰
አዲስ አበባ መስከረም ፮ ቀን ፪ሺ፱ ዓ.ም

በኢትዮጵያ ፌደራላዊ ዲሞክራሲያዊ ሪፐብሊክ
የሕዝብ ተወካዮች ምክር ቤት ጠባቂነት የወጣ

22nd Year No. 108
ADDIS ABABA 16th September, 2016

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በመንግሥትና በግሉ ዘርፍ የሚካሄዱ የጂኦተርማል ኃይል ማመንጨት ተግባራትን የሚደግፍ የሕግ እና የቁጥጥር ማዕቀፍ መኖር ለውጤታማ የጂኦተርማል ሀብት ልማትና ጥቅም ላይ መዋል አስፈላጊ በመሆኑ፤

የጂኦተርማል ሀብት ልማት እና ተግባራት ዓላማ ዎችን ከግብ ለማድረስ የሚመራ አዲስ ሕግ ማውጣት በማስፈለጉ፤

በኢትዮጵያ ፌደራላዊ ዴሞክራሲያዊ ሪፐብሊክ ሕገመንግሥት አንቀጽ ፶፭ (፪) (ሀ) መሠረት የሚከተለው ታውጇል::

PROCLAMATION No. 981/2016

A PROCLAMATION TO PROVIDE FOR GEOTHERMAL RESOURCES DEVELOPMENT

WHEREAS, it is necessary to ensure the conservation and development of geothermal resources for the social and economic benefit and growth of the country;

WHEREAS, it is necessary to ensure that the geothermal resources are utilized for the most economically benefits of the country, including electricity generation;

WHEREAS, putting in place the legal and regulatory framework to support geothermal power generation by the public and private sectors is essential to successful development and use of geothermal resources;

WHEREAS, it is essential to promulgate a new law which guides the achievement of the objectives of the geothermal resources development and operations;

NOW, THEREFORE, in accordance with Article 55 (2) (a) of the Constitution of the Federal Democratic Republic of Ethiopia, it is hereby proclaimed as follows:

ያንዱ ዋጋ
Unit Price 64.75

ነጋሪት ጋዜጣ ፖ.ሣ.ቁ ፹ሺ፩
Negarit G. P.O.Box 80001

ክፍል አንድ
ጠቅላላ

፩. አጭር ርዕስ
ይህ አዋጅ "የጂኦተርማል ሀብት ልማት አዋጅ ቁጥር ፱፻፹፩/፪ሺ፰" ተብሎ ሊጠቀስ ይችላል::

፪. ትርጓሜ
የቃሉ አገባብ የተለየ ትርጉም የሚያሰጠው ካልሆነ በስተቀር በዚህ አዋጅ ውስጥ፦

፩/ "የጂኦተርማል ሥራ" ማለት በዚህ አዋጅ መሠረት የሚሰጥ ፈቃድ የሚያስፈልጋቸው ተግባራት ናቸው፤

፪/ "የጂኦተርማል ሀብት" ማለት የማዕድንም ሆነ የውሃ ሀብት ወይም ቁሳዊ ንብረት ያልሆነ ነገር ግን ለዚህ አዋጅ አፈፃፀም የጂኦተርማል ኢነርጂ፣ የጂኦተርማል ተረፈ ምርትን እና የጂኦተርማል ፈሳሽን የሚያካትት ተፈጥሯዊ የመሬት ሙቀት ነው፤

፫/ "የጂኦተርማል ኢነርጂ" ማለት በማንኛውም ሁኔታ ከመሬት ገፀ-ምድር በታች የሚገኝ ሆኖ ከተፈጥሮአዊ የመሬት ሙቀት የተገኘ ወይም የተፈጠረ ወይም ከዚሁ የተፈጥሮ ሙቀት ውስጥ የወጣ ኢነርጂ ነው፤

፬/ "የጂኦተርማል ተረፈ-ምርት" ማለት ዘይት፣ የሃይድሮ ካርቦን ጋዝና ሂሊየምን ሳይጨምር በመጠን፣ በጥራት ወይም በቴክኒክ ረገድ ለማውጣት ወይም ለማምረት አስቸጋሪ በመሆኑ ምክንያት ራሳቸውን ችለው እንዳ ይወጡ ወይም እንዳይመረቱ በቂ ጠቀሜታ የሌላቸው ሆኖም ውህድ ሆኖ ወይም በጂኦ ተርማል እንፋሎት ውስጥ የሚገኙ ማንኛውም ማዕድን ነው፤

፭/ "የጂኦተርማል ፈሳሽ" ማለት ውሃ፣ ብራይንና እንፋሎትን አካቶ በሚገኝበት ከፍታ ወይም ጥልቀት ሙቀቱ ውሃ የሚፈላበት ደረጃ የደረሰም ይሁን ከዛ በላይ እንዲሁም ሙቀቱ የተገኘው በተፈጥሮም ይሁን በሪኢንጀክሽን ከጅኦተርማል ሀብት ጋር የተያያዘ ፈሳሽ ነው፤

PART ONE
GENERAL

1. Short Title
This Proclamation may be cited as the "Geothermal Resources Development Proclamation No. 981/2016".

2. Definitions
In this Proclamation, unless the context otherwise requires:

1/ "geothermal operations" means activities requiring a license to be issued pursuant to this Proclamation;

2/ "geothermal resources" means the natural heat of the earth, neither mineral resources, water resources or real property, but for the purposes of this Proclamation, includes geothermal energy, geothermal by-products, and geothermal fluids;

3/ "geothermal energy" means energy, in whatever form, exist below the surface of the earth, resulting from, or created by, or which may be extracted from such natural heat;

4/ "geothermal by-products" means any mineral exclusive of oil, hydrocarbon gas, and helium but which are found in solution or in association with geothermal steam and which, because of quantity, quality, or technical difficulties in extraction and production, are not of sufficient value to warrant extraction and production by themselves;

5/ "geothermal fluids" means those fluids associated with geothermal resources, including water, brines, and vapour, that have value by virtue of the heat contained therein, whether or not such fluids have a temperature that is the boiling point of water or greater than the boiling point of water at the altitude or depth of the occurrence, and whether the heat contained therein is naturally occurring or is transmitted in fluids artificially introduced into an underground formation;

፭/ "የጂኦተርማል ሀብት ክልል" ማለት ማንኛውም የጂኦተርማል ሀብት የተገኘበት ወይም የሀብቱ መገኛ እንደሆነ ታምኖ በፈቃድ ሰጪው ባለሥልጣን በሕዝብ ማስታወቂያ የተሰየመ ማንኛውም መሬት ነው፤

፮/ "የንግድ ማህበር" ማለት በኢትዮጵያ የንግድ ሕግ የተሰጠው ትርጉም ይኖረዋል፤

፯/ "ደረጃ I የጂኦተርማል ሀብት" ማለት የኤሌክ ትሪክ ኃይል ለማመንጨት ብቃት ያለውና በዚያው አካባቢ እንደማሞቂያና የተቀናጀ መቀትና ኃይል የመሣሠሉ አገልግሎቶች መስጠት የሚችል ጂኦተርማል ሀብት ነው፤

፰/ "ደረጃ II የጂኦተርማል ሀብት" ማለት የኤሌክ ትሪክ ኃይል ማመንጨትን ሣይጨምር የሙቀት ኃይሉን በቀጥታ ጥቅም ላይ ለሚያውሉ አገልግሎቶች፣ ለግብርና እና ለኢንዱስትሪ፣ ለመዝናኛ ገላ መታጠቢያ እንዲሁም ለህክምናና ለመሣሠሉ ሌሎች አገልግሎቶች የሚውል የጂኦተርማል ሀብት ነው፤

፱/ "አግባብ ያለው አካል" ማለት ሐረጉ የተጠቀሰበት ድንጋጌ በሚመለከተው ጉዳይ ላይ በሕግ ኃላፊነት እና ሥልጣን የተሰጠው መንግሥታዊ አካል ነው፤

፲/ "አላቂ ዕቃዎች" ማለት ለጂኦተርማል ሥራ የሚያስፈልጉና በጂኦተርማል ሥራው ወቅት በጥቅም ላይ የሚውሉ ወይም የሚተኩ ኬሚካሎች፣ ሲሚንቶን ጨምሮ ፈቃድ ሰጪው ባለሥልጣን በመመሪያ አላቂ ዕቃዎች ብሎ የሚሰይማቸው ናቸው፤

፲፩/ "ሰነድ" ወይም "ሪከርድ" ማለት የኤሌክትሮኒክስ ጽሑፎችን ወይም ሪከርዶችን ጨምሮ ማንኛውም ጽሑፍ ወይም ሪከርድ ነው፤

፲፪/ "መቆፈር" ማለት ለጂኦተርማል ሥራ የሚደረግ የጉድጓድ ቁፋሮ ነው፤

6/ "geothermal resource area" means any land where geothermal resources have been discovered or is believed to be a source of geothermal resources and is so designated by the licensing authority by public notice;

7/ "business organization" shall have the meaning provide for under the Commercial Code of Ethiopia;

8/ Grade I geothermal resources" means a type of geothermal resources capable to generate electric power and to provide services such as direct heating and combined heat and power;

9/ "Grade II geothermal resources" means a type of geothermal resources used for the purposes such as direct heating, agricultural and industrial applications and recreational bathing and medicinal purposes, but excludes the purposes of generating electricity;

10/ "competent body" means any government organ empowered by law with responsibility and authority related to the subject specified in the provisions in which the phrase is used;

11/ "consumables" means anything may be utilized for geothermal operations and that is expendable or may be replaced during service such as chemicals, other items including cement that the licensing authority may, by directive, designate as consumables;

12/ "document" or "record" means any writing or record, including electronic writings or records;

13/ "drilling" means an operation in which a well is drilled for the purposes of geothermal operations;

፲፬/ "የምርመራ ፈቃድ" ማለት የጂኦተርማል ሀብት መኖሩንና የሀብቱን መጠንና የኢኮኖሚ ጥቅም ለማረጋገጥ ሲባል ጉድጓዶችን መቆፈርን እንዲሁም ለጉድጓድ ፍተሻ ሲባል የጂኦተርማል ፈሣሾችን መልቀቅን ጨምሮ ዝርዝር የጂኦሎጂ፣ የጂኦኬሚስትሪና የጂኦፊዚክስ ጥናቶችን በማከናወን የጂኦተርማል ሀብትን መጠን፣ አቀማመጥ፣ ባሕርያትና ወሰን ለማረጋገጥ የሚረዱ ሥራዎችን ለማካሄድ መብት የሚሠጥ ፈቃድ ሲሆን የአካባቢና ማህበረሰብ ተጽዕኖ፣ የሀብት መጠንና የአዋጭነት ጥናቶችን ማጥናትና ሌሎች ተዛማጅ ሥራዎችን ማካሄድንም ይጨምራል፤

14/ "exploration license" means a license that gives the right to undertake activities that help to establish the dimensions, position, characteristics and extent of geothermal resources by detailed geological, geochemical and geophysical studies including the drilling wells, discharge of geothermal fluids for the purpose of well testing, and also includes conducting environmental and social impact assessment, resource assessment and feasibility studies and other related activities in order to establish the existence of geothermal resources and to determine their extent and economic value;

፲፭/ "ኮር" ማለት በቁፋሮ ከጉድጓድ የሚወሰድ ጠጣር የአለት ናሙና ነው፤

15/ "core" means solid rock sample taken out from underground through drilling;

፲፮/ "ማመንጨት" ማለት በኢነርጂ አዋጅ የተሰጠው ትርጓሜ ይኖረዋል፤

16/ "generation" shall have the meaning provided for under the Energy Proclamation;

፲፯/ "መንግሥት" ማለት የኢትዮጵያ ፌዴራላዊ ዴሞክራሲያዊ ሪፐብሊክ መንግሥት ሲሆን እንደ አግባቡ ክልል መንግሥታትንም ይጨምራል፤

17/ "Government" means the Government of the Federal Democratic Republic of Ethiopia and includes States where appropriate;

፲፰/ "የታወቀ የጂኦተርማል ሀብት ክልል" ማለት የታወቀ የጂኦተርማል ሀብት ክልል ተብሎ በፈቃድ ሰጪው ባለሥልጣን በሕዝብ ማስታወቂያ የተሰየመ አካባቢ ነው፤

18/ "known geothermal resource area" means an area designated by the licensing authority by public notice as a known geothermal resource area;

፲፱/ "መሬት" ማለት ከመሬት በታችም ይሁን በላይ የንብረት አገልግሎት መብት ወይም ጥቅም የተገኘበት በማንኛውም ዓይነት ይዞታ ሥር የሚገኝ መሬት ሲሆን በውሃ የተሸፈነ መሬትንም ያካትታል፤

19/ "land" means any land under whatever tenure held and any servitude, right or privilege in or over land and includes land covered with water;

፳/ "ፈቃድ ሰጪ ባለሥልጣን" ማለት የኢትዮጵያ ኢነርጂ ባለሥልጣን ነው፤

20/ "licensing authority" means the Ethiopian Energy Authority;

፳፩/ "የሕዝብ ማስታወቂያ" ማለት ሰፊ ተደራሽነት ባለው መገናኛ ብዙሀን ወይም የኤሌክትሮኒክስ መገናኛ ዘዴ በዚህ አዋጅ ውስጥ የተካተቱ መሠረታዊ ጉዳዮችን ይፋ ማድረግ ነው፤

21/ "public notice" means publication of the substantive material addressed in this Proclamation through widely accessible mass media or electronic media;

፳፪/ "የቅኝት ፈቃድ" ማለት አንድ ቦታ የጂኦተርማል ሀብት ሊኖረው እንደሚችል ለማረጋገጥ ሲባል የጂኦሎጂ፣ የጂኦኬሚስትሪና የጂኦፊዚክስ ባሕር ያቱን ለማጥናት የሚያስችሉና በአካባቢው ተፈጥሮ ላይ ተጽዕኖ የሌላቸውን የመሬት ላይ

22/ "reconnaissance license" means a license that gives right to undertake surface exploration activities without environmental impact and that are intended to assess geological, geochemical and geophysical characteristics for

የምርመራ ሥራዎችን ለማካሄድ መብት የሚሠጥ ፈቃድ ሲሆን ጉድጓድ መቆፈርን አያካትትም፤

፳፫/ "ሪኢንጀክሽን" ማለት የጂኦተርማል ፈሳሽን በጉድጓድ አማካኝነት ከመሬት በታች መልሶ መጨመር ነው፤

፳፬/ "መሠረዝ" ማለት ባለፈቃዱ ፈቃዱን በፈቃድ ሰጪው ባለሥልጣን አስገዳጅነት እንዲመልስ ማድረግ ነው፤

፳፭/ "መመለስ" ማለት በባለፈቃዱ በፈቃደኝነት ፈቃዱን ወይም ከፈቃዱ ክልል ውስጥ የተወሰነን ቦታ ለፈቃድ ሰጪው ባለሥልጣን መመለስ ነው፤

፳፮/ "የሙቀት መለኪያ ጉድጓድ" ማለት የጂኦሳይን ትፈክ ወይም ከሙቀት ጋር የተያያዘ መረጃ ለማግኘት ሲባል የሚቆፈር ማንኛውም ጉድጓድ ነው፤

፳፯/ "መቋረጥ" ማለት ከፈቃድ ምሠረዝ፣ መነጠቅ ወይም መመለስ ጋር በተያያዙ ምክንያቶች ባለፈቃዱ የነበረው መብት ሲያበቃ ነው፤

፳፰/ "ማስተላለፍ" ማለት የጂኦተርማል ፈቃድ ወይም ከፈቃዱ ጋር ተያያዥ ሀብትን መሸጥ፣ በዕዳ ማስያዝ፣ ማውረስ፣ መዳረግ ወይም በሌላ መንገድ ባለቤትነትን ማስተላለፍ ነው፤

፳፱/ "ጉድጓድ" ማለት የጂኦተርማል ሀብት ለመፈለግ ወይም ለማምረት ወይም የጂኦተርማል ሀብቱን ሪኢንጀክት ለማድረግ ወይም ለመከታተል በማንኛውም መሬት ላይ ተቆፍሮ የተጠናቀቀ ጉድጓድ ነው፤

፴/ "የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ" ማለት የጂኦተርማል የሀብት መጠንና የአዋጭነት ጥናቶችን ለማጥናት፣ ከፍተኛ ደረጃ የጂኦሎጂ፣ የጂኦኬሚስትሪና የጂኦፊዚክስ ጥናቶችን ለማካሄድ፣ የምርት፣ የሪኢንጀክሽንና የክትትል ጉድጓዶችን ለመቆፈር፣ የእንፋሎት መስክን ለማልማት፣ የጂኦተርማል ሀብትን ከመሬት ሥር ለማውጣትና ለመጠቀም መብት የሚሠጥ ፈቃድ ነው፤

the purpose of determining whether a land may have geothermal resources, but not including drilling activities;

23/ "re-injection" means a process of returning to the subsurface geothermal fluids through a well;

24/ "revocation" means a return of a license from the licensee by the order of the licensing authority;

25/ "surrender" means a voluntary return of a license or any portion of the license area by a licensee to the licensing authority;

26/ "temperature gradient well" means any well drilled expressly for the acquisition of geo-scientific or temperature-related data;

27/ "termination" means cessation of rights of a licensee by an act, including expiration, revocation or surrender of a license;

28/ "transfer" means a sale, encumbrance, inheritance, assignment or any other change in ownership of a geothermal resource license or related asset;

29/ "well" means any hole drilled and completed on any land which is made for the discovery or production of geothermal resources or for re-injecting or monitoring geothermal resources;

30/ "geothermal well-field development and use license" means a license that gives right to undertake geothermal resource assessment and feasibility studies, advanced geological, geochemical and geophysical studies, drilling of production, re-injection and monitoring wells, steam-field development, extraction and use of geothermal resources;

፴፩/ "የሥራ ፕሮግራም" ማለት ዝርዝሩ በዚህ አዋጅ እና ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ የሚወሰን ሆኖ የጂኦተርማል ቅኝት ፈቃድ እና የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ለመስጠት እንዲሁም የጅኦተርማል ምርመራ ፈቃድ ለመስጠት ወይም ለማደስ እንደቅድመ ሁኔታ መቅረብ ያለበት የሥራ ዝርዝር እና የወጪ ዕቅድ ነው፤

31/ "work program" means the program of work showing details of the work and expenditure as may be further defined in pursuant to this Proclamation and regulation and directive issued hereunder and required as a precondition for granting a reconnaissance and geothermal well-field development and use licenses, and granting or renewing exploration license;

፴፪/ "ክልል" ማለት በኢትዮጵያ ፌደራላዊ ዴሞክራሲያዊ ሪፐብሊክ ሕገ-መንግሥት አንቀጽ ፵፯ (፩) የተመለከተው ማንኛውም ክልል ሲሆን፣ የአዲስ አበባና የድሬዳዋ ከተሞች አስተዳደሮችንም ይጨምራል፤

32/ "State" means any national regional state specified under Article 47 (1) of the Constitution of the Federal Democratic Republic of Ethiopia, and includes the Addis Ababa and Dire Dawa city administrations;

፴፫/ "ሰው" ማለት ማንኛውም የተፈጥሮ ሰው ወይም በሕግ የሰውነት መብት የተሰው አካል ነው፤

33/ "person" means any natural or juridical person;

፴፬/ ማንኛውም በወንድ ፆታ የተገለፀው የሴትንም ይጨምራል::

34/ any expression in the masculine gender includes the feminine.

፫. የተፈፃሚነት ወሰን

ይህ አዋጅ በኢትዮጵያ ፌደራላዊ ዴሞክራሲያዊ ሪፐብሊክ ግዛት ውስጥ በሚካሄዱ የጂኦተርማል ሀብት ልማት ሥራዎች ላይ ተፈፃሚ ይሆናል::

3. Scope of Application

This Proclamation shall apply to geothermal resources development activities within the territory of the Federal Democratic Republic of Ethiopia.

፬. ዓላማ

ይህ አዋጅ የሚከተሉት ዓላማዎች ይኖሩታል፦

4. Objectives

This Proclamation shall have the following objectives:

፩/ የሀገሪቱ የጂኦተርማል ሀብት ሥርዐትና ዘላቂነት እንዲሁም የአካባቢ ጥበቃን ግምት ውስጥ ባስገባ ሁኔታ መልማቱን ማረጋገጥ፤

1/ ensuring that the country's geothermal resources are developed in an orderly, sustainable and environmentally responsible manner;

፪/ ከጂኦተርማል ኃይል ለአገር ውስጥ እና ለውጭ አገር ፍጆታ የሚውል ኤሌክትሪክ ማመንጨትንና ማቅረብን መደገፍ፤

2/ supporting the generation and delivery of electricity from geothermal energy for local consumption and export;

፫/ የደረጃ II ጂኦተርማል ሀብትን ለልዩ ልዩ አገልግሎቶች የሚውልበትን ሁኔታ ማራመድ፤

3/ promoting the use of Grade II geothermal resources for various uses;

፬/ በጂኦተርማል ሀብት ልማት ሥራ ላይ የተሠማሩ ባለሀብቶች መብቶችን የማረጋገጥ፤ እና

4/ ensuring security of tenure for all investors in respect of geothermal resources development operations; and

፭/ በኢትዮጵያ ቀጣይነት ያለው ከካርቦን ነፃ የሆነ ኢኮኖሚን ማበረታታት::

5/ encouraging a sustainable, carbon-neutral economy in Ethiopia.

ክፍል ሁለት

ስለ ጂኦተርማል ሀብት ልማት ጠቅላላ ድንጋጌዎች

፭. ውጤታማ የመሬትና ሌሎች የተፈጥሮ ሀብቶች አጠቃቀም

፩/ አዋጭና ከዚህ አዋጅ ጋር የሚስማማ እስከሆነ ድረስ ለጂኦተርማል ሀብት ልማት በሚሰጥ የፈቃድ ክልል ውስጥ የሚገኙ ሌሎች የተፈጥሮ ሀብቶች አግባብነት ባላቸው ሕጎች መሠረት ከጂኦተርማል ፈቃዱ ጎን ለጎን ጥቅም ላይ እንዲውሉ አግባብ ባለው አካል ሊወሰን ይችላል።

፪/ ፈቃድ ሰጪው ባለሥልጣን የጂኦተርማል ሥራ በሚካሄድበት የፈቃድ ክልል ውስጥ ጂኦተር ማልን የማይመለከቱ ሌሎች የልማት ሥራዎች ጎን ለጎን የሚካሄዱበትን አሠራር በተቻለ መጠን መደገፍ አለበት።

፮. የሀብት ጥበቃና ዘለቄታዊነት

የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ያለው ባለፈቃድ ተገቢነት ያለውና ከአካባቢ ብክለት የጸዳ አሠራር የመከተል ግዴታ ያለበት ሲሆን የጂኦተርማል ሀብቱ ዘለቄታዊነት መጠበቁን ለማረጋገጥ ሲባል ከጂኦተርማል ኢንዱስትሪ ምርጥ አሠራርና ከጂኦተርማል ሀብቱ ባሕርያት ጋር የተጣጣመ መሆኑን በማረጋገጥ የጂኦተርማል ፈሳሾች ሪኢንጀክሽንን መተግበር አለበት።

፯. መሬትን ለጂኦተርማል ሥራዎች ስለመከለል

፩/ የዚህ አንቀጽ ንዑስ አንቀጽ (፫) እና (፬) ድንጋጌዎች እንደተጠበቁ ሆነው ማናቸውም በኢትዮጵያ ውስጥ የሚገኝ መሬት ለጂኦተርማል ሥራዎች ክፍት ይሆናል።

፪/ ፈቃድ ሰጪው ባለሥልጣን ለሕዝብ ጥቅም አስፈላጊ ነው ብሎ ሲያምን የሕዝብ ማስታወቂያ በማውጣት ማናቸውም መሬት የታወቀ የጂኦተርማል ክልል ነው ብሎ ሊሰየም ይችላል። ፈቃድ ሰጪው ባለሥልጣን የታወቀ የጂኦተርማል ክልልን መጠን እና ቅርጽን ለመወሰን ከሌሎች ሁኔታዎች በተጨማሪ፦

ሀ) እንዲከለል ሀሣብ የቀረበበትን አካባቢ የታወቀ የጂኦሎጂካል፣ ጂኦኬሚካል እና ጂኦፊዚካል ባህርያትን፤ እና

PART TWO

GENERAL PROVISIONS ON GEOTHERMAL RESOURCE DEVELOPMENT

5. Productive Use of Land and Other Resources

1/ The competent body may decide that other natural resources in the geothermal resource license area may be developed, in so far as feasible and in a manner consistent with this Proclamation and under the laws applicable to them.

2/ The licensing authority shall, to the extent feasible, support the coexistence of non-geothermal development activities within the license area of geothermal operations.

6. Resource Conservation and Sustainability

Geothermal well-field development and use licensee shall avoid unreasonable waste affecting environment and promote the sustainability of geothermal resources, and to that end, the license shall practice re-injection of geothermal fluids when re-injection is consistent with geothermal industry best practices and the characteristics of the geothermal resource.

7. Reservation of Land for Geothermal Operations

1/ Without prejudice to sub-articles (3) and (4) of this Article, any land in Ethiopia shall be available for geothermal operations.

2/ The licensing authority may, by public notice, designate an area as a known geothermal resources area. In designating the size and configuration of the known geothermal resources area the licensing authority shall, among other considerations, take into account:

a) known geological, geochemical and geophysical characteristics of the area proposed for designation; and

ለ) የጂኦተርማል ሀብቱ የሚገኝበት መሬት በወቅቱ እየሰጠ ያለውንና ወደፊት ሊሰጥ የሚችለውን ሌላ ጠቀሜታ፣ ግምት ውስጥ ማስገባት አለበት::

፫/ ፈቃድ ሰጪው ባለሥልጣን ለሕዝብ ጥቅም አስፈላጊ ነው ብሎ ሲያምን የሕዝብ ማስታወቂያ በማውጣት ማናቸውም መሬት የጂኦተርማል ሥራ የማይካሄድበት ነው ብሎ መከለል ይችላል:: ሆኖም ይህን የመሰለው ክልከላ በዚህ አዋጅ መሠረት ፈቃድ በተሰጠው ሰው ላይ ጉዳት ያደረሰ ከሆነ አግባብ ባለው ሕግ መሠረት የመካስ መብት ይኖረዋል።

፬/ ማንኛውም ሰው ቀጥሎ በተዘረዘሩት ሥፍራዎች ላይ የጂኦተርማል ሥራዎች ፈቃድ አይሰጠውም፦

ሀ) ለመቃብርና ሃይማኖታዊ ጉዳዮች በተከለሉ ሥፍራዎች፤

ለ) የቅድመ ታሪክ ቅሪቶች ባሉባቸው ወይም ብሔራዊ መታሰቢያዎች በቆሙባቸው ሥፍራዎች፤

ሐ) ለመሠረተ ልማት አውታሮች በተከለሉ ቦታዎች፤

መ) ለተፈጥሮ አካባቢ ጥበቃ ወይም ለብሔራዊ ፓርክ በተከለሉ ሥፍራዎች፤

ሠ) አግባብ ያለው አካል ካልፈቀደ በቀር ከመንደሮች፣ ከከተማዎች ወይም ከውኃ ማጠራቀሚያዎች ወይም ግድቦች በአምስት መቶ (፭፻) ሜትር ክልል ውስጥ፤ እና

ረ) በሌላ ሕግ በተከለከሉ ቦታዎች::

፭/ በዚህ አንቀጽ ንዑስ አንቀጽ (፪) የተመለከተው የሕዝብ ማስታወቂያ በሥራ ላይ በዋለበት ቀን ይህ አዋጅ ከመውጣቱ በፊት ፈቃድ በተሰጠበት እና የፀና የኃይል ግዥ ስምምነት ባለው መሬት መጠንና ቅርጽ ላይ ተፈፃሚ አይሆንም::

፮/ መንግሥት ለሕዝብ ጥቅም ሲባል ተገቢው የማካካሻ እርምጃ ተወስዶ በዚህ አንቀጽ ንዑስ አንቀጽ (፫) ወይም (፬) መሠረት የተከለለ ማንኛውም ሥፍራ ለጂኦተርማል ሥራ ክፍት እንዲሆን ሊፈቅድ ይችላል::

b) the existing and potential uses of the land overlying the geothermal resources.

3/ The licensing authority may by public notice, upon a determination that such a reservation would be in the best interests of the public, reserve any land, within which geothermal operations shall not be conducted; provided, however, that if such prohibition is detrimental to a person holding license under this Proclamation, the person shall have the right to compensation according to the relevant laws.

4/ No person shall be granted a geothermal operations license over an area:

a) which is reserved for cemeteries and religious sites;

b) contains archaeological remains or national monuments;

c) which is reserved for infrastructure area;

d) which is within areas reserved for natural habitats or national parks;

e) which is within five hundred (500) meters from the boundary of a village, city, water reservoir or dam without permission of the competent body; and

f) which is protected by any other law of the country.

5/ A public notice issued pursuant to sub-article (2) of this Article shall not affect the size and configuration of the land that, on the date of the public notice, is subject to a geothermal license granted prior to the coming into force of this Proclamation with a valid power purchase agreement.

6/ The Government may, upon a determination that it is in the best interest of the public, authorize the availability of any protected area under sub-articles (3) or (4) of this Article for geothermal operations, upon providing appropriate compensatory arrangements, if any.

፰. በመንግሥት ስለሚካሄድ የጂኦተርማል ሥራ

፩/ መንግሥት ለሀገሪቱ የኢኮኖሚ እና ማኅበራዊ ዕድገት ወሳኝ ሚና የሚኖራቸውን የጂኦተርማል ሥራዎች በራሱ ወይም ከሌሎች ባለሀብቶች ጋር በቅንጅት ሊያካሂድ ይችላል።

፪/ የዚህ አንቀጽ ንዑስ አንቀጽ (፩) ድንጋጌ እንደተጠበቀ ሆኖ ፈቃድ ሰጪው ባለሥልጣን የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድን አወዳድሮ ለመስጠት የሚያስችለው በቂ መረጃ እንዲኖረው ለማስቻል መንግሥት የጂኦተርማል ሀብት ፍለጋ እና ልማት ሥራዎች ያካሂዳል።

፱. ስለ ጂኦተርማል ሀብት መዝገብ

፩/ ፈቃድ ሰጪው ባለሥልጣን የጂኦተርማል ሀብት መዝገብ አደራጅቶ ይይዛል።

፪/ በጂኦተርማል ሀብት መዝገብ ውስጥ የፈቃድ ማመልከቻዎችና ፈቃድን ለመስጠት፣ ለመከልከል ወይም ለመሠረዝ የተሰጡ ውሳኔዎች፣ የይግባኝ ሪከርዶችና በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ የሚወሰኑ የጽሑፍ ሰነዶች ይመዘገባሉ።

፫/ ከፈቃድ ጋር የተገናኙና በግል የተካሄዱ ግብይቶችን፣ ማስተላለፍን፣ በዕዳ መያዝን፣ በውርስ ማስተላለፍን የሚመለከቱ ሰነዶች ስምምነቱ ከተከናወነ ወይም ህጋዊነትን ካገኘ በኋላ ባሉት በዘጠና (፺) ቀናት ውስጥ መብቱን ባገኘው ሰው አማካይት ቀርበው መመዝገብ አለባቸው። ለምዝገባ በወቅቱ ያልቀረቡ ስምምነቶች በሕግ ፊት ዋጋ አይኖራቸውም።

፬/ የጂኦተርማል ሀብት መዝገብ ለሕዝብ ክፍት ይሆናል።

፲. ጉዳዩ የሚመለከታቸውን ሰዎች ስለማሳወቅ

፩/ ፈቃድ ሰጪው ባለሥልጣን በዚህ አዋጅ መሠረት የቀረበለትን ማመልከቻ በጂኦተርማል ሀብት መዝገብ ከመዘገበ በኋላ ጥያቄ የቀረበበትን ቦታ የጂኦግራፊ ኮኦርድኔት በመጥቀስ ሰፊ ተደራሽነት ባለው የመገናኛ ብዙሃን አማካይነት ሦስተኛ ወገኖች እንዲያውቁት ያደርጋል።

8. Government Geothermal Operations

1/ The Government may, either by itself or in partnership with other investors, undertake geothermal operations that have crucial role for the country's economic and social development.

2/ Without prejudice to sub-article (1) of this Article the Government shall undertake geothermal resource exploration and development activities to provide sufficient data to the licensing authority to facilitate the granting of license for well-filed development and use license on a competitive basis.

9. Register of Geothermal Resources

1/ The licensing authority shall establish and maintain a register of geothermal resources.

2/ Applications for licenses and decisions for granting, denying or revoking licenses, records of appeals and other written documents determined by this Proclamation and regulation and directive issued hereunder shall be registered in geothermal resources register.

3/ Instruments involving private transactions, transfers, encumbrances, and inheritance of interests in licenses, shall be presented for registration by the person who acquired the rights within ninety (90) days after the conclusion of the agreement or to get legality; if an agreement is not timely presented for registration it shall be null and void.

4/ The geothermal resources register shall be open to the public.

10. Notification of Interested Parties

1/ The licensing authority shall, after registering an application in the register of geothermal resources, publicize it to third parties through public mass media having wider access by specifying the geographic coordinate of the area to which application is lodged.

፪/ ፈቃድ እንዳይሠጥ ተቃውሞ የሚያቀርብ ሰው በዚህ አንቀጽ ንዑስ አንቀጽ (፩) መሠረት ጥያቄ የቀረበበት ቦታ በመገናኛ ብዙሃን እንዲታወቅ በተደረገ በአሥራ አምስት (፲፭) ቀናት ውስጥ ተቃውሞውን ያቀረበ እንደሆነ ፈቃድ ሰጪው ባለሥልጣን በጉዳዩ ላይ በሚመለከታቸው ወገኖች መካከል ድርድር እንዲጀመር ያደርጋል።

፫/ ጉዳዩ የሚመለከታቸው ወገኖች የቀረበውን ተቃውሞ አስመልክቶ ፈቃድ ሰጪው ባለሥልጣን ድርድሩ እንዲጀመር ከወሰነበት ቀን ጀምሮ በስልሳ (፷) ቀናት ውስጥ መስማማት ካልቻሉ ፈቃድ ሰጪው ባለሥልጣን የሁለቱንም ወገኖች ክርክር ካዳመጠ በኋላ በአሥራ አምስት (፲፭) የሥራ ቀናት ውስጥ የቀረበውን ተቃውሞ የመቀበል ወይም ያለመቀበል ውሣኔ ይሰጣል።

ክፍል ሦስት
ፈቃድ ሰጪ ባለሥልጣን

፲፩. የፈቃድ ሰጪው ባለሥልጣን ሥልጣንና ተግባር

ፈቃድ ሰጪው ባለሥልጣን የሚከተሉት ሥልጣንና ተግባራት ይኖሩታል፦

፩/ የጂኦተርማል ሀብት ልማት ኢንቨስትመንትን ለማሣደግ የሚረዱ ሁኔታዎችን የማመቻቸት፤

፪/ የጂኦተርማል ሀብት ልማትን የሚመለከቱ ተግባራት በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈፀም በሚወጣ ደንቦችና መመሪያዎች መሠረት መከናወናቸውን የማረጋገጥ፤

፫/ የጂኦተርማል ሀብት ልማትን በማሳደግ እና ባለፈቃዶች ኃላፊነቶቻቸውን እንዲወጡ በማድረግ መካከል የሚኖርን ወይም ሊከሰት የሚችል የጥቅም ግጭትን ለማስወገድ ተገቢ እርምጃ የመውሰድ፤

፬/ በደረጃ I እና ደረጃ II የጂኦተርማል ሀብት ላይ የጂኦተርማል ሥራ ፈቃዶችን የመስጠት ወይም የመከልከል የተሰጡ ፈቃዶችን የማደስ፣ የማገድ፣ የማራዘም እና የመሠረዝ፤

፭/ ለጂኦተርማል ዘርፍ የማማከር አገልግሎት ሥራ እና ለጂኦተርማል ቴክኒክ ነክ ሥራ የብቃት ማረጋገጫ የምስክር ወረቀት የመስጠት፤

2/ If any person objects to the granting of the license within fifteen (15) days from the date of the publicity of the area requested for license under sub-article (1) of this Article, the licensing authority shall initiate negotiations between the concerned parties to resolve the objection.

3/ If the parties fail to resolve the objection amicably within sixty (60) days starting from the date fixed by the licensing authority to start the negotiation, the licensing authority shall hear the presentations of both parties and pass decision within fifteen (15) working days either by upholding or rejecting the objection.

PART THREE
LICENSING AUTHORITY

11. Powers and Duties of the Licensing Authority

The licensing authority shall have the powers and duties to:

1/ promote conditions necessary for the development of geothermal resources investment activities;

2/ ensure the compliance of geothermal resources development activities with this Proclamation and the regulations and directives issued hereunder;

3/ take appropriate measures to prevent an actual or perceived conflict of interest between the promotion of the development of geothermal resources and compliance responsibilities of licensees;

4/ issue or deny, renew, suspend, extend, revoke and terminate geothermal operations license issued on Grade I and Grade II geothermal resources operation;

5/ issue certificates of competency for consultancy and geothermal works in the geothermal sector;

፮/ የጂኦተርማል ፈሳሽና ተያያዥ ውጤቶች ወደ ውጪ እንዲላኩ ፈቃድ የመስጠት ወይም የመከልከል፤

፯/ አግባብ ካለው አካል ጋር በመመካከር የጂኦተርማል ተረፈ ምርት ጥቅም ላይ እንዲውል ወይም እንዲሸጥ የመፍቀድ፤

፰/ የፈቃድ ክልል በጨረታ ወይም በማመልከቻ የሚሰጥበትን ሁኔታ የመወሰን፤

፱/ በዚህ አዋጅ መሠረት ማንኛውም ባለፈቃድ በፈቃዱ የተመለከቱ ግዴታዎችን ለመወጣት አስፈላጊው የገንዘብ ምንጭ፣ የቴክኒክ ብቃትና ልምድ ያለው መሆኑን የማረጋገጥ፤

፲/ አንድን አካባቢ የታወቀ የጂኦተርማል ሀብት መገኛ ክልል ብሎ የመሰየም፤

፲፩/ በዚህ አዋጅ እና በዚህ አዋጅ መሠረት በወጡ ደንቦችና መመሪያዎች የተመለከቱ መረጃዎችን እና ሪከርዶችን የመቀበል፤

፲፪/ የጂኦተርማል ሥራዎች በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብ፣ መመሪያና አግባብ ባላቸው ስምምነቶች መሠረት መካሄዳቸውን የመቆጣጠርና የማረጋገጥ፤

፲፫/ በመንግሥት በሚወጣ ተመን መሠረት የፈቃድና ሌሎች ክፍያዎችን የመሰብሰብ፤

፲፬/ አግባብ ካለው አካል ጋር በመተባበር የጂኦተርማል ሥራዎች ከኢትዮጵያ የአካባቢ፣ የጤና እና የደህንነት ሕግጋት ጋር የተጣጣሙ መሆናቸውን የማረጋገጥ፤

፲፭/ ከጂኦተርማል ሥራ ጋር ተያያዥነት ያላቸው የጤናና የደህንነት ደረጃዎችን፣ የጉድጓድ ቁፋሮ ኮዶችን፣ የቁጥጥር መመሪያዎችንና ሌሎች መሰል ኮዶችን የማውጣትና አፈፃፀማቸውንም የመቆጣጠር፤

፲፮/ ይህን አዋጅ ለማስፈፀም አግባብ ካላቸው አካላት ጋር የመተባበር::

6/ authorize or deny permission for the export of samples of geothermal fluids and related products;

7/ authorize the use and sale of geothermal by-products in consultation with the competent body;

8/ determine whether a license on certain license area shall be given through competitive bid or application;

9/ ensure that any licensee has the necessary financial resources, technical capability and experience to fulfill the obligations provided under license in accordance with this Proclamation;

10/ designate an area as a known geothermal resource area;

11/ receive information and records specified in this Proclamation and regulations and directives issued hereunder;

12/ inspect to ensure that geothermal operations are carried out in accordance with this Proclamation and regulation and directive issued hereunder and applicable licenses agreements;

13/ collect license fees and other payments pursuant to rates approved by the Government;

14/ ensure, in collaboration with the competent body, that geothermal operations comply with environmental, health and safety laws of Ethiopia;

15/ issue health and safety standards, drilling code of practices, inspection guidelines, and other codes and standards related to geothermal operations and supervise the implementation of same;

16/ collaborate with competent bodies for the implementation of this Proclamation.

ክፍል አራት

ስለ ፈቃዶች እና የሙያ ብቃት ማረጋገጫ ምስክር ወረቀቶች

፲፪. የፈቃድ አስፈላጊነት

ማንኛውም ሰው በዚህ አዋጅ መሠረት ተገቢውን ፈቃድ ከፈቃድ ሰጪው ባለሥልጣን ሳያገኝ የጂኦተርማል ሥራ ማካሄድ አይችልም::

፲፫. የፈቃድ ዓይነቶች

፩/ ማንኛውም አመልካች በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ መሠረት ፈቃድ ለማግኘት የሚያስፈልጉ ሁኔታዎችን ካሟላ የሚከተሉት የጂኦተርማል ሥራ ማካሄድ የሚያስችሉ ፈቃዶችን በደረጃ I የጂኦተርማል ሀብት ላይ ሊሰጡት ይችላሉ፦

ሀ) የቅኝት ፈቃድ፤

ለ) የምርመራ ፈቃድ፤ እና

ሐ) የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ::

፪/ በደረጃ II የጂኦተርማል ሀብት ላይ የጂኦተርማል ሥራ ፈቃድ የሚሰጥበት ሁኔታ እና ዝርዝር ይህን አዋጅ ለማስፈፀም በሚወጣ ደንብና መመሪያ ይወሰናል::

፫/ የዚህ አንቀጽ ንዑስ አንቀጽ (፩) እና (፪) ድንጋጌዎች እንደተጠበቁ ሆነው ክልሎች ሙቀቱ ከአንድ መቶ ሀያ (፩፻፳) ዲግሪ ሴንቲግሬድ በማይበልጥ እና መጠኑ በዓመት ከሁለት ሚሊዮን (፪ ሚሊዮን) ሜትር ኪዩብ በማይበልጥ የደረጃ II የጂኦተርማል ሀብት ላይ የጂኦተርማል ሥራ ፈቃድ ይሰጣሉ::

፲፬. የቅኝት ፈቃድ

፩/ የቅኝት ፈቃድ የብቻ የሆነ መብት የማያስገኝና ያለውድድር የሚሰጥ ፈቃድ ነው::

፪/ የቅኝት ፈቃድ በፈቃዱ ላይ ለተገለፀው ጊዜ ፀንቶ ይቆያል፣ ሆኖም ይህ ጊዜ ከሃያ አራት (፳፬) ወር በላይ ሊሆን አይችልም::

፫/ የቅኝት ፈቃድ አይታደስም::

PART FOUR

LICENSES AND CERTIFICATES OF PROFESSIONAL COMPETENCY

12. Requirement of License

No person, may undertake geothermal operations without having appropriate license from the licensing authority pursuant to this Proclamation.

13. Types of Licenses

1/ The licensing authority may grant the following geothermal operation licenses on Grade I geothermal resources to any applicant that meets the requirements prescribed in this Proclamation and regulation and directive issued hereunder:

a) reconnaissance license;

b) exploration license; and

c) geothermal well-field development and use license.

2/ The manner and details of granting geothermal operations license on Grade II geothermal resources shall be determined by regulation and directive to be issued for the implementation of this Proclamation.

3/ Without prejudice to sub-articles (1) and (2) of this Article, Regional States shall grant operation licenses license on Grade II geothermal resource the temperature of which do not exceed one hundred twenty (120) degree centigrade and volume not exceeding two million (2,000,000) meter cube per year.

14. Reconnaissance License

1/ A reconnaissance license shall be issued on a non-exclusive and non-competitive basis.

2/ A reconnaissance license shall be valid for the period specified in the license; provided, however, such period shall not exceed twenty four (24) months.

3/ A reconnaissance license shall not be renewable.

፬/ የቅኝት ፈቃድ ያዥ የቅኝት ክልል በምርመራና በጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ሥር ያልተያዘ ከሆነ እና በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ የተገለፁ አስፈላጊ መስፈርቶችን የሚያሟላ ከሆነ የምርመራ ፈቃድ እንዲሰጠው ሊያመለክት ይችላል::

4/ The holder of a reconnaissance license, may apply for a geothermal exploration license if he meets the requirements specified in this Proclamation and regulation and directive issued hereunder; and provided that the area applied for is not under an exploration or geothermal well-field development and use license and that.

፭/ ፈቃድ ሰጪው ባለሥልጣን የቅኝት ፈቃድ ሥር የነበረን ክልል በከፊል ወይም ሙሉ በሙሉ ለሌላ ሰው የምርመራ ወይም የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ የሰጠ ከሆነ ይህንኑ ለቅኝት ፈቃድ ያዡ ማስታወቅ አለበት::

5/ The licensing authority shall notify a holder of reconnaissance license, if an exploration or geothermal well-field development and use license has been granted to another person for the whole or part of the reconnaissance license area.

፲፭. <u>የምርመራ ፈቃድ</u>

15. <u>Exploration License</u>

፩/ የብቻ የሆነ መብት የሚያስገኝ የምርመራ ፈቃድ የሚሰጠው፦

1/ An exclusive exploration license shall be granted to an applicant who:

ሀ) በፈቃድ ሰጪው ባለሥልጣን ተቀባይነት ያገኘ የሥራ ዕቅድ እና የአካባቢና የማኅበረሰብ ተጽዕኖ ግምገማ ጥናት ላቀረበ፤

a) has submitted work program and environmental and social impact assessment and got approval from the licensing authority;

ለ) የታሰበውን የምርመራ ሥራ በቀረበው የሥራ ፕሮግራም መሠረት ለማከናወን የሚያስችል የገንዘብ አቅም ያለው ወይም ለማግኘት የሚችል መሆኑን እና አስፈላጊው የቴክኒክ ችሎታ ያለው መሆኑን ላረጋገጠ፤

b) has demonstrated financial capability or access to the financial resources and the technical ability to conduct the proposed exploration in accordance with the approved work program;

ሐ) ከዚህ በፊት የጂኦተርማል ሥራ ፈቃድ የነበረው ከሆነ የዚህኑ ፈቃድ ግዴታዎች ላልጣሰ አመልካች ይሆናል::

c) is not in breach of any obligation of a geothermal operation license, if any.

፪/ የምርመራ ፈቃድ በፈቃዱ ላይ ለተገለፀው ጊዜ ፀንቶ ይቆያል፤ ሆኖም ይህ ጊዜ ከአምስት (፭) ዓመት በላይ ሊሆን አይችልም::

2/ An exploration license shall be valid for an initial period specified in the license; provided, however, such period shall not exceed five (5) years.

፫/ የምርመራ ፈቃድ እያንዳንዱ ከአንድ (፩) ዓመት ለማይበልጥ ለሁለት ጊዜ በፈቃድ ሰጪው ባለሥልጣን ተቀባይነት ሊያገኝ ሊታደስ ይችላል፤ ሆኖም ለሁለተኛ ጊዜ የታደሰ የምርመራ ፈቃድ ፀንቶ የሚቆይበት ጊዜ እንዳበቃ ይሠረዛል::

3/ An exploration license may be renewed twice, each for a period not exceeding one (1) year upon approval by the licensing authority; provided, however, that an exploration license shall be terminated at the end of the second renewal period.

፬/ ባለፈቃዱ በፈቃዱ የተመለከቱትን ግዴታዎች አሟልቶ ከፈፀመ፣ ለዕድሳት የሚጠየቁ ተፈላጊ ሁኔታዎችን ካሟላና ይህን አዋጅ፣ አዋጁን ተከትለው የወጡ ደንቦችን ወይም መመሪያዎችን ድንጋጌዎች በመተላለፍ ፈቃዱን ለማገድ ወይም ለመሠረዝ የሚያበቃ ጥፋት ካልፈፀመ በዚህ አንቀጽ ንዑስ አንቀጽ (፫) መሠረት መንግሥት ፈቃዱን ሊያድስለት ይችላል።

4/ Government may renew the license pursuant to sub-article (3) of this Article; provided that the licensee has fulfilled the obligations specified in the license, meets all the requirements in connection with application for the renewal and is not in breach of any provision of this Proclamation, regulations or directives issued hereunder which constitute grounds for suspension or revocation of the license.

፲፮. <u>የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ</u>

16. <u>Geothermal Well-field Development and Use License</u>

፩/ ፈቃድ ሰጪው ባለሥልጣን የብቻ የሆነ መብት የሚያስገኝ የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ የሚሰጠው የሚከተሉትን ሁኔታዎች ለሚያሟላ አመልካች ይሆናል፦

1/ The Authority shall grant a license for an exclusive geothermal well-field development and use to an applicant who satisfies the following conditions:

ሀ) በፈቃድ ሰጪው ባለሥልጣን ተቀባይነት ያገኘ የሥራ ዕቅድ፣ የአዋጭነት ጥናትና የአካባቢ እና የማኅበረሰብ ተጽዕኖ ግምገማ ጥናት ላቀረበ፤

a) who has submitted work program, feasibility study and environmental and social impact assessment and got approval from the licensing authority;

ለ) ሕጋዊ የኃይል ግዥ ስምምነት ላለው፤

b) has acquired a valid power purchase agreement;

ሐ) የታሰበውን ሥራ በቀረበው የሥራ ፕሮግራም መሠረት ለማከናወን የሚያስችል የገንዘብ አቅምና አስፈላጊው የቴክኒክ ችሎታ ያለው ወይም ለማግኘት የሚችል መሆኑን ላረጋገጠ፤

c) has demonstrated financial capability or access to the financial resources and the technical ability to conduct the proposed exploration in accordance with the approved work program;

መ) ከዚህ በፊት የጂኦተርማል ሥራ ፈቃድ የነበረው ከሆነ የዚህኑ ፈቃድ ግዴታዎች ላልጣሰ።

d) is not in breach of any obligation of a geothermal operation license, if any.

፪/ የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ በፈቃዱ ላይ ለተገለፀው ጊዜ ወንቶ ይቆያል፤ ሆኖም ይህ ጊዜ ከሃያ አምስት (፳፭) ዓመት በላይ ሊሆን አይችልም።

2/ A geothermal well-field development and use license shall be valid for an initial period specified in the license; and such period shall not exceed twenty five (25) years.

፫/ የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ጸንቶ የሚቆይበት ጊዜ ሲያበቃ መንግሥት በሚመችው መንገድ የጂኦተርማል ሀብት ልማቱን ሊያስቀጥል ይችላል።

3/ When the validity period of the geothermal well-field development and use license expires, Government may continue the development of the geothermal resource as it finds feasible.

፬/ የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ባለፈቃድ በደረጃ I ጂኦተርማል ሀብት ላይ የኃይል ማመንጨት ተግባርን ብቻ የማካሄድ ወይም በተጓዳኝ ጥቅም ላይ የዋለ የጂኦተርማል ሀብትን ለራሱ የመጠቀም ወይም በሽያጭ መንግስት እንዲጠቀምበት የማድረግ መብት አለው::

፭/ አግባብነት ያላቸውን የኢነርጂ ሕግ ድንጋጌዎች የሚያሟላና በደረጃ I ጂኦተርማል ሀብት ላይ የኃይል ማመንጨት ተግባር ለማካሄድ ብቁ የሆነ የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ባለፈቃድ ለፈቃድ ሰጪው ባለሥልጣን ማመልከቻ ሲያቀርብ ኤሌክትሪክ ለማመንጨት ፈቃድ ይሰጠዋል::

፮/ በደረጃ I የጂኦተርማል ሀብት ላይ የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ባለፈቃድ በሀገሪቱ የኢነርጂ እና የኢንቬስትመንት ሕግ መሠረት ከጂኦተርማል ሀብት ኤሌክትሪክ የማመንጨት እና ያመነጨውን ኤሌክትሪክ አግባብ ላለው አካል የመሸጥ ግዴታ አለበት::

፲፯. <u>ፈቃድን በውድድር ስለመስጠት</u>

፩/ ፈቃድ ሰጪው ባለሥልጣን የሙከራ ጉድጓድ ቁፋሮ ሥራዎች ተከናውነውና የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ለመስጠት በሚያስችል ደረጃ የጂኦተርማል ሀብት መኖሩ የተረጋገጠ የታወቀ የጂኦተርማል ሀብት ክልልን በማወዳደር የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ሊሰጥ ይችላል::

፪/ ፈቃድ ሰጪው ባለሥልጣን የተወሰነን ክልል የሚመለከት የምርመራ ፈቃድ ማመልከቻ የቀረበለት እንደሆነ የሕዝብ ማስታወቂያ በማውጣት ፍላጎት ያላቸው ሌሎች ሰዎች የሕዝብ ማስታወቂያው በወጣ በሠላሳ (፴) ቀን ውስጥ ማመልከቻ ለቀረበበት ቦታ የቴክኒክ ብቃትንና የገንዘብ አቅምን በመመዘኛነት በመጠቀም እንዲወዳደሩ መጋበዝ አለበት::

4/ A geothermal well-field development and use licensee shall have the right to undertake power generation activities on Grade I geothermal resources, either as a standalone operation or combined with sale of used geothermal resource for direct use by Government, or for self-use.

5/ A geothermal well-field development and use licensee who qualifies for power generation activities on Grade I geothermal resources shall be granted a license to generate electricity upon application to the licensing authority, provided that the licensee demonstrates compliance with the relevant provisions of the Energy Law.

6/ The holder of a geothermal well-field development and use license on a Grade I geothermal resource shall have the obligation to generate and to sell the electricity generated from geothermal resources to the competent body as promulgated in the relevant Energy and Investment Laws of the country.

17. <u>Competitive Award of Licenses</u>

1/ The licensing authority may grant a geothermal well-field development and use license on a competitive basis for a known geothermal resource area, where exploration activities have been conducted for the area at least to the level of test drilling and the existence of geothermal resources have been confirmed to the degree sufficient to grant a well-filed development and use license.

2/ If the licensing authority receives an application for an exploration license for an area, it shall, through a public notice, invite other interested persons to apply within thirty (30) days from the date of publicity for the purpose of competitive award of the same area based on technical ability and financial capacity criteria of the applicants.

፫/ በዚህ አንቀጽ ንዑስ አንቀጽ (፪) መሠረት ለፈቃድ ሰጪው ባለሥልጣን ማመልከቻ ያልቀረበለት እንደሆነ በቅድሚያ የተቀበለውን ማመልከቻ ያስተናግዳል::

፲፰. ስለማመልከቻ ሥነ-ሥርዓት

ፈቃድ ለማግኘት የሚቀርቡ ማመልከቻዎች በፍጥነትና በብቃት የሚስተናገዱበትን ሁኔታ ለማረጋገጥ የሚያስችሉ ሥነ-ሥርዓቶች፣ መሟላት ያለባቸው ሁኔታዎችና የጊዜ ገደቦች ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብ ይወሰናሉ::

፲፱. ፈቃድ ለማግኘት ብቁ ስላለመሆን

፩/ የዚህ አዋጅ አንቀጽ ፲፫ (፩) ድንጋጌ እንደተጠበቀ ሆኖ የሚከተሉት ፈቃድ ማግኘት አይችሉም፦

ሀ) ሥልጣን ባለው ፍርድ ቤት መክሠሩ የተረጋገጠ ማንኛውም ሰው፤

ለ) የማፍረስ ሂደት የንግድ ማኅበሩን እንደገና ለማቋቋም ወይም ከሌላ ኩባንያ ጋር ለማዋሃድ እስካልሆነ ድረስ በመፍረስ ላይ ያለ የንግድ ማኅበር፤

ሐ) ከማመልከቻው ጋር የተሳሳተ መረጃ ሆን ብሎ ያቀረበ ወይም ማመልከቻውን አስመልክቶ ፈቃድ ሰጪው ባለሥልጣን ለሚሰጠው ውሣኔ አስፈላጊ የሆነ መረጃ ሆን ብሎ ያላቀረበ ሰው፤

መ) ቀድሞ ፈቃድ የነበረው ከሆነ የተሳሳተ መረጃ ሆን ብሎ ያቀረበ ወይም ፈቃድ ሰጪው ባለሥልጣን ለሚያካሄደው የሪፖርት ግምገማ አስፈላጊ የሆነ መረጃ ሆን ብሎ ያላቀረበ ሰው::

፪/ በማጭበርበር ወይም ለፈቃድ ሰጪው ባለሥልጣን አስፈላጊ የሆነ መረጃን ሆን ብሎ ባለማቅረብ ፈቃዱ የተሠረዘበት ባለፈቃድ ፈቃዱ ከተሠረዘበት ቀን አንስቶ ለአሥር (፲) ዓመታት ማንኛውንም ዓይነት ፈቃድ ማግኘት አይችልም::

፳. ስለሥራ ፕሮግራም

፩/ ማንኛውም ዓይነት ፈቃድ እንዲሰጠው የሚያመለክት ሰው ከማመልከቻው ጋር የሥራ ፕሮግራሙን፣ በጀቱን እና በፈቃዱ የተሸፈኑ ተግባራትን የሚመለከቱ ዝርዝር ሥራዎችን የያዘ የሥራ ፕሮግራም ማቅረብ አለበት::

3/ If the licensing authority receives no application pursuant to sub-article (2) of this Article, it shall consider the application of the initial applicant.

18. Application Procedure

The procedures, requirements and timelines for applications shall be provided in regulation to be issued pursuant to this Proclamation to ensure expeditious processing of applications for licenses.

19. Ineligibility for License

1/ Without prejudice to of Article 13 (1) of this Proclamation no license shall be granted to:

a) a person who is declared bankrupt by the court having jurisdiction;

b) a business organization that is in liquidation, other than liquidation which forms a part of a scheme for the reorganization or merger with another business organization;

c) a person who has knowingly provided false information in its application; or knowingly failed to provide information to the licensing authority for decision with respect to his application;

d) a licensee who has knowingly provided false information or knowingly failed to provide information to the licensing authority for the review of required reports.

2/ A licensee whose license is revoked due to fraudulent misrepresentation, or knowingly fails to provide material information required by the licensing authority shall not be granted any license for ten (10) years starting from the date of revocation of the previous license.

20. Work Program

1/ Any person lodging application to obtain any type license shall submit his application accompanied with a work program, including budget, detailing the program of work for each activity covered by the license.

፪/ ባለፈቃዱ በጀትን ጨምሮ ተቀባይነት አግኝቶ የነበረውን የሥራ ፕሮግራም በማንኛውም ጊዜ ለመለወጥ ለፈቃድ ሰጪ ባለሥልጣን ማመልከት ይችላል::

፫/ በማንኛውም የሥራ ፕሮግራም ላይ ለውጥ ለማድረግ የሚቀርብ ማመልከቻ፦

ሀ) ተቀባይነት አግኝቶ የነበረውን የሥራ ፕሮግራም ለመተግበር ያላስቻሉትን ክስተቶች ወይም የባለፈቃዱን የቀድሞ ሥራ ፕሮግራም መሠረት በማድረግ ለውጡ ያስፈለገበትን የቴክኒክና የፋይናንስ ምክንያቶችን ለይቶ ማሳየት እና መሠረታዊ ለውጥ የሚደረግ ከሆነም አሳማኝ ምክንያቶችን ማቅረብ፤ እና

ለ) የታሰበውን የሥራ ፕሮግራም ማሻሻያና በጀት መያዝና የሚከፈል ክፍያ ካለ መክፈል አለበት::

፬/ ፈቃድ ሰጪው ባለሥልጣን የሥራ ፕሮግራም ለውጥ ለማድረግ ማመልከቻ በቀረበ በአሥር (፲) ቀን ውስጥ፦

ሀ) ተሻሽሎ የቀረበው የሥራ ፕሮግራም አሳማኝ ሆኖ ከተገኘ ተቀብሎ ያፀድቀዋል፤ ወይም

ለ) የሥራ ፕሮግራም ለውጥ ለማድረግ የቀረበውን ጥያቄ ውድቅ ካደረገው ለውሣኔው ምክንያት የሆኑትን ጉዳዮች በመዘርዘር ለአመልካቹ በጽሑፍ ያሳውቃል::

፳፩. <u>ስለባለፈቃዶች አጠቃላይ መብቶች</u>

በዚህ አዋጅ ሌሎች ድንጋጌዎች የተመለከቱት መብቶች እንደተጠበቁ ሆነው በዚህ አዋጅ የተመለከቱ ተግባራትን ለማከናወን አስፈላጊ እስከሆኑና በፈቃዱ ላይ የተደረጉ ማናቸውም ገደቦች እንደተጠበቁ ሆኖ የፈቃዱ ጊዜ እስከሚያበቃ ድረስና ተፈጻሚነት ያላቸው ሌሎች ሕጎችን መሠረት በማድረግ ባለፈቃዱ የሚከተሉት መብቶች ይኖሩታል፦

፩/ በጀትን ጨምሮ ተቀባይነትን ባገኘ የሥራ ዕቅድ መሠረት በፈቃዱ የተዘረዘሩ የጂኦተርማል ሥራዎችንና እነዚህኑ ሥራዎች ለመሥራት አስፈላጊ የሆኑ ማናቸውንም ተግባራት ለማከናወን ወደ ፈቃድ ክልል የመግባት፤

2/ The licensee may at any time apply to licensing authority to vary the approved work program, including budget.

3/ Any application for variation shall:

a) identify the events that prevent the licensee from carrying out the work program as approved, or identify the technical or financial basis for varying the work program based on prior work program of the licensee and provide justification for any substantive changes; and

b) be accompanied with the intended amendment of the work program and its budget, and discharge payment of fee, if any.

4/ After receiving the application for variation the licensing authority shall, within ten (10) days:

a) approve the variation work program, if convinced with the variation; or

b) shall notify the applicant in writing of the reasons for refusal, if it rejects the application for variation work program.

21. <u>General Rights of Licensees</u>

In addition to the rights provided for in the other provisions of this Proclamation, in so far as it may be necessary for the operations referred to in this Proclamation and subject to any restrictions specified in the license, the licensee shall, for the term of the license consistent with applicable laws, have the right to:

1/ enter the license area for the purposes of conducting activities specified in the geothermal operations license and to carry on any other necessary activity for the operation in accordance with approved work program including budget;

፪/ በሥራ ዕቅዱ መሠረት ወደ ፈቃድ ክልሉ ሠራተኞችንና ሥራዎቹን ለማካሄድ አስፈላጊ የሆኑ ፋብሪካዎችን፣ ማሽነሪዎችንና መሣሪያዎችን የማስገባት፤

2/ bring to the license area, in accordance with the work program, personnel and any plant, machinery and equipment;

፫/ አግባብነት ያላቸው የውሃ ሀብት ሕጎችና የተፋሰስ ዕቅዶችን በማክበር፣ የተሻሉ የአሠራር ልምዶች፣ የጤናና ደህንነት ደንቦችና መመሪያዎች በማክበር ለሥራው አስፈላጊ የሆነ ውሃን በፈቃድ ክልሉ ውስጥ ከሚገኝ የገፀ-ምድር፣ የከርሠ-ምድር ወይም አቋርጦ ከሚያልፍ ከማንኛውም የውሃ አካል የመጠቀም ወይም የውሃ ጉድጓድ የመቆፈር፤

3/ use water from any water body, situated on, under, or flowing through, such land or drill a well required for his activities, subject to the relevant Water Laws, relevant basin plans and upholding best practices and applicable health and safety regulations and directives;

፬/ የጂኦተርማል ሥራ ለማካሄድ አስፈላጊ የሆኑ ከመሬት በላይ ወይም በመሬት ሥር የሚዘረጉ መሠረተ ልማቶችን የመዘርጋትና የመገንባት እንዲሁም እንደአስፈላጊነቱ ፋብሪካዎችንና ማሽነሪዎችን መትከል ሕንፃዎችንና ሌሎች ግንባታዎችን የማካሄድ እና የማደስ፤

4/ build and construct, any surface or underground infrastructure required for the purposes of geothermal resources operations and erect, construct and maintain such plant, machinery, buildings and other erections as may be necessary;

፭/ በፈቃድ ክልሉ ውስጥ አስፈላጊ የሆኑ መሠረተ ልማቶችን ለመዘርጋት በፍቃድ ክልሉ በሚገኙ የግንባታ ማዕድናት የመጠቀም፤

5/ use construction materials found within the license area as required for constructing essential physical infrastructure within the license area;

፮/ ማንኛውንም የጂኦተርማል ፈሳሽ የመያዝና የመጠቀም፤

6/ reclaim and utilize any geothermal fluids;

፯/ አግባብነት ያላቸው የውሀ ሀብት ሕጎችን፣ የተፋሰስ ዕቅዶችንና ተያያዥነት ያላቸውን የአካባቢ ጥበቃ ሕጎችን በማክበር ጥቅም ላይ የዋለ ውሃን የማስወገድ፤

7/ dispose used water consistent with Water Laws and relevant basin plans and related Environmental Laws;

፰/ የደን ውጤቶችን ስለመቁረጥና በምትካቸው ችግኞችን ስለመትከል የወጡ አግባብ ያላቸው ሕጎችን በማክበር በፈቃድ ክልሉ ውስጥ ለጂኦተርማል ሥራው ብቻ አስፈላጊ የሆኑ የደን ውጤቶችን የመቁረጥና የመጠቀም፤

8/ subject to the applicable laws regarding the cutting of timber and reforestation, cut and use timber that is strictly necessary for access to the licensed area and other geothermal resources operations;

፱/ ሌሎች ሰዎች እንዳይገለገሉባቸው መሰናክል በማይፈጥር ሁኔታ በነባር መንገዶች፣ ድልድዮችና የመሠረተ ልማት አውታሮች የመገልገል፤

9/ use the existing roads, bridges and communications infrastructure in a manner that does not impair the use of other persons;

፲/ በፈቃዱ መሠረት መሬቱን ጥቅም ላይ ለማዋልና ወደ ፈቃድ ክልሉ ለመግባት የሚያስፈልጉ መጋቢ መንገዶችን፣ ድልድዮችንና ሌሎች የመገናኛ ዘዴዎችን የአካባቢ ዕቅድንና የግንባታ ደረጃን ጠብቆ የመገንባትና የማደስ፤

10/ construct and maintain access roads, bridges and other means of communications consistent with environmental planning and construction standards to facilitate access to and use of the land pursuant to the license;

፲፩/ አግባብነት ያላቸውን ድንጋጌዎችና መመሪያዎች በማክበር ለጂኦተርማል ሥራው አስፈላጊ የሆኑ ጉድጓዶችን የመቆፈርና የመገንባት፤

፲፪/ ለራሱና ለሠራተኞቹ መኖሪያ የሚያገለግሉ ጊዜያዊ ቤቶች ግንባታዎችን የማካሄድ፣ የመገንባትና የመጠገን እና እነዚህን ቤቶችና ግንባታዎች የመተው፤

፲፫/ ጂኦተርማል ፈቃድ ለመስጠት መሟላት ካለባቸው ሁኔታዎች ጋር በተጣጣመ መንገድ በደረጃ I የጂኦተርማል ሀብት ላይ ከማመንጫ ተቋም የሚወጣ የጂኦተርማል ፍሳሽን ለኤሌክትሪክ አገልግሎት ላልሆነ ተግባር በፈቃድ ክልሉ ውስጥ ወይም በፈቃዱ ክልል አካባቢ የመጠቀም ወይም የመሸጥ፤

፲፬/ ባለፈቃዱ የውጭ ባለሀብት ሲሆን በኢትዮጵያ ተቀባይነት ባለው የሂሣብ አሠራር መሠረት እና የኢትዮጵያ ብሔራዊ ባንክ ባወጣው መመሪያ መሠረት የውጭ ምንዛሪ የባንክ ሂሣብ የመያዝ::

11/ drill and construct wells necessary for geothermal operation in compliance with the relevant rules and directives;

12/ erect, construct and maintain temporary houses and buildings for his own or employees use or abandon such houses and buildings;

13/ utilize or sell for non-electrical purposes a geothermal fluids generating from facility within the license area or adjacent to it in a consistent manner with the licensing requirement of geothermal resources on Grade I geothermal resources;

14/ if the licensee is foreign investor, hold foreign currency bank account in accordance with accounting practices accepted in Ethiopia and directive issued by the National Bank of Ethiopia.

፳፪. <u>ስለባለፈቃዶች አጠቃላይ ግዴታዎች</u>

፩/ በዚህ አዋጅ እና አግባብነት ባላቸው ሕጎች የተመለከቱ ሌሎች ግዴታዎች እንደተጠበቁ ሆነው ባለፈቃዱ የሚከተሉት ግዴታዎች ይኖሩታል፦

ሀ) የጂኦተርማል ሥራውን ተገቢ በሆኑ ሕጎች፣ ቴክኖሎጂና ለጂኦተርማል ሥራ ዓለም አቀፍ ተቀባይነት ባገኘ የአሠራር ልምድ መሠረት የማካሄድ፤

ለ) የወኪሎቹን፣ የሠራተኞቹንና የሌሎች ሰዎችን ጤንነትና ደህንነት በሚያረጋግጥና በተፈጥሮ አካባቢ ላይ ሊደርስ ጉዳትን ወይም ብክላን መከላከል በሚያስችል ሁኔታ የጂኦተርማል ሥራውን የማከናወን፤

ሐ) ለጂኦተርማል ሥራው አስፈላጊ የሆነና በጂኦተርማል ኢንዱስትሪ ተቀባይነት ባገኘ የአሠራር ልምድ መሠረት ሁሉም ሠራተኞች ትምህርትና ሥልጠና ያገኙ መሆናቸውን የማረጋገጥ፤

22. <u>General Obligations of Licensees</u>

1/ In addition to the obligations provided for under other relevant provisions of this Proclamation and other applicable laws, a licensee shall have the following obligations:

a) carry out geothermal operations in accordance with the appropriate laws, technology and geothermal operations consistent with international best practices generally accepted in the geothermal industry;

b) conduct geothermal operations to ensure the health and safety of licensee's agents, employees and other persons, and comply with the applicable laws pertaining to environmental protection;

c) ensure that all employees have received appropriate training and education necessary for geothermal operations consistent with best practices generally accepted in the geothermal industry;

መ) በፈቃዱ ክልልና አዋሳኝ በሆነ መሬት ላይ ሕጋዊ የይዞታ መብት ያላቸውን ሰዎች ላለማወክ ተገቢውን ጥንቃቄ የመውሰድ፤

ሠ) በፈቃድ ክልሉ ከሌሎች ሰዎች ጋር በጋራ ለሚጠቀምባቸው እንደ መንገድ የመሳሰሉ መሠረተ ልማቶች ግንባታና ጥገናን በሚመለከት በተጠቃሚዎቹ፣ የነፍስ ወከፍ የአገልግሎት መጠን ላይ ተመሥርቶ በሚደርስ ስምምነት መሠረት ገንዘብ የማዋጣት፤

ረ) በጂኦተርማል ሥራው ላይ እንቅፋት የማይፈጥርበት እስከሆነ ድረስ በዘረጋቸው የመንገዶችና የድልድዮች መሠረተ ልማቶች ሌሎች ሰዎች በነፃ እንዲጠቀሙ የመፍቀድ፤

ሰ) ድንገተኛ ሁኔታ ሲፈጠር፣ ለሚደርሰው ብልሽት ብቻ ካሣ በማስከፈል መንግሥት ወይም ሌሎች ሰዎች በመንገዱ፣ በሕንጻው፣ በመገናኛ መሣሪያዎቹ በመሳ ሰሉ መሠረተ ልማቶች በጊዜያዊነት እንዲ ገለገሉ የመፍቀድ፤

ሸ) ተፈላጊው ችሎታ ላላቸው ኢትዮጵያውያን የቅጥር ቅድሚያ የመስጠት፤

ቀ) በዋጋቸው ተወዳዳሪና በጥራታቸው ተመጣ ጣኝ ደረጃ ያላቸው እንደልብ ለሚገኙ የሀገር ውስጥ ዕቃዎች ግዥና አገልግሎቶች ቅድሚያ የመስጠት፤

በ) በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ መሠረት የሚፈለግበትን ማናቸውንም ክፍያ በወቅቱ የመክፈል፤

ተ) ፈቃዱንና የሥራ ፕሮግራሙን የሚመለከቱ ማናቸውንም ሁኔታዎች የማክበር፤

ቸ) መዛግብቶችንና ሪከርዶችን ጨምሮ አግባ ብነት ያላቸውን ሰነዶች በሙሉ በፈቃድ ሰጪው ባለሥልጣን ወይም በሌላ ሕግ ሥልጣን በተሰጣቸው ሌሎች አካላት እንዲመረመሩ የማቅረብ፤

d) take proper precautions not to interfere with other legitimate occupants of the license area and adjacent land;

e) contribute financially in the construction and maintenance of infrastructure such as roads to be used jointly with other users within the license area as agreed upon the basis of proportional use of the infrastructure;

f) permit other persons to use its road and bridge infrastructure freely; provided, that such use does not impair its geothermal operations;

g) allow Government or other persons to use temporarily its roads, buildings and communications infrastructure in circumstances of emergency, subject only to the payment of compensation in the event of damage thereto;

h) give employment preference to the Ethiopian citizens, provided that such persons have the required qualifications;

i) give preference to the purchase and use of domestic goods and services, where they are readily available at a competitive price and are of a comparable quality;

j) discharge timely all payments required under this proclamation and regulation and directive issued hereunder;

k) comply with any terms of the license and provisions of work program provided in the license;

l) make available at reasonable time all relevant documents, including books and records, for inspection by the licensing authority or other duly authorized bodies under the relevant laws;

ሰ) የሰውን ጤና እና ደህንነት አደጋ ላይ የሚጥል ድንገተኛ ሁኔታ ሲፈጠር መንግሥት ወደ ቦታው ገብቶ አስፈላጊውን እንዲፈጽም የመፍቀድ፤

ሠ) በአካባቢና በኅብረተሰቡ ላይ የሚደርስ ተፅዕኖን የመቀነስና እንዲሁም ተገቢ ሆኖ ሲገኝ ተቀባይነት ባገኘው የአካባቢና የኅብረተሰብ ላይ የሚደርስ ተፅዕኖ መቀነሻ ዕቅድ መሠረት እርምጃ የመውሰድ፤

ሸ) የጂኦተርማል ሥራ ፈቃድ ሲያበቃ፣ ሲቋረጥ ወይም የፈቃድ ክልሉን በራሱ ፈቃድ ሲለቅ በፈቃድና በኪራይ ተይዞ በነበረው ቦታ የሚገኙ ጉድጓዶችና ሌሎች ሥራዎች በሰዎች ጤንነት፣ ሕይወትና ንብረት ላይ አደጋ እንዳያስከትሉ ተቀባይነት ባገኘው የአካባቢ ተፅዕኖ ጥናት ግምገማ መሠረት ማጠር፣ ግንባታዎች ማንሳት፣ የቆፈራቸውን ጉድጓዶች በአግባቡ በመድፈን የመተው እና መከላከያ የማበጀት፤

ቀ) አግባብ ባለው አካል ዘንድ በንግድ መዝገብ ላይ የመመዝገብና ለፈቃዱ ዘመን በኢትዮጵያ ውስጥ ጽሕፈት ቤት የማቋቋም፤

በ) በሚመለከተው ክልል ህግ መሠረት ለፈቃድ ክልሉና በኪራይ ለያዘው መሬት በየዓመቱ በቅድሚያ ክፍያ መክፈል።

፪/ ባለፈቃዱ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) (ኘ) መሠረት ያላነሳቸውን ግንባታዎች መንግሥት ያለምንም ክፍያ የራሱ ንብረት ሊያደርጋቸው ይችላል።

፳፫. <u>የፈቃድ ክልል ወሰን</u>

፩/ የታወቀ የጂኦተርማል ክልል መጠንና ድንበር በፈቃድ ሰጪው ባለሥልጣን ይወሰናል።

፪/ የዚህ አንቀጽ ንዑስ አንቀጽ (፩) እና የዚህ አዋጅ አንቀጽ ፯ ድንጋጌዎች እንደተጠበቁ ሆነው ከታወቀ የጂኦተርማል ክልል ውጭ የሚገኝ የጂኦተርማል ክልልን የሚመለከት ፈቃድ ለመስጠት በግሎባል ፖዚሽንንግ ሲስተም (በጂ.ፒ.ኤስ) ኮኦርድኔት የሚገለጹ

m) provide access to the Government to the facility so as to take necessary measures in an emergency situation affecting health and safety;

n) minimize impacts on the environment and communities and, where appropriate, provide mitigation for those impacts in accordance with the approved environmental and social plan;

o) fence, remove constructions and properly plug and abandon wells and otherwise safeguard in accordance with a duly approved environmental impact assessment any wells and such other works in the license or lease area so that the health, life and property of persons may not be endangered upon revocation, termination or surrender of the geothermal operations license or leased area;

p) get registered in the registry of trade with the competent body and shall maintain an office in Ethiopia during the entire term of any license;

q) to effect prior payment annually for the license and lease area in accordance with the law of the respective Regional State.

2/ The Government may takeover, free of charge, constructions not removed by a licensee pursuant to sub-article (1) (o) of this Article.

23. <u>Boundaries of License Area</u>

1/ The size and boundaries of known geothermal areas shall be determined by the licensing authority.

2/ Without prejudice to sub-article (1) of this Article and subject to the limitations of Article 7 of this Proclamation, for the purpose of licensing a geothermal resource area other than the known geothermal resource area, shall be limited by the perimeter of a geometric figure whose vertices

የማዕዘን ነጥብ ባሉት አንድ የጂኦሜትሪ ቅርጽ የወሰን መስመሮች ውስጥ የተወሰነ የቦታ መጠን የሚኖረው ሆኖ፡-

ሀ) ለቅኝት ፈቃድ ሲሆን ከሁለት ሺህ (፪ሺ) ስኩዌር ኪ.ሎ ሜትር የማይበልጥ፤

ለ) ለምርመራ ፈቃድ ሲሆን ከሁለት መቶ (፪፻) ስኩዌር ኪ.ሎ ሜትር የማይበልጥ ሆኖ፣ አንድ ሰው እስከ ሁለት ፈቃድ ብቻ፣ ወይም

ሐ) ለጂ.አተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ሲሆን ከሃምሳ (፶) ስኩዌር ኪ.ሎ ሜትር የማይበልጥ የጂ.አተርማል ሀብት ክልል ሊፈቀድ ይችላል።

፫/ የዚህ አንቀጽ ንዑስ አንቀጽ (፩) እና (፪) ዝርዝር አፈፃፀም አዋጁን ለማስፈፀም በሚወጣ ደንብ ይወሰናል።

፳፬. <u>የሌሎች አገልግሎቶች ፈቃድ ስለመደረብ</u>

አግባብነት ያለው አካል ከፈቃድ ሰጪው ባለሥልጣን ጋር በመመካከርና ለአገሪቱ የሚያስገኘውን የኢኮኖሚ ጥቅምና በነባር ባለፈቃድ ላይ ሊደርስ የሚችለውን ተፅዕኖ በተመለከተ አመልካቹ ያካሄደውን ጥናት ግምት ውስጥ በማስገባት፣ እንዲሁም ነባሩን ባለፈቃድ በቅድሚያ በማሳወቅና በሥራዎቹና በአፈጻጸሙ ላይ አሉታዊ ተፅዕኖ አለማሣረፋቸውን አረጋግጦ በተመሳሳይ የፈቃድ ክልል ውስጥ ለሌሎች አገልግሎቶች ፈቃድ ደርቦ ሊሰጥ ይችላል።

፳፭. <u>ስለፈቃድ ቀዳሚነት</u>

፩/ ፈቃድ ሰጪው ባለሥልጣን የጂ.አተርማል ሀብቱን ኢኮኖሚያዊ ጠቀሜታ ወይም ሌሎች አግባብ ያላቸውን የኢንቨስትመንት ዓላማዎች መሠረት በማድረግ በሌላ አኳኋን ካልወሰነ በቀር ፈቃድ በመስጠት ሂደት በደረጃ I የጂ.አተርማል ሀብት ላይ የጂ.አተርማል ሥራ ፈቃድ መስጠት በደረጃ II የጂ.አተርማል ሀብት ላይ በሚሰጥ የጂ.አተርማል ሥራ ፈቃድ ላይ ቀዳሚነት ይኖረዋል።

are referred to in Global Positioning System Coordinates, and the following size of geothermal resources area may be authorize:

a) for a reconnaissance license it shall be not more than two thousand (2,000) square kilometers;

b) for an exploration license it shall be not more than two hundred (200) square kilometers; and a licensee shall not hold more than two licenses at time; or

c) for a geothermal well-field development and use license it shall be not more than fifty (50) square kilometers.

3/ the manner of detailed application of sub-articles (1) and (2) of this Article shall be determined in regulation issued pursuant to this Proclamation.

24. <u>Superimposition of Licenses for Other Purposes</u>

The competent body may, in consultation with the licensing authority and on the basis of the economic benefit to the country and assessment made by the subsequent applicant of the potential impacts on an existing licensee, grant licenses for other purposes within the same license area, upon notification to the holder of any existing license and as long as they do not materially affect the activities and performance of the existing license.

25. <u>Precedence of Licenses</u>

1/ Unless the licensing authority determines otherwise on the basis of an analysis of the economic benefits of the development of geothermal resources or other appropriate investment objectives, the granting of geothermal operations license on Grade I geothermal resources shall take precedence over granting geothermal operations license on Grade II geothermal resources.

፪/ ፈቃድ ሰጪው ባለሥልጣን የጂኦተርማል ሀብቱን ኢኮኖሚያዊ ጠቀሜታ ወይም ሌሎች አግባብ ያላቸውን የኢንቨስትመንት ዓላማዎች መሠረት በማድረግ በሌላ አኳኋን ካልወሰነ በቀር ፈቃድ በመስጠት ሂደት የምርመራ ፈቃድ በቅኝት ፈቃድ ላይ እና የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ በምርመራና በቅኝት ፈቃድ ላይ ቀዳሚነት ይኖረዋል::

፫/ ፈቃድ በተሰጠበት ክልል በተደራቢ የተሰጠ ፈቃድ ቢኖር በክርክር ላይ ያለው የጂኦተርማል ሀብት ፈቃድ ክልል በቀዳሚው ባለፈቃድ ይዞታ ሥር እንዳለ ሆኖ ይቆጠራል::

፳፮. <u>ፈቃድ ስለማስተላለፍ</u>

፩/ ከቅኝት ፈቃድ በስተቀር ማንኛውም ፈቃድ የያዘ ባለፈቃድ በቅድሚያ የፈቃድ ሰጪውን ባለሥልጣን የጽሑፍ ስምምነት በማግኘትና ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብ የተመለከተ የፈቃድ ማስተላለፍ ክፍያ በመፈፀም ፈቃዱን ለሌላ ሰው ሊያስተላልፍ ይችላል::

፪/ ፈቃድ ሰጪው ባለሥልጣን ማንኛውንም ፈቃድ እንዲተላለፍ ከመፈቀዱ በፊት ፈቃድ እንዲተላለፍለት የሚፈልገው ሰው አስፈላጊው የገንዘብ አቅም፣ የቴክኒክ ችሎታና ልምድ ያለውና በማንኛውም ፈቃድ ሥር ያሉ ግዴታዎችንና ይህን አዋጅ ለማስፈጸም በሚወጣ በደንብና በመመሪያ የተዘረዘሩ ሌሎች መሥፈርቶችን የሚያሟላ ስለመሆኑ ማረጋገጥ አለበት::

፫/ ከፈቃድ ሰጪው ባለሥልጣን በቅድሚያ ስምምነት ካልተገኘ በስተቀር ፈቃዱ የሚተላለፍባቸው ሰነዶች የሚከተሉትን የስምምነት ድንጋጌዎች ማካተት አለባቸው፦

ሀ) ያለምንም ልዩነት ፈቃዱ የሚመለከተው ክልልና የፈቃዱ ሁኔታዎች በአጠቃላይ የሚተላለፉ መሆኑን፤ እና

ለ) ፈቃዱ የሚተላለፍለት ሰው ተቀባይነት ባገኘው የሥራ ፕሮግራም መሠረት ለመፈፀም የተስማማ መሆኑን::

፬/ በዚህ አዋጅ በአንቀጽ ፲፱ (፩) እና (፪) ለተመለከተ ሰው ማንኛውም ዓይነት ፈቃድ አይተላለፍም::

2/ Unless the licensing authority determines otherwise on the basis of analysis of economic benefits of the development of geothermal resources or other appropriate investment objectives, in the granting of licenses, an exploration license shall take precedence over a reconnaissance license, and a geothermal well-field development and use license shall take precedence over an exploration and reconnaissance license.

3/ If any license area is found to be superimposed upon that of another license, the area under dispute shall stay within the area of the first-issued license.

26. <u>Transfer of License</u>

1/ Any license, other than a reconnaissance license, may transfer his license to another person with the prior written consent of the licensing authority and upon payment of any transfer fees prescribed in the regulation issued hereunder.

2/ The licensing authority shall, prior to approving any transfer, ensure that the transferee has the necessary financial resources and technical capability and experience to fulfill the obligations under any license and meets such other criteria as may be set forth in the regulation and directive issued hereunder.

3/ The documents that transfer the licenses shall include the following provisions; unless prior written consent of the licensing authority is obtained:

a) the license area and the terms of the license are transferred in total, without exception; and

b) the transferee of the license agrees to adhere to any provisions of the approved work program.

4/ No license may be transferred to a person specified under Article 19 (1) and (2) of this Proclamation.

፫/ በሚተላለፍ ፈቃድ ሥር ያለ ማንኛውም መብት በፈቃድ ሰጪው ባለሥልጣን ተቀባይነት አግኝቶ ካልተመዘገበ በቀር ፈቃዱ ተላልፏል ለተባለለት ሰው የሚያስገኘው ሕጋዊ ውጤት አይኖረውም::

፳፯. <u>መብትን ስለመተው</u>

፩/ ባለፈቃዱ ፈቃዱን ወይም የፈቃድ ክልሉን የትኛውንም ክፍል በቅድሚያ ፈቃድ ሰጪውን ባለሥልጣን በጽሑፍ በማሳወቅ መተው ይችላል:: ሆኖም መብቱን በራሱ ፍላጎት ከተወ በኋላም የለቀቀውን ቦታ ቀድሞ ወደነበረበት ሁኔታ የመመለስ ወይም በራሱ ተግባራት ምክንያት የተከሰቱ ብክለቶችን የማስወገድ ወይም ለዚህ ተግባር የሚውል ዋስትና ወይም ገንዘብ የማስያዝ የመሣሰሉት ግዴታዎች አሉበት::

፪/ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) መሠረት የፈቃድ ወይም የኪራይ መብቱን የተወ ማንኛውም ሰው ፈቃዱ ወይም የኪራይ ውሉ ፀንቶ ለቆየበት ጊዜ የሚያስከትላቸውን ግዴታዎች ከመፈፀም ነፃ አይሆንም::

፳፰. <u>መረጃዎችን ስለመግለጽ</u>

፩/ የአዕምሯዊ ንብረት ባለቤትነት መብት እንዳለው ወይም ሚስጥር መሆኑ በባለፈቃዱ ምልክት ተደርጎበት በዚህ አዋጅ መሠረት የቀረበ ማንኛውም መረጃ፣ ሪፖርት፣ ሰነድ ወይም ዳታ በባለፈቃዱ ስምምነት ካልሆነ በስተቀር ፈቃዱ ፀንቶ እስከሚቆይበት ጊዜ ድረስ በፈቃድ ሰጪው ባለሥልጣን ወይም በሌላ የመንግሥት አካል ለሌላ ሦስተኛ ወገን መገለጽ የለበትም:: ሆኖም ባለፈቃዱ በፈቃዱ ሥር የነበረ ክልልን ከተወ ወይም ፈቃዱ ከተሠረዘ በኋላ ማናቸውም የጂኦተርማል ሀብቱን የሚመለከቱ መረጃዎች ለሕዝብ ክፍት ይሆናሉ::

፪/ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) የተመለከተው ክልከላ፦

ሀ) በፍትሕ አካላት ዘንድ ለተያዘ ክርክር፣ ማጣራት ወይም ምርመራ ሲሆን፤

ለ) እንደዚህ ያሉ መረጃዎችን እንዲቀበል በፈቃድ ሰጪው ባለሥልጣን የተፈቀደለት ከመንግሥት ጋር ውለታ ያለው አማካሪ ሲሆንና ይኸው አማካሪ በዚህ አንቀጽ

5/ Rights under any transfer of a license shall be ineffective as against any transferee of the license unless such transfer is approved and is registered by the licensing authority.

27. <u>Surrender</u>

1/ The holder of a license may surrender his license or any portion of the license area by giving notice to the licensing authority subject to obligations which shall continue following surrender, such as the obligation to restore the site or remediate pollution caused by licensee's operation, or to furnish guarantee or other financial instrument for that purpose.

2/ Any person who surrenders his license or lease right pursuant to sub-article (1) of this Article, shall not be released from the liability of performing the duties imposed upon him and due to be performed during the term of the license.

28. <u>Disclosure of Information</u>

1/ Any information, reports, documents, or data submitted pursuant to this Proclamation marked as proprietary or confidential by the licensee shall not be disclosed by the licensing authority or any other Government organ to a third party during the term of the license and any extensions thereof, except with the consent of the licensee; provided, however, that following surrender of license area or termination of license, all information related to the geothermal resources shall be public information.

2/ The prohibition of disclosure of information pursuant to sub-article (1) of this Article shall not apply when the information is sought:

a) for the purpose of legal proceedings, an inquiry or investigation conducted by an organ of justice administration;

b) to any person that is under contract as a consultant to the Government who is authorized by the licensing authority to receive such information; provided that such

መሠረት መንግሥት ሚስጥር ለመጠበቅ እንደገባው በተመሳሳይ ግዴታ ያለበት ሲሆን፤ ወይም

ሐ) ለጉዳዩ ከሚያስፈልገው በላይ ዝርዝር እስካል ሆነ ድረስ ለመንግሥት ወይም መንግሥትን በመወከል የልማት ሥራዎችን ስታትስቲክስ ለማጠናቀር ሲሆን፣ ተፈፃሚነት አይኖ ረውም::

፳፱. ስለሪከርዶችና ሪፖርቶች

፩/ ማናቸውም ባለፈቃድ በፈቃዱ በግልጽ እንደሚ ያስፈልጉ ከተጠቀሱ ዝርዝር ሪከርዶችና ሪፖርቶች በተጨማሪ የሚከተሉትን መረጃ ዎች የያዙ ሰነዶችን በኢትዮጵያ ግዛት ውስጥ መያዝ እና እነዚህኑ ሪፖርቶች ለፈቃድ ሰጪው ባለሥልጣን ማቅረብ አለበት፦

ሀ) ስለጉድጓድና ከጉድጓድ ስለወጣ ኮር የተመዘገበ ዝርዝር ዳታ፣ ጉድጓዱም ስለሚ ሰጠው ምርት፣ ስለ ሪኢንጀክሽን ተግባራ ትና በጉድጓዶች መካከል ሊኖር የሚችል ተጽዕኖን ለመፈተሽ የተደረጉ ሙከራዎችን ጨምሮ የጂኦተርማል ሥራውንና የተገኙ ውጤቶችን የሚመለከቱ መረጃዎችን፤

ለ) የቅጥር፣ የፋይናንስ፣ የንግድና ሌሎች በፈቃድ፣ ይህን አዋጅ ለማስፈጸም በሚ ወጣ በደንብና በመመሪያ የተመለከቱ አግባብነት ያላቸው መረጃዎችን::

፪/ ባለፈቃዱ የፈቃድ ሰጪውን ባለሥልጣን በጽሑፍ የተሰጠ ይሁንታን ሳያገኝ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) (ሀ) የተመለከቱትን ማናቸውንም ከጉድጓድ ጋር የተያያዘ ወይም ከጉድጓድ የወጣ ኮር ወይም የኮሩን የተመዘገበ ዳታ ማስወገድ ወይም ማጥፋት አይችልም::

፴. ከጂኦተርማል ጋር የተያያዙ ናሙናዎችን ወደ ውጭ ስለመላክ

፩/ ባለፈቃዱ ከፈቃድ ሰጪው ባለሥልጣን በቅድሚያ በጽሑፍ በተሰጠ ፈቃድ መሠረት የጂኦተርማል ፈሳሾችን፣ ብራይንና ሌሎች የጂኦሎጂካል ናሙናዎችን ወደ ውጭ ሀገር ለፍተሻ የመላክ መብት አለው::

consultant is bound by the same standard of non-disclosure as is the Government under this Article; or

c) for the preparation of statistics by or on behalf of the Government in respect of development operations; provided such disclosure is no more specific in detail than is necessary for the purpose of the statistics concerned.

29. Records and Reports

1/ In addition to specific records and reports that may be required in the license, any licensee shall make available within the territory of Ethiopia documents containing the following information and shall submit such reports to the licensing authority that include:

a) information pertaining to its geothermal operations and the results connected therewith, including, but not limited to, well and core-log data, production and re-injection activities and interference or tracer tests;

b) employment, financial, commercial and other relevant information as may be required in the license or as may be prescribed in regulation and directive issued hereunder.

2/ The licensee may not dispose of or destroy any document relating to well or core-log data specified in sub-article (1) (a) of this Article, without the prior written consent of the licensing authority.

30. Export of Geothermal Related Geological Samples

1/The holder of a license shall have the right, with the prior written consent of the licensing authority, to export samples of fluids, brine and other geological related resources for laboratory testing.

፪/ የዚህ አንቀጽ ንዑስ አንቀጽ (፩) ድንጋጌ እንደተጠበቀ ሆኖ የጂኦተርማል ናሙናዎች መጠን፣ አያያዝ፣ ምርመራና ቁጥጥር አፈጻጸም ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ ይወሰናል።

2/ Without prejudice to sub-article (1) of this Article, the quantity, handling, control and inspection of geothermal samples shall be determined in regulation and directive issued hereunder.

፴፩. <u>ስለቴክኖሎጂ ሽግግር</u>

31. <u>Technology Transfer</u>

፩/ ማንኛውም ባለፈቃድ ከጂኦተርማል ሥራው ጋር በተያያዘ ሁኔታ የቴክኖሎጂ ሽግግር ስምምነት በሚያደርግበት ጊዜ ስምምነቱን ለፈቃድ ሰጪው ባለሥልጣን በማቅረብ ማስፈቀድና ማስመዝገብ አለበት።

1/ Any licensee who concludes a technology transfer agreement in connection with his geothermal operations shall submit same to the licensing authority for approval and registration.

፪/ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) መሠረት ለፈቃድ ሰጪው ባለሥልጣን መቅረብ የሚገባቸው መረጃዎች እና መቅረብ የማይገባቸው የአዕምሯዊ ንብረት መረጃዎች በደንብና በመመሪያ ይወሰናሉ።

2/ Information to be provided pursuant to sub-article (1) of this Article, as well as any excluded proprietary information, shall be determined in regulation and directive.

፫/ የዚህ አዋጅ አንቀጽ ፳፰ ድንጋጌዎች ባለፈቃዱ ለፈቃድ ሰጪው ባለሥልጣን በሚሰጣቸው መሰል የቴክኖሎጂና የአዕምሮአዊ ንብረት ባለቤትነት መብቶች ላይ ተፈፃሚ ይሆናሉ።

3/ The provisions of Article 28 of this Proclamation shall apply to the technology and proprietary ownership rights transferred by the licensee to the licensing authority.

፬/ ከባለፈቃዱ ጋር የሚደረጉ የቴክኖሎጂ ሽግግር ስምምነቶች ከአገሪቱ የቴክኖሎጂ ሽግግር ሕጎች ጋር የሚጣጣም መሆኑን ፈቃድ ሰጪው ባለሥልጣን ማረጋገጥ አለበት።

4/ When considering entering into a technology transfer agreement with a licensee, the licensing authority shall ensure that the agreement is consistent with the technology transfer law of the country.

፴፪. <u>ፈቃድን ስለማገድ</u>

32. <u>Suspension of Licenses</u>

፩/ የዚህ አንቀጽ ንዑስ አንቀጽ (፪) እና (፫) ድንጋጌዎች እንደተጠበቁ ሆነው ፈቃድ ሰጪው ባለሥልጣን ወደ ፈቃድ ክልሉ በመግባት ቁጥጥር በማድረግ የባለፈቃዱ ተግባር በማኅበረሰቡ፣ በሠራተኞቹ ወይም በአካባቢ ላይ ከባድ አደጋ የሚያስከትል መሆኑን ሲያምንበትና ባለው ተጨባጭ ሁኔታ ማገድ ብቸኛው መፍትሄ ሆኖ ሲያገኘው ፈቃዱን ሙሉ በሙሉ ወይም በከፊል ማገድ ይችላል።

1/ Subject to sub-articles (2) and (3) of this Article, the licensing authority shall have the right to enter the license area and upon conducting supervision may suspend geothermal licenses in whole or in part when it believes that the activity of the licensee is or is likely to pose imminent danger to the local community, its employees, or the environment, provided that such suspension is the only remedy under the prevailing circumstances.

፪/ የሕዝብን ጤና፣ ደህንነት ወይም አካባቢን ለመታደግ ፈጣን ምላሽ የሚያስፈልገው ድንገተኛ ሁኔታ ካልተፈጠረ በስተቀር ፣ ፈቃድ ሰጪው ባለሥልጣን ፈቃዱን ከማገዱ በፊት፦

2/ Except in emergency circumstances in which immediate response is required to protect public health safety or the environment, before suspending the license, the licensing authority shall give notice in writing to the licensee:

ሀ) ፈቃዱን ለማገድ ምክንያት ናቸው የሚላቸውን ነገሮች፣ ባለፈቃዱ የፈፀማቸውን የዚህን አዋጅ፣ ሌሎች ሕጎችንና ደንቦችን ጥሰቶች ለማረም ሊወስዳቸው የሚገባቸውን በጊዜ የተገደቡ እርምጃዎች፤ እና

ለ) ባለፈቃዱ የፈቃድ ሰጪው ባለሥልጣን እገዳ ሊፈጸም አይገባም የሚላቸውን ማናቸውም ጉዳዮች በጽሑፍ የሚያቀርብበት ከሃያ (፳) ያልበለጠ በቂ የሥራ ቀን የያዘ፣ የጽሑፍ ማስጠንቀቂያ መስጠት አለበት::

፫/ ፈቃድ ሰጪው ባለሥልጣን የእገዳ ማስጠንቀቂያውን በማንሳት ባለፈቃዱ ወደነበረበት ሁኔታ ሥራዉን እንዲቀጥል የሚፈቅደው፦

ሀ) ባለፈቃዱ ለፈቃዱ መታገድ ምክንያት ናቸው ተብለው የተዘረዘሩትን ነገሮች በዚህ አንቀጽ ንዑስ አንቀጽ (፪) (ሀ) በተሰጠው ማስጠንቀቂያ በተገለፀው የጊዜ ገደብ ውስጥ በበቂ ሁኔታ ካረመ፣ በበቂ ሁኔታ ካሻሻለ፣ ካስወገደ ወይም እንዳይደገሙ ከተከላከለ፤ ወይም

ለ) እገዳ ሊፈፀም አይገባም በማለት ባለፈቃዱ በዚህ አንቀጽ ንዑስ አንቀጽ (፪) (ለ) መሠረት ያቀረባቸውን ምክንያቶች ከተቀበለ፣ ይሆናል::

፴፫. <u>ስለፈቃድ መሠረዝና መቋረጥ</u>

፩/ በዚህ አዋጅ መሠረት የተሰጠ ፈቃድ የሚሰረዘው፦

ሀ) ባለፈቃዱ የፈቃዱን ክልል በሙሉ ሲለቅ ወይም የፈቃድ መብቱን ሲተው፤

ለ) በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ መሠረት ፈቃዱ በፈቃድ ሰጪው ባለሥልጣን ሲሠረዝ፤

ሐ) የፈቃዱ ዘመን ከተፈፀመ በኋላ ሳይታደስ ሲቀር፤

መ) የወራሾች መብት እንደተጠበቀ ሆኖ ባለፈቃዱ የተፈጥሮ ሰው ከሆነ ሲሞት ወይም ባለፈቃዱ የሕግ ሰውነት መብት ያለው የንግድ ማህበር ከሆነ መፍረሱ ሲረጋገጥ ወይም የመክሰር ውሣኔ ሲሰጥበት፤ ይሆናል::

a) setting out the grounds for suspension of the license, directing the licensee to take specific measures to remedy any violation of this Proclamation or other laws and regulations; determine a time period for the licensee to rectify, and any penalties for violations of applicable laws; and

b) specifying a reasonable date not exceeding twenty (20) working days, before which the licensee may, in writing, submit to the licensing authority's his objection against suspension.

3/ The licensing authority may lift the notice of suspension of a license and reinstate the licensee in good standing in circumstances in which:

a) the licensee complies with the requirement of the notice contemplated in sub-article (2) (a) of this Article by rectifying, removing, or mitigating the grounds for suspension, or by preventing the recurrence of such grounds within the time specified in the notice; or

b) the reasons submitted by the licensee in accordance with sub-article (2) (b) of this Article justify the lifting of the suspension.

33. <u>Termination and Revocation of License</u>

1/ A license issued pursuant to this Proclamation shall terminate if:

a) a licensee surrenders the whole license area;

b) a license is revoked by the licensing authority pursuant to the provisions of this Proclamation and regulation and directive issued hereunder;

c) a license expires without being renewed;

d) without prejudice to the rights of heirs, upon death of a licensee if he is a natural person and when liquidated or declared bankrupt if a licensee is a juridical person.

፪/ በዚህ አዋጅ መሠረት የተሰጠ ፈቃድ ሊቋረጥ የሚችለው ባለፈቃዱ፦

ሀ) በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ የተመለከቱ የፋይ ናንስ ግዴታዎችን ካላከበረ፤

ለ) የጂኦተርማል ሥራዎችን በከባድ ቸልተኝነት ወይም ሆን ብሎ አግባብ ባልሆነ መንገድ ካካሄደ፤

ሐ) የፈቃዱን መሠረታዊ ስምምነቶች ወይም ግዴታዎች ከጣሰ፤

መ) በሥራ ፕሮግራሙ መሠረት የጂኦተርማል ሥራዎችን የማያካሂድ ከሆነ፤

ሠ) የተፈቀደ የአካባቢና ማህበረሰብ ተጽዕኖ ግምገማ ጥናት ተግባራዊ ያላደረገ ወይም የደህንነትና የጤና ደረጃዎችን ያላከበረ ከሆነ፤

ረ) በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ መሠረት ማቅረብ ከሚገባው ጉዳይ ጋር በተያያዘ ትክክለኛ ያልሆነ ወይም የተሳሳተ መረጃ አቅርቦ ከተገኘ፤

ሰ) በማናቸውም ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ መሠረት የተሟሉ፣ ትክክለኛ የሆኑና ወቅታዊውን ሁኔታ የሚያሳዩ መዝገቦችንና ሪከርዶችን ካልያዘ ወይም በፈቃዱ መሠረት መቅረብ የሚገባቸውን ሪፖርቶች ወይም ሌሎች መዝገቦችን ካላቀረበ፤

ሸ) በአግባቡ ሥልጣን የተሰጠው የፈቃድ ሰጪው ባለሥልጣን ሠራተኛ ወደ ፈቃድ ክልሉ ወይም በኪራይ ወደተያዘው ክልል እንዳይገባ ወይም የጂኦቲርማል ሥራዎች የሚካሄድ ባቸውን ቦታዎች ወይም ተቋማት ወይም የባለፈቃዱን መዝገቦች፣ ሪከርዶች ወይም ሌሎች ሰነዶች ወይም ማቴሪያሎች እንዳያይ ካደረገ ወይም በሠራተኛው የተሰጠውን ሕጋዊ ትዕዛዝ ወይም መመሪያ ካልፈፀመ፤

2/ A license issued pursuant to this Proclamation may be revoked if a licensee:

a) fails to comply with the financial obligations prescribed in this Proclamation and regulation and directive issued hereunder;

b) conducts geothermal operations in a grossly negligent or willfully improper manner;

c) breaches any material term or condition of its license;

d) is not conducting its geothermal operations in accordance with the approved work program;

e) is in breach of the approved environmental impact assessment, or safety and health standards;

f) has submitted false or fraudulent information in connection with any matter required to be submitted under this Proclamation and regulation and directive issued hereunder;

g) fails to maintain complete, accurate and current books and records or other documents or materials required by any regulation and directive issued hereunder or fails to submit reports or other documents as required by its license;

h) fails to grant a duly authorized official of the licensing authority access into the license area, or any area covered by a lease, or to any other site or premises of geothermal operations or to licensee's books, records, other documents or materials, or fails to carry out a lawful order or instruction of such official;

ቀ) በፈቃዱ ውስጥ በተቀመጠው መሠረት ለፈቃድ ሰጪው ባለሥልጣን ማቅረብ ያለበትን አስፈላጊ መሠረታዊ መረጃ ያላቀረበ ከሆነ::

i) fails to submit to the licensing authority as required by the license, any material information.

፫/ በፈቃዱ ወይም በሌላ ስምምነት፣ በሌላ ሁኔታ ካልተገለፀ በቀር በደረጃ I ወይም በደረጃ II የጂኦተርማል ሀብት ላይ የሚሰጥ የጂኦተርማል ሥራ ፈቃድ ሲቋረጥ ለጂኦተርማል ሥራዎች ጥቅም ላይ ውለው የእርጅና ቅናሻቸው ሙሉ በሙሉ ያልተጠናቀቁ ጉድጓዶችን ሳይጨምር የማይንቀሳቀሱና ተንቀሳቃሽ ንብረቶች በባለፈቃዱ የሂሣብ መዝገብ ላይ በሚታየው ዋጋቸው መንግሥት ሊገዛቸው ይችላል::

3/ Upon termination of a geothermal operations license granted on Grade I or Grade II geothermal resources, the Government may, unless a license or another agreement specifies otherwise, buy all of the immovable and movable property, excluding wells, used in the geothermal operations at a price equal to the then unamortized value of such assets, as shown in the financial book of accounts of the licensee.

፬/ መንግሥት በአንድ ዓመት ጊዜ ውስጥ ወይም ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብ በሚወሰን የጊዜ ገደብ ውስጥ በዚህ አንቀጽ ንዑስ አንቀጽ (፫) የተመለከቱ ንብረቶችን ሊያነሳቸው ካልቻለ፣ ባለፈቃዱ አግባብ ባላቸው ሕጎች መሠረት ንብረቶቹን ለሌላ ሰው ሊያስተላልፍ ይችላል፣ ንብረቱ ሊተላለፍ የማይችል ከሆነ ስለአካባቢ ጥበቃ በገባቸው ግዴታዎች መሠረት ያስወግዳቸዋል::

4/ If the Government does not acquire the properties specified under sub-article (3) of this Article in one year or in such other time set forth in regulation issued hereunder, the licensee shall be free to transfer such assets to another person in accordance with the applicable laws, or shall remove them as required by its environmental obligations if cannot be transferrable.

፴፬. <u>የጂኦተርማል የማማከር አገልግሎት ወይም የቴክኒክ ነክ ሥራ የሙያ ብቃት ማረጋገጫ የምስክር ወረቀት</u>

34. <u>Certificate of Professional Competency for Geothermal Consultancy Service and Technical Works</u>

፩/ ማንኛውም በጂኦተርማል የማማከር አገልግሎት ላይ መሠማራት የሚፈልግና ከጂኦተርማል ጋር የተያያዘ ሙያ ያለው ግለሰብ በዚህ አዋጅ እና ይህንን አዋጅ ለማስፈፀም በሚወጣ ደንብ መሠረት የሙያ ብቃት ማረጋገጫ የምሥክር ወረቀት እንዲሰጠው ለፈቃድ ሰጪው ባለሥ ልጣን ሊያመለክት ይችላል::

1/ Any individual with geothermal related profession who wishes to engage in geothermal consultancy services may apply for a certificate of professional competency to the licensing authority in accordance with this Proclamation and Regulation issued hereunder.

፪/ ማንኛውም በጂኦተርማል የማማከር አገልግሎት ወይም ቴክኒክ ነክ ሥራ ላይ መሠማራት የሚፈልግ በሕግ የሰውነት መብት የተሰጠው የንግድ ማህበር በዚህ አዋጅ እና ይህንን አዋጅ ለማስፈፀም በሚወጣ ደንብ መሠረት የብቃት ማረጋገጫ የምስክር ወረቀት እንዲሰጠው ለፈቃድ ሰጪው ባለሥልጣን ሊያመለክት ይችላል::

2/ Any juridical person wishes to engage in geothermal technical works or geothermal consultancy services may apply for a certificate of competency to the licensing authority in accordance with this Proclamation and Regulation issued hereunder.

ክፍል አምስት

ስለ አስተዳደር፣ ስለካሣ ክፍያ፣ ከጉምሩክ ቀረጥና ታክስ ነጻ ስለመሆን፣ ስለፈቃድ ክፍያ እና ስለአካባቢ ደህንነት

፴፭. ስለ ቁጥጥር

፩/ ማንኛውም ሥልጣን የተሰጠው የፈቃድ ሰጪው ባለሥልጣን ተቆጣጣሪ ሠራተኛ ተገቢ በሆነ የሥራ ሰዓት ከባለሥልጣኑ የተሰጠውን የጸና መታወቂያ ካርድ በማሳየት ወደማንኛውም የፈቃድ ክልል በመግባት፦

ሀ) የፈቃድ ክልሉንና በፈቃድ ክልሉ ውስጥ በመካሄድ ላይ ያለን ማናቸውንም እንቅስቃሴ ወይም ሂደት ለመቆጣጠር፤

ለ) ማንኛውንም ሪከርድ፣ መግለጫ ወይም ሌላ ሰነድ ለመመርመርና የሰነዱን ወይም የሰነዱን ክፍል ቅጅ ለመውሰድ፤

ሐ) ማናቸውንም ናሙና ለመውሰድና ለመፈተሽ፣ ለመመርመር፣ ለመተንተንና በዓይነት በዓይነቱ ለመለየት፤ ይችላል::

፪/ ባለፈቃዱ ሥልጣን ለተሰጠው ተቆጣጣሪ ድጋፍ የሚሰጥ አግባብ ያለው ሠራተኛ መመደብና በፈቃዱ ክልል ውስጥ ባለ ጊዜ ሁሉ ደህንነቱን የማረጋገጥና በፈቃድ ክልሉ ውስጥ ለሚገኙ ሌሎች ሠራተኞች የታደለውን የደህንነት መጠበቂያ መሣሪያ መስጠት አለበት::

፫/ ሥልጣን የተሰጠው ተቆጣጣሪ በማስረጃዎችና በአካባቢ ሁኔታዎች ላይ በመመስረት የዚህ አዋጅ ድንጋጌዎች መጣሳቸውን፣ እየተጣሱ ወይም ሊጣሱ መሆኑን ካመነ የፈቃድ ሰጪው ባለሥልጣን በጽሑፍ በሚሰጠው ይሁንታ መሠረት አስተዳደራዊ ወይም ሕጋዊ ክስ ለመመሥረት አስፈላጊ የሆኑ መዝገቦችን፣ ሪከርዶችን፣ መግለጫዎችን ወይም ሌሎች ሰነዶችን ደረሰኝ በመስጠት ለመያዝና በፈቃድ ሰጪው ባለሥልጣን ጥበቃ ሥር ለማቆየት ይችላል::

፬/ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) (ሐ) መሠረት ናሙና ሲወሰድ ወይም በዚህ አንቀጽ ንዑስ አንቀጽ (፫) መሠረት ማንኛውም ሰነድ ሲያዝና በፈቃድ ሰጪው ባለሥልጣን ጥበቃ ሥር እንዲቆይ ሲደረግ፦

PART FIVE

ADMINISTRATION, COMPENSATION, EXEMPTION FROM CUSTOMS DUTIES, LICENSE FEES AND ENVIRONMENTAL SAFETY

35. Inspections

1/ Any authorized inspector of the licensing authority during appropriate working hours, upon showing valid identity card issued by the Authority, may enter any license area:

a) inspect the license area and any activity or process carried out in the license area;

b) inspect any record, statement or other document and make copies or extracts thereof;

c) take samples of any material for the purpose of testing, examining, analyzing and classifying such samples.

2/ The licensee shall provide the authorized inspector an appropriate employee to assist him and shall take reasonable measures to ensure that the inspector's safety while in the license area, including provision of safety equipment generally distributed to the employees working in the license area.

3/ In the event that the authorized inspector has the logical belief, supported by facts and circumstances, that a violation of the terms of this Proclamation has been, is being, or will be committed; the inspector may with the written approval of the licensing authority, by giving receipt, may seize any book, record, statement or other document deemed relevant to administrative or judicial proceedings and keep same in the custody of the licensing authority.

4/ When any material is taken pursuant to sub-article (1) (c) of this Article or when any document is seized under sub-article (3) of this Article, and is in the custody of the licensing authority:

ሀ) በይዞታው ወይም በቁጥጥሩ ሥር የነበረ ሰነድ የተያዘበት ሰው እነዚሁ ሰነዶች ከመወሰዳቸው በፊት ተቆጣጣሪው እየተከታተለው የሰነዱን ወይም የሰነዱን ክፍል ቅጅዎች እንዲወሰድ ማድረግ ይቻላል፤ ወይም

ለ) ከተያዘው የትኛውም ነገር ጋር በተያያዘ ክስ ካልተመሠረተ ወይም በማናቸውም ክርክር ወቅት እንደማስረጃ ሊያገለግል መቻሉ አጠራጣሪ ሆኖ ሲገኝ ወይም በፍርድ ቤት ትዕዛዝ ለተያዘበት ሰው ወዲያውኑ ይመለሳል::

a) the person from whose possession or control any document is taken shall be allowed, under the supervision of the inspector, to make copies, extracts, or descriptions thereof prior to their removal; or

b) if no legal proceedings are instituted in connection with any of the items seized, or if it appears that seized materials are not required as evidence or upon court order, that item shall be returned immediately to the person from whom it was seized.

ፀ፮. <u>የሠራተኞች ጥበቃ</u>

ማንኛውም ባለፈቃድ የፈቃድ ግዴታዎቹን ወይም ይህን አዋጅ፣ ይህንን አዋጅ ለማስፈፀም የሚወጣ ደንብና መመሪያን አለማክበሩን በሥሩ የሚገኝ ሠራተኛ ለፈቃድ ሰጪው ባለሥልጣን ወይም ለሌላ ለማንኛውም ሥልጣን ለተሰጠው ሰው በማሳወቁ ምክንያት በሠራተኛው የሥራ ሁኔታ ላይ ጎጅ ተጽዕኖ የሚያደርስ እርምጃ ሊወሰድ አይችልም::

36. <u>Protection of Employees</u>

The holder of any license may not subject any of its employees to any occupational detriment on account of any such employees disclosing information to the licensing authority or any other authorized person regarding the failure by such holder to comply with its license or with any provision of this Proclamation and regulation, directive issued hereunder.

ፀ፯. <u>ስለ ካሣ</u>

ማንኛውም የጂኦተርማል ሥራ ለማከናወን መሬትን ማስለቀቅ የሚጠይቅ ባለፈቃድ ለሚለቀቀው የመሬትና ንብረት ባለይዞታ ለሕዝብ ጥቅም መሬት የሚለቀቅበትንና ለንብረት ካሣ የሚከፈልበትን ሁኔታዎች ለመወሰን በወጣ አዋጅ መሠረት ካሣ መክፈል አለበት::

37. <u>Compensation</u>

Where any geothermal operation requires the expropriation of land, the licensee shall pay compensation to the expropriated land use and property in accordance with the payment of compensation for expropriation of property for public interest Proclamation.

ፀ፰. <u>የአካባቢና የማኅበረሰብ ተጽዕኖ ግምገማ</u>

፩/ የጂኦተርማል ሥራ ለማከናወን ፈቃድ ለማግኘት ማመልከቻ የሚያቀርብ ማንኛውም ሰው፣ ከቅኝት ፈቃድ በስተቀር የአካባቢና የማኅበረሰብ ተጽዕኖ ግምገማ ሰነድ አግባብ ላለው አካል አቅርቦ ማፀደቅ አለበት::

፪/ ከቅኝት ባለፈቃድ በስተቀር ማንኛውም ባለፈቃድ የፈቃድ ክልሉን ፈቃድ ከመለጠቱ በፊት ከነበረበት ሁኔታ በተሻለ ወይም በነበረበት ሁኔታ ለመመለስ የሚውል ፈንድ ይመድባል::

38. <u>Environmental and Social Impact Assessment</u>

1/ Any person lodging application to obtain geothermal operations license, except for a reconnaissance license, shall submit an environmental and social impact assessment document to competent body and get approval.

2/ Any licensee shall, except the holder of reconnaissance license, allocate funds to cover the cost of restoration of the license area to conditions as good as or better than conditions prior to the license period.

፴፱. ተፈጥሮአዊና ባሕላዊ ሀብቶችን ስለመንከባከብና መጠበቅ

ባለፈቃዱ የጂኦተርማል ሥራውን በጂኦተርማል ወይም በሌላ የኃይል ወይም የማዕድን ሀብት ላይ አስፈላጊ ያልሆነ ብክነት ወይም ጉዳት በማያደርስ ሁኔታ፣ በገፀ-ምድርና በከርሠ-ምድር ውሃ ሀብቶች ጥራት ላይ እንዲሁም በአየርና በሌሎች የተፈጥሮ ሀብቶች፣ የዱር እንስሳትን፣ አፈርና እጽዋትን ጨምሮ በባህላዊ ሀብቶችና በአርኪዎሎጂ ቅርሶች፣ የተፈጥሮ መስህቦችና ለመዝናኛ የሚውሉ ሀብቶች ላይ ጉዳት በማያደርስ ሁኔታ ማካሄድ አለበት::

፵. ስለሰዎችና ንብረት ደህንነት

፩/ ባለፈቃዱ የጂኦተርማል ሥራው የሰውን ጤናና ደህንነት በጠበቀና በንብረት ላይ ጉዳት በማያደርስ ሁኔታ ማካሄድ አለበት::

፪/ ባለፈቃዱ በሥራው ምክንያት ሆን ተብሎም ይሁን በቸልተኝነት በሌላ በማንኛውም ሰው ወይም ንብረት ላይ ለሚደርስ ማናቸውም ጥፋት፣ ጉዳት ወይም አደጋ ተጠያቂ ይሆናል::

፵፩. ስለማኅበረሰብ ልማት ፈንድ

የጂኦተርማል ጉድጓድ መስክ የማልማትና የመጠቀም ፈቃድ ለማግኘት ያመለከተ ሰው ባመለከተበት የፈቃድ ክልል ውስጥ ወይም አካባቢ ከሚኖሩ ነዋሪዎች ጋር በመመካከር በጽሑፍ የተዘጋጀ የኅብረተሰብ ልማት ዕቅድ ማካተት አለበት:: ዕቅዱ የነዋሪዎቹን ማኅበራዊ ተቋማት ለማሻሻል የሚመደበውን ፈንድ ጨምሮ የዕቅዱን ማስፈፀሚያ መርሃግብር መያዝ አለበት::

፵፪. ስለጂኦተርማል ሥራዎች መዘጋት የምስክር ወረቀት

ባለፈቃዱ ፈቃዱ ሲሠረዝ፣ ሲቋረጥ ወይም ሥራውን ሲተው ይህን አዋጅ ተከትሎ በወጣ ደንብና መመሪያ መሠረት የጂኦተርማል ሥራዎቹን በአካባቢና ማህበረሰብ ተጽዕኖ ዕቅድ በሚያዘው መሠረት መዘጋቱን የሚያረጋግጥ የምስክር ወረቀት እንዲሰጠው ለፈቃድ ሰጪው ባለሥልጣን ማመልከቻ ማቅረብ አለበት::

፵፫. የፈቃድ ሰጪው ባለሥልጣን መፍትሔ የመስጠት ሥልጣን

፩/ ባለፈቃዱ የሞተ እንደሆነ ወይም ሊገኝ ካልቻለ ወይም የሕግ ሰውነት ያለው የንግድ ማህበር ሲሆን ህልውናው ካከተመ ወይም በኪሣራ ከተዘጋ ፈቃድ ሰጪው ባለሥልጣን የአካባቢ ተጽዕኖን ለመከላከልና የኅብረተሰቡን ጤና፣ ደህንነትና ማኅበራዊ ተቋማት ለመጠበቅ አስፈላጊውን እርምጃ ሊወስድ ይችላል::

39. Preservation and Protection of Natural and Cultural Resources

Geothermal operations shall be carried out in such a manner as to prevent unnecessary waste of or damage to geothermal or other energy and mineral resources; to protect and enhance the quality of surface and ground waters, air and other natural resources, including wildlife, soil and vegetation; and preserve cultural resources, including archeological, scenic and recreational resources.

40. Safety of Persons and Property

1/ Geothermal operations shall be carried out in a manner that protects human health and safety and prevents damage to property.

2/ A licensee shall be liable for any loss, damage or injury to any person or property resulting from its operations, whether intentionally or as a result of negligence.

41. Fund for Community Development

Any person lodged application for geothermal well-field development and use license shall include a written community development plan, developed by the applicant in consultation with the communities existing in or adjacent to the license area; and such plan shall include an implementation plan including allocation of funding to support community welfare.

42. Geothermal Operation Closure Certificate

A licensee upon revocation, termination or surrender of license shall apply to the licensing authority to obtain a geothermal operation closure certificate, after proving that the closure has been undertaken in accordance with the environmental and social impact plans provided for in regulation and directive issued hereunder.

43. Remedial Powers of the Licensing Authority

1/ In the event the holder of a license is deceased, cannot be traced, or in case a juridical person ceases to exist or has been liquidated, the licensing authority may take the necessary measures to address environmental impacts and ensure protection of the public health, safety and welfare.

፪/ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) የተመለከተውን ሥራ ለመሥራት የሚያስፈልገው ገንዘብ ባለፈ ቃዱ ለዚህ ተግባር ብሎ ካስቀመጠው የአካባቢ ፈንድ ወጪ ይሆናል::

፵፬. ከጉምሩክ ቀረጥና ታክስ ነፃ ስለመሆን

፩/ ማንኛውም የጂኦተርማል ሥራ ባለፈቃድ ለሥራው የሚያስፈልጉና በፀደቀው የሥራ ፕሮግራም መሠረት ከውጭ አገር ወደ ኢትዮጵያ የሚያስገባቸው አላቂ ዕቃዎች፣ መሣሪያዎች፣ ማሽነሪዎችና ተሽከርካሪዎች ተጨማሪ ዕሴት ታክስን ጨምሮ ከጉምሩክ ቀረጥና ታክስ ነፃ ይሆናሉ::

፪/ ማናቸውም በዚህ አንቀጽ መሠረት ከጉምሩክ ቀረጥና ታክስ ነፃ ሆኖ የገባ ዕቃ ፈቃድ ሰጪው ባለሥልጣን በቅድሚያ በጽሑፍ ሳይፈቅድና ተገቢው የጉምሩክ ቀረጥና ታክስ ሳይከፈልበት በማንኛውም ሁኔታ በአገር ውስጥ ለሌላ ሰው አይተላለፍም፤ ሆኖም ዕቃው ተመልሶ ከሀገር የሚወጣ ከሆነ ከጉምሩክ ቀረጥና ታክስ ነፃ ይሆናል::

፵፭. ስለፈቃድ ክፍያ

፩/ በዚህ አዋጅ መሠረት ፈቃድ ሲሰጥ የፈቃድ ማውጫ ክፍያ ይፈፀማል::

፪/ በዚህ አንቀጽ ንዑስ አንቀጽ (፩) መሠረት የተሰጠ ፈቃድ በየዓመቱ የፈቃድ ማሳደሻ ክፍያ ሲፈጸም የሚታደስ ይሆናል::

፫/ የፈቃድ ማውጫ እና የፈቃድ ማሳደሻ ክፍያ የአከፋፈል ሁኔታና የገንዘቡ መጠን ይህን አዋጅ ለማስፈፀም በሚወጣ ደንብ ይወሰናል::

ክፍል ስድስት
ልዩ ልዩ ድንጋጌዎች

፵፮. አለመግባባቶችን ስለመፍታት

፩/ በፈቃድ ሰጪው ባለሥልጣንና በባለፈቃድ መካከል ከውል በመነጨ ወይም ከፈቃድ ጋር በተያያዘ የሚፈጠር ማንኛውም ክርክር፣ አለመግባባት ወይም የይገባኛል ጥያቄ በተቻለ መጠን በጋራ ውይይት ይፈታል::

፪/ ፈቃድ ሰጪው ባለሥልጣንና ባለፈቃዱ በሚያደርጉት ውይይት አለመግባባቱ በዘጠና (፺) ቀናት ውስጥ ሊፈታ ካልቻለ በግልግል ዳኝነት ሥርዓት ታይቶ ውሣኔ የሚያገኝ ይሆናል::

2/ The measures contemplated under sub-article (1) of this Article shall be funded from the proceeds of environmental funds allocated by the licensee.

44. Exemption from Customs Duties and Taxes

1/ Any holder of a geothermal license shall be exempted from customs duties and taxes including value added tax for importing into Ethiopia any consumables, equipment, machinery and vehicles required for his operations in accordance with the approved work program.

2/ Any item imported into Ethiopia free of customs duties and taxes pursuant to the provisions of this Article shall not be transferred in Ethiopia to any person in any manner without having obtained a written permission from the license authority and paid the required duties and taxes; provided, however, that such items may be re-exported free of customs duties and taxes.

45. License Fees

1/ License fee shall be paid for issuance of license pursuant to this Proclamation.

2/ A license issued pursuant to sub-article (1) of this Article shall be renewed annually upon payment of license renewal fees.

3/ The amount and manner of payment of license issuance and renewal fees shall be determined by regulation to be issued hereunder.

PART SIX
MISCELLANEOUS PROVISIONS

46. Settlement of Disputes

1/ Any dispute, controversy or claim between the licensing authority and a licensee arising out of, or relating to any agreement or license shall, to the extent possible, be resolved through negotiation.

2/ In the event that agreement between the licensing authority and a licensee cannot be reached through negotiations within ninety (90) days, the case shall be settled through arbitration procedure.

፫/ በግልግል ዳኝነት በሚሰጠው ውሣኔ ቅር የተሰኘ ማንኛውም ወገን ውሣኔው በተሰጠ በሠላሳ (፴) ቀናት ውስጥ ይግባኝ ለከፍተኛ ፍርድ ቤት ማቅረብ ይችላል።

፵፮. ደንብና መመሪያ የማውጣት ሥልጣን

፩/ የሚኒስትሮች ምክር ቤት ይህን አዋጅ ለማስፈፀም የሚያስፈልጉ ደንቦችን ሊያወጣ ይችላል።

፪/ ፈቃድ ሰጪው ባለሥልጣን ይህን አዋጅና በዚህ አንቀጽ ንዑስ አንቀጽ (፩) መሠረት የወጡ ደንቦችን ለማስፈፀም የሚያስፈልጉ መመሪያ ዎችን ሊያወጣ ይችላል።

፵፯. የመሸጋገሪያ ድንጋጌዎች

፩/ ይህ አዋጅ በሥራ ላይ ከመዋሉ በፊት በማዕድን ሥራዎች አዋጅ ቁጥር ፮፻፸፰/፪ሺ፪ (እንደተሻሻለ) መሠረት ከጂኦተርማል ሥራ ጋር በተያያዘ የተሰጠ ፈቃድና የተደረገ ስምምነት ፀንቶ ለሚቆይበት ቀሪ ዘመን ተፈፃሚነቱ ይቀጥላል።

፪/ ይህ አዋጅ በሥራ ላይ ከመዋሉ በፊት በማዕድን ሥራዎች አዋጅ ቁጥር ፮፻፸፰/፪ሺ፪ (እንደተሻሻለ) መሠረት ከጂኦተርማል ሥራ ጋር በተያያዘ ፈቃድና ስምምነት ያለው ባለፈቃድ በማንኛውም ጊዜ በዚህ አዋጅ፣ ይህን አዋጅ ለማስፈጸም በሚወጣ ደንብና መመሪያ የተመለከተ ፈቃድ እንዲሰጠው ሊያመለክት ይችላል።

፫/ ይህ አዋጅ በሥራ ላይ ከመዋሉ በፊት የተፈጠረ ለክስ መነሻ የሚሆን ጉዳይ ወይም የተጀመረ ክርክር ወይም የአፈፃፀም ሂደት ይህ አዋጅ በሥራ ላይ ከመዋሉ በፊት ፀንተው በነበሩ ሕጎች መሠረት ፍፃሜ ያገኛል።

፵፰. ተፈጻሚ ስለማይሆኑ ሕጎች

፩/ የዚህን አዋጅ ድንጋጌዎች የሚቃረን ማንኛውም ሕግ፣ ደንብ፣ መመሪያ ወይም የአሠራር ልምድ በዚህ አዋጅ የተሸፈኑትን ጉዳዮች በሚመለከት ተፈፃሚነት አይኖረውም።

፪/ የዚህ አዋጅ አንቀጽ ፵፰ ድንጋጌ እንደተጠበቀ ሆኖ የማዕድን ሥራዎች አዋጅ ቁጥር ፮፻፸፰/፪ሺ፪ (እንደተሻሻለ) ጂኦተርማል ሀብትን በሚመለከት ተፈጻሚነት አይኖረውም።

3/ Any party aggrieved by the arbitral award may lodge appeal within thirty (30) days to the High Court.

47. Power to Issue Regulations and Directives

1/ The Council of Ministers may issue regulations necessary for the implementation of this Proclamation.

2/ The licensing authority may issue directives necessary for the implementation of this Proclamation and regulations issued under sub-article (1) of this Article.

48. Transitory Provisions

1/ Any license issued and agreement concluded in relation to geothermal operations pursuant to Mining Operations Proclamation No. 678/2010 (as amended) prior to the coming into force of this Proclamation shall continue in force for the remaining period of its validity.

2/ A holder of a license issued or agreement concluded in relation to geothermal operations pursuant to Mining Operations Proclamation No. 678/2010 (as amended) prior to the coming into force of this Proclamation may apply at any time for a license in accordance with this Proclamation, and regulation and directive issued hereunder.

3/ Any cause of action materialized or legal proceeding pending before the coming into force of this Proclamation shall be dealt with in accordance with the laws in force prior to the effective date of this Proclamation.

49. Inapplicable Laws

1/ No law, regulation, directive or practice shall, in so far as it is inconsistent with this Proclamation, be applicable with respect to matters provided for in this Proclamation.

2/ Without prejudice to the provisions of Article 48 of this Proclamation, the Mining Operations Proclamation No. 678/2010 (as amended) shall not be applicable with regard to geothermal resources.

፶. አዋጁ የሚፀናበት ጊዜ

ይህ አዋጅ በፌደራል ነጋሪ ጋዜጣ ታትሞ ከወጣበት ቀን ጀምሮ የፀና ይሆናል::

አዲስ አበባ መስከረም ፮ ቀን ፪ሺ፱ ዓ.ም.

ዶ/ር ሙላቱ ተሾመ

የኢትዮጵያ ፌደራላዊ ዲሞክራሲያዊ ሪፐብሊክ

ፕሬዚዳንት

50. Effective Date

This Proclamation shall enter into force on the date of publication in the Federal Negarit Gazette.

Done at Addis Ababa, this16th day of September, 2016.

MULATU TESHOME (DR.)

PRESIDENT OF THE FEDERA DEMOCRATIC REPUBLIC OF ETHIOPIA

ብርሃንና ሰላም ማተሚያ ድርጅት

6-3 COUNCIL OF MINISTERS REGULATIONS ON GEOTHERMAL OPERATIONS (Draft)

COUNCIL OF MINISTERS REGULATIONS No. _____
COUNCIL OF MINISTERS REGULATIONS ON GEOTHERMAL OPERATIONS

These Regulations are issued by the Council of Ministers pursuant to Article 4(2) of the Definition of Powers and duties of the Prime Minister and the Council of Ministers Proclamation No. 2/1991.

PART I
GENERAL

1. Short Title

   These Regulations may be cited as the "Geothermal Resources Council of Ministers Regulations No._____."

2. Definitions

   In these Regulations, unless the context requires otherwise, any word or expression to which a meaning has been assigned in the Geothermal Proclamation No. _____, shall have that meaning, and:

   a. "GSE" means Geological Survey of Ethiopia;
   b. "Power generation license" means a license to generate electricity issued under the Energy Proclamation, 2013; and
   c. "Proclamation" means the Geothermal Proclamation No. _____

PART II
APPLICATIONS FOR CLASS I LICENSES

3. Application for Reconnaissance License

   An application for aReconnaissance License under Article 15 of the Proclamation shall be made to the Licensing Authority in writing on the prescribed form and accompanied by the prescribed application fees, and shall include the following:

   a. Where the applicant is a natural person:
      i. full name, nationality, and date of birth,
      ii. profession; and
      iii. country of residence and address.
   b. Where the applicant is a juridical person:
      i. its name, legal form, nature of business and principal place of business;
      ii. address of its head office; and
      iii. name, address, telephone number, and email address of the applicant's designated agent or representative in Ethiopia.
   c. For any applicant, whether a naturalor juridical person:
      i. a license authorizing the carrying on of business in Ethiopia;

ii. a short summary of information available to the applicant that describes how and why the area has the potential for geothermal development and use, including:
    1. detailed geological maps of the area, indicating location of major structural features and manifestation and/or areas of alteration;
    2. geothermometer temperatures based on water and gas sampling;
    3. interpretation of any geophysical surveys conducted, including any maps
iii. the proposedwork program the applicant proposes to carry out during the term of the license;
iv. a proposal for delineation of the area proposed to be covered by the license, with preliminary analysis of available information justifying the requested License Area;
v. proposedaccess to the License Area;
vi. any geothermal license the applicant currently holds or has previously held in Ethiopia;
vii. integrated map and description of the physical characteristics and setting of the proposed license area and its surrounds, including geology, surface manifestations including fossil manifestations and major structures;
viii. identification ofhuman habitation and communities in the proposed license area including nomadic communities, focusing on areas where proposed activities will take place under a license; impacts on local communities and proposed mitigation of such impacts;
ix. a plan for the restoration of any surface disturbance;
x. information related to the technical and financial capacity of the applicant to carry out the work identified in the work program; and
xi. any other technical information as may reasonably be requested.

4. Application for an Exploration License

An application for an Exploration License under Art ____ of the Proclamation shall be made in writing on the prescribed form, accompanied by the prescribed application fees, and shall include the following:

a. Where the applicant is a natural person:
    i. full name, nationality, and date of birth,
    ii. profession; and
    iii. country of residence and address.
b. Where the applicant is a juridical person:

i. its name, legal form, nature of business and principal place of business;
ii. address of its head office; and
iii. name, address, telephone number, and email address of the applicant's designated agent or representative in Ethiopia.
iv. copies of its memorandum and articles of association;
v. the name and nationality of every director or equivalent officer; and, if the juridical person holds a capital share, the name of any person who is the beneficial owner of more than five per cent of the issued capital share;
vi. a copy of the latest annual report of the board of directors, if any;
vii. copies of balance sheets, profit and loss statements and auditor's reports for the previous three years, if any;
viii. a list of the names of the board of directors, showing the address and nationality of each; and
ix. the name and title of any person or persons authorized to sign on behalf of the applicant.

c. For any applicant, whether a natural or juridical person:
   i. A license authorizing the carrying on of business in Ethiopia;
   ii. a full summary of information available to the applicant that describes how and why theapplicant believes that the area has the potential for geothermal development and use, including:
      1. detailed geological maps of the license and surrounding areas, indicating location of major geological and structural features, surface manifestations and/or areas of alterationidentifying, with GPS coordinates, the area proposed to be covered by the license.;
      2. description of geochemical surveys undertaken and analyses that may indicate reservoir fluid properties and potential resource temperatures;
      3. description and interpretation of any geophysical surveys conducted, including any mapsand geophysical cross-sections;
      4. if data allows, an indication of the potential location of exploratory wells;
      5. either within each report, or listed separately, identification of who undertook each stage of the surveys and/or interpretations and a brief description of their geothermal exploration qualifications and experience;
   iii. the identity of any GeothermalLicense currently held by the applicant;

iv. a map of the area proposed to be covered by thelicense including GPS coordinates, with preliminary analysis of available information justifying the requested license area;
v. a proposed work plan including:
    1. a detailed description of the activities to be carried out in the first year of exploration, including any additional reconnaissance work to be carried out and, if known,location of preliminary exploration wells;
    2. a description of the long-range plan forexploration activities, including a plan for completion of a drilling plan by the end of the third year, with drilling to start by the end of the fourth year;
    3. location of existing access roads, and plans for construction of any roads that may be needed;
    4. a plan and associated budget for the license term showing expenditures on key items and a financial plan that demonstrates the ability to successfully finance the work;
    5. a health and safety planthat is in compliance with applicable laws and regulations, and, at a minimum, the environmental and social safeguards and policies of the World Bank;
    6. a plan describing proposed collection of baseline environmental and social data as provided in directives, and identifying steps to minimize environmental and social impacts and restore or mitigate impacts; and
    7. awell testing and reporting plan compliant to the AU Code of Drilling Practice or as otherwise provided in directives.
vi. information that will allow the Licensing Authority to determine what area is reasonably needed for the proposed use;
vii. names and contact information for personnel responsible for ensuring health and safety and environmental and social compliance;
viii. an approved environmental and social impact assessment that meets, at a minimum, the social safeguards of the World Bank;
ix. identification of human habitation and communities in the proposed license area including nomadic communities, focusing on areas where proposed activities will take place under a license; impacts on local communities and proposed mitigation of such impacts;
x. information showing the applicant’s technical and financial capability and experience in carrying out similar projects; and
xi. such other information as the Licensing Authority may reasonably request to properly consider the application.

5. Application forClass I Wellfield Development and Use License

An application for a Class I Wellfield Development and Use License shall be made in writing on the prescribed form, shall be accompanied by the prescribed license application fees,and shallincluding the following:

a. Where the applicant is a natural person:
   i. full name, nationality, and date of birth,
   ii. profession; and
   iii. country of residence and address.

b. Where the applicant is a juridical person:
   i. its name, legal form, nature of business and principal place of business;
   ii. address of its head office; and
   iii. name, address, telephone number, and email address of the applicant's designated agent or representative in Ethiopia.
   iv. copies of its memorandum and articles of association;
   v. the name and nationality of every director or equivalent officer; and, if the juridical person holds a capital share, the name of any person who is the beneficial owner of more than five per cent of the issued capital share;
   vi. a copy of the latest annual report of the board of directors, if any;
   vii. copies of balance sheets, profit and loss statements and auditor's reports for the previous three years, if any;
   viii. a list of the names of the board of directors, showing the address and nationality of each; and
   ix. the name and title of any person or persons authorized to sign on behalf of the applicant.

c. For any applicant, whether a natural or juridical person:
   i. a license authorizing the carrying on of business in Ethiopia;
   ii. the identity of the applicant's Exploration License on which the application is based, if any;
   iii. the duration for which the license is sought;
   iv. well data characterizing the resource temperature and permeability and complete water chemistry;
   v. amap of the proposed license area, at an appropriate scale, indicating the geographical coordinates of the turning points along its boundaries using Global Positioning System (GPS) coordinates, and showing all important landmarks, buildings and topographic and other physical features;
   vi. a preliminary three-dimensionalconceptual model of the resource that shows estimated depth and extent of the possible and probable (expected) reservoir; and a report explaining the approach the applicant

will use to better define the existence, size, and characteristics of the reservoir through its exploration and wellfield development program;

vii. a site plan showing existing and proposed wells, well gathering systems, resource use assets, buildings andother facilities for the development and use under the license,details of use of existing infrastructure and plans for construction of new infrastructure, including onsite and offsite improvements,recognizing that the plan may be modified as the resource is further drilled and developed;

viii. a description and analysis of anticipated reservoir production, discharge and injection, and characteristics to the extent required by directives of the Licensing Authority;

ix. proposedannual work program and budget, including details of work to be performed and budget expenditures during the first two years of the license term,with an estimatedbudgetfor the reminder of the license term, and a schedule for annual updates and modifications of the work program as required based on work during the preceding year, and anticipated future work;

x. community outreach and coordination already undertaken by the applicant, if any,and a plan for coordinating with local communities to determine and address impacts;

xi. plans for community action approved by the appropriate regional/State or community authorities;plans for closure of geothermal operations including plugging and abandoningof wells and decommissioningof buildings and facilities;

xii. projected capital and operating costs, and sources of funding demonstrating the financial viability of the project;

xiii. a report summarizing all exploration work conducted by the applicant in the proposed License Area;

xiv. program of employment and training including proposals with respect to the employment and training of citizens ofEthiopia;

xv. an approved environmental and social impact assessment report in accordance with the relevant laws;

xvi. identification of human habitation and communities in the proposed license area including nomadic communities, focusing on areas where proposed activities will take place under a license; impacts on local communities and proposed mitigation of such impacts;

xvii. goods and services required for geothermal operations which can be obtained within Ethiopia and goods and services to be imported, and the applicant’s intention in relation thereto;

xviii. if the proposed use of geothermal resources is for combined heat and power, information required under Article 12 of these regulations; and

xix. such other information as the Licensing Authority may request in writing relating to the technical or financial capacity of the applicant to carry out the work identified in the work program.

PART III
ISSUANCE OF LICENSES

6. Establishment of Register of Geothermal Resources; Verification of Applications,Registration and Notice.

a. The Licensing Authority shall establish and maintain a Register of Geothermal Resources as provided in Article 10 of the Proclamation. The Register shall include;

i. maps providing a general representationof areas where preliminary analysis indicates geothermal resources may be available but have not been confirmed;maps showing areas under license under the Proclamation;

ii. complete applications for licenses;

iii. licenses issued or renewed under theProclamation and this regulation;

iv. notices and/or orders of transfer, extensions, surrenders and revocations of licenses and license areas or portions of license areas; and

v. technical information and documentation of designation of Known Geothermal ResourcesAreas;and

vi. identification of areas open for bid or proposed future bid, with actual or expected timeframes for bid advertisement and acceptance of bids, as available.

b. Upon receipt of an application, including an application signed by a successful bidder following bid award, the Licensing Authority shall mark each application for license, renewal, extension, surrender, transfer, assignment, or any form of encumbrance with a date of receipt.

c. Within 30days of receipt, the Licensing Authority shall review anapplication to determine whether itmeets the requirements for completeness as provided in this regulation. If deemed incomplete, the application shall be returned to the applicant for completion.

d. If determined to be complete and in the proper form and accompanied by the prescribed application review fees and registration fees as may be established in directives, the Licensing Authority shall immediately register suchapplication and shall notify the applicant or licensee of such registration in writing, indicating the date and number thereof.

e. Following the registration of each application for Reconnaissance, Exploration, Class IWellfield Development and Use or Class II Geothermal Resources license or renewal of such license, the Licensing Authority shall prepare a notice setting out the location anddescription of the proposed project and other details as may be established in directives, and shall provide the text of such notice to the applicant, and shall publish the notice for two consecutive weeks in a national newspaper.

f. The applicant shall pay all costs for registrations and publications required under this regulation.

7. Terms and Conditions ofLicenses

The Licensing Authority shall review an application and, upon a determination that the requirements of the Proclamation, this regulation and directives have been met, issue a license upon the following terms and conditions:

a. A Reconnaissance License
   i. shall be issued on a noncompetitive and nonexclusive basis, in a form and with conditions as set forth in directives.
   ii. shall be valid for a period of not more than 24 months, subject to extension in the event of Force Majeure as provided in Article 15, 2/ of the Proclamation.

b. An Exploration License
   i. may be issued on a competitive and exclusive basis, as provided in Article 17 of the Proclamation and Article 25(b) of these regulations, and in a form and with conditions as set forth in directives;
   ii. shall be valid for a term not exceeding five (5) years, subject to extension in the event of Force Majeure as provided in Article _____of the Proclamation.
   iii. the Licensing Authority may, when granting an Exploration License, on such conditions as the Licensing Authority may determine and set out in the Exploration License, also grant to such applicant the right to be issued a Class I Wellfield Development and Use License for all or part of the area covered by that license, provided the applicant meets the requirements for issuance of such license as set forth in the Proclamation and this regulation, including technical justification of the size of the Class I Wellfield Development and Use License area, which area may not exceed fifty (50) square kilometers, and fulfills the work program requirements established in the Exploration License, and such License is valid.

c. An Exploration License orClass I Wellfield Development and Use License

i. shall include a requirement of a setback from the License Area boundaries within which geothermal operations may not be undertaken, and directional surveys of all wells, to reduce the risk of interference or overlapping License areas; alternatively, the Licensing Authority may establish and enforce a unitization scheme, or provide for future unitization, as provided in directives;
ii. shall include, for all well operations, measurement and reporting of wellhead flow, wellhead temperature, and wellhead pressure information, reported at a minimum on an annual basis for each well or shared well header;

d. AClass I Wellfield Development and Use License
   i. shall be issued either on an exclusive,non-competitive basis to an applicant that has competitively won the right to an Exploration License and has been granted the right to be issued a Class I Wellfield Development and Use license and has fulfilled the conditions precedent to such issuanceor through a competitive process as provided in Article ___ of the Proclamation and Part ____ of theseregulations;
   ii. shall be accompanied by a valid power purchase agreement, except for projects in which the Licensee will usethe power that it generates exclusively for its own purposes within the license area;
   iii. shall be issued conditioned upon posting of a bond in an amount sufficient to cover costs of environmental impacts, site closure, and site remediation, and a plan for establishment of an environmental fund upon receipt of revenues from the project, as provided in directives; provided that
      1. the Licensee may request release of the bond by the Licensing Authority, which release shall be approved by the Licensing Authority upon a showing by the Licensee that the environmental fund is fully funded in an amount approved by the Licensing Authority;
      2. alternatively, a letter of credit or other financial instrument may be submitted by the applicant to secure performance.
   iv. will include an approved Work Program as provided in Article21of the Proclamation, including
      1. a technical report on the production possibilities and the intention of the applicant in relation thereto;
      2. expected production capacity for power generation and other output or product;
      3. plan of operations including work to be completed during the term of the License;

4. health and safety plan;
5. proposed details of all contracts or arrangements with the government of Ethiopia for purchase of power generated;
6. plan for use of geothermal fluids for other purposes by the licensee or proposed details of arrangements for use of geothermal fluids by third parties;
7. plan for collecting and reporting dataconsistent with minimum data recording and reporting requirements as provided in directives, and a schedule for reporting, including:
    a. for all well operations, measurement and reporting of wellhead flow, wellhead temperature, and wellhead pressure information, reported at a minimum on an annual basis for each well or shared well header;
    b. for all electrical generation facilities, measurement and quarterlyreporting of:
        i. steam and/or hot water flow into the facility;
        ii. steam chemistry (Chloride, pH, wetness) or water chemistry (in case of binary plants);
        iii. temperature of the water and/or steam into the facility;
        iv. pressure of the water and/or steam into the facility;
        v. gross electricity generated;
        vi. net electricity at the facility tailgate;
        vii. electricity delivered to the sales point;
        viii. estimated amount of non-condensable gases (CO_2, H_2S, and CH_4 vented by the plant on an annual basis; and
        ix. temperature of the steam and/or hot water exiting the facility.
8. plan for coordinating with communities in the license area;
9. plan for minimizing or mitigating the impacts of the project on affected communities;
10. a statement of any significant adverse effect which the carrying out of operations authorized under the license would be likely to have on the environment and a plan for controlling or mitigating thateffect;
11. plan for establishment and use of an environmental fund;

12. a detailed forecast and budget showing capital investment; operating costs and source offinancing during the term of the license;
13. plan for closure including plugging and abandonment of unserviceable wells; capping of serviceable wells and retention for future use as may be authorized by the Licensing Authority; and removal of project infrastructure and facilities; and
14. any additional terms and conditions imposed by the Licensing Authority.

v. alllicenses shall require annual reporting of progress in implementingthe work program, and a general description of tasks and expenditures for the next five (5)-year period, as set forth indirectives.

8. Relationship of Class I Wellfield Development and Use License and Power Generation License

For the initial power plant and for each additional power plant within the License Area, a power generation license shall be issued during the term of the Development and Use License, pursuant to Article ___ of these regulations; upon issuance of a power generation license such license shall be incorporated into the Class I Wellfield Development and Use License by reference.

9. Lodging of Objections

Pursuant to the process for lodging objections as set forth in Article __ of the Proclamation,the 15 working day period for the Licensing Authority's response to objection may be tolled/suspended ifthe Licensing Authoritydetermines that additional information is needed, in which case it may request such information from the parties involved or a 3rd party and the period shall be tolled/suspendedfor so long as necessary to complete review by the Licensing Authority or a qualifiedthird-party reviewer. The Licensing Authority may maintain a list of qualified and approved reviewersas identified in directives.

10. Determination of License Area and Number of Licenses held by Licensees.
    a. For a Reconnaissance License
        i. the size and dimensions of alicense area shall be determined by the Licensing Authority based on the applicant's written justification in writing and additional information available to the Licensing Authority,and may not exceedtwo thousand (2,000) square kilometers;
        ii. at any point in time a Licensee may hold multipleReconnaissance Licenses, provided that the total area held by the Licensee under all such licenses may not exceedtwo thousand (2,000) square kilometers.

b. For an Exploration License
    i. alicense area may not exceed two hundred (200) square kilometers, with the size and dimensions of the area to be determined by the Licensing Authority based on available information;
    ii. at any point in time a Licensee may hold a maximum of two (2) Exploration Licenses.
c. For a Class I Wellfield Development and Use License
    i. alicense area may not exceed fifty (50) square kilometers, with the specific size and dimensions of the area to bedesignated by the Licensing Authority based on available information;
    ii. there are no limitations on the number of Geothermal Wellfield Development and Use Licenses held by a Licensee, so long as the applicant meets the requirements for a License, and, if already a Licensee, is in compliance with its work program and terms of its License(s).

11. Class I Wellfield Development and Use License including Combined Heat and Power
    a. A Class I Wellfield Development and UseApplicant or Licensee may submit documentation to the Licensing Authority describing the proposed use of fluids for other than power generation, including, as appropriate,
        i. a description of planned additional use(s);
        ii. the anticipated effects of multiple uses on the source reservoir, and
        iii. the combined operations as they may affect employment, health and safety, economic and technical capability of the licensee, budget, the environment and other considerations as established in directives.
    b. For new Class I Wellfield Development and Use applications, if the Licensing Authority is satisfied that the applicant has met the requirements for a license, and that the applicant's plan for the combined use, including budget, is well founded and will not be detrimental to the public welfare and conservation of the resource, it shall issue a Class I WellfieldDevelopment and Uselicense that includes authorization to use geothermal fluids fordirect usepurposes.
    c. For existing Class I Wellfield Development and Use Licenses, upon review of the Licensee's proposal and receipt of the required fees, absent clear evidence that the Licensee does not have the technical or financial capability to undertake the additional operations and use of the resource, the Licensing Authority shall issue an amended Development and UseLicenseauthorizing the use geothermal fluids for direct use purposes,and promptly register same in the Registry and provide written confirmation of registration to the Licensee.

12. Minimum WorkRequirements and Requirements for Updates
    a. For an Exploration License:
        i. annually, the Licensee shall prepare a report including a summary of the work completed,data gathered and a summary of what the data show, and planned adjustments to the work program, including costs.
        ii. at or before the end of the third year, the Licensee shall submit to the Licensing Authority a preliminary three-dimensional conceptual model and description of resource characteristics based on surface exploration and drilling plan.
        iii. at or before end of the fourth year, the Licensee shall commence drilling of full size deep reservoir confirmation wells.
    b. For a Class I Wellfield Development and Use License:
        i. within two years of issuance of a Class I Wellfield Development and Use License the Licensee shall apply for a power generation license;
        ii. within four years of the start of the License, the Licenseeshall submit a reservoir report stamped by a licensed engineer, and aninitial site plan showing probableproduction and injection well locations, plant location, and other facilities that would be constructed in the remaining license period;
        iii. prior to issuance of a power generation licensefor each power plant within the License Area, the Licensee shall submit toand receive approval from the Licensing Authority of a reservoir engineering report including updated numerical model;
        iv. within 60 days of the end of an operating year,the Licensee must meet minimum data handover requirements (such as production and reinjection data) as required in directives, and an updated work program and budget.

13. Replacement and Issuance of Copies of Licenses
    a. The licensee may request from the Licensing Authority one or more copies of the license. Upon receiving such a request and payment of applicable fees, the Licensing Authority shall issue and deliver such certified copies to the licensee.
    b. The licensee may apply to the Licensing Authority for the replacement of a license that has been lost or destroyed. Upon receiving such a request and payment of applicable fees, the Licensing Authority shall issue and deliver replacement of such license to the licensee.

14. Issuance of Class IWellfield Development and Use Licenses in Conjunction with Generation Licenses

a. To ensure diligence in providing electricity to the grid, a holder of a Class I Wellfield Development and Use License must apply for a power generation license within three (3)years of issuance of the Class I Wellfield Development and Use license.
b. Based on the recommendation of the Geothermal Advisory Council, if such Council exists, and a reservoir engineering report that certifies that the reservoir is capable of the power generation proposed, and in consultation with the energy authority, the Licensing Authority shall grant a power generation license, including any limitations or conditions that should be placed on the license, and shall coordinate with the appropriate authorities to issue such license.
c. A power generation may not be denied, unless in the LicensingAuthority's opinion the Licensee has not met the requirements of the energy laws of Ethiopia and associated regulations;
d. The power generation license shall be issued for a term ending on the same date as the Class I Wellfield Development and Use License.
e. In the event of revocation or termination of a power generation license, or denial of an application for power generation license, the Class I Wellfield Development and Use Licensee shall have the right to sell or otherwise transfer its assets, including well(s) and license(s), to the Government of Ethiopia or to other parties, subject to government approval of transfers as provided in Article ___ of the Proclamation and other applicable laws and regulations.

PART IV
RENEWAL, TRANSFER AND REVOCATION OF LICENSES

15. Renewal of Reconnaissance License Prohibited
    a. A Reconnaissance License shall not be renewable, as provided in Article___of the Proclamation.

16. Renewal of an Exploration License
    a. An application for the renewal of an Exploration License shall be made at least sixty (60) days before the end of the license term, and shall include the following:
        i. evidence that all requirements during the term of the License have been met;
        ii. any change in the information submitted in applying for the original license or a prior renewal thereof;
        iii. annual reports containing information as specified by directive;

iv. details of the work program the licensee has carried out in the most recent period(s) for which a report is due, and related expenditure;
v. plan for the work program and expenditures the applicant proposes to carry out and incur during the renewal period;
vi. details of any part of the License area to be voluntarily surrendered, subject to the requirements of Article 20 of the Proclamation, unless the Licensing Authority agrees otherwise, an area to be surrendered, which shall be in simple geometric form as specified by directive; and
vii. such other information as the Licensing Authority may reasonably request.

b. After reviewing the documents submitted with the application and approving the application, and upon payment of the prescribed renewal fees by the applicant, the Licensing Authority shall renew the Exploration License in accordance with Article 16 of the Proclamation.

c. License renewal shall not be granted if confirmation of the deep reservoir is not complete within the initial license period.

17. Renewal of aClass I Wellfield Development and Use License

a. An application for the renewal of a Class I Wellfield Development and Use License may be made at any time during the term of the License, andmustbe made at least ninety daysprior to the expiry of the term of the License; and shall include the following:
i. any change in the information submitted in applying for the original license or a prior renewal thereof;
ii. report of work completed in the most recent reporting period and work plan for the renewal period;
iii. a power purchase agreement and valid power generation license or application for renewal of power generation license for the requested term of renewal; and
iv. such other information as the Licensing Authority may reasonably request.

b. After verifying the documents attached with the application, approving the proposed plan for the renewal period, and upon payment of the prescribed renewal fees by the applicant, the Licensing Authority shall renew thelicense in accordance with Article 16, 2/ of the Proclamation.

18. Transferof License

a. An application for the transfer of an Exploration License or Class I Wellfield Development and Use Licensein accordance with Article __of the

Proclamation shall be made in writing on a prescribed form to be established in directives, with an accompanying fee, and shall include the following:

i. information regarding the identity and technical and financial qualifications of the proposed transferee;
ii. certification that the licensee's interest in the license area will be transferred in its entirety;
iii. a notarized statement signed by the proposed transferee agreeing to undertake and comply with all the terms and conditions of the license, including the applicable work program and expenditure and any other undertakings of the licensee; and
iv. all details of the contractual, economic and financial terms and conditions of the proposed transfer or assignment.

b. An application for the encumbrance of an Exploration License or aWellfield Development and Use License shall be made in writing on a prescribed form to be established in directives, with an accompanying fee, and shall include the following:

i. information as to the identity of the proposed encumbrancer;
ii. the nature, terms and conditions of the security interest proposed to be granted; and
iii. the conditions under which the proposed security interest would be realized, including such safeguards as the Licensing Authority may require to assure the financial and technical qualifications of the eventual acquirer of the license and its undertaking to respect the terms and conditions of the license, the work program and any other undertaking of the licensee.

c. Application for transfer or encumbrance of a Class II Geothermal Resources License, if the oversight of such License is undertaken by the Licensing Authority, shall meet the applicable requirements of this Article.

d. The Licensing Authority shall review such applications and issue decisions based upon directives.

19. Revocation and Suspension

The Licensing Authority may revoke any license on any of the grounds listed underArticle 33 of the Proclamation.

a. Prior to revocation, the Licensing Authority shall follow the notice provisions in Article 32 of the Proclamation, provided that, such notice will not be required in circumstances in which the Licensing Authority has grounds to believe that immediate suspension of geothermal operations is required to protect human health, safety and welfare or the environment.

b. Following notice, the Licensing Authority may issue administrative orders and assess penalties as provided in directives.
c. The Licensing Authority may pursueany additional sanctions or remediesauthorized under the laws of Ethiopia.
d. Primary Infractions
    i. Any person who:
        1. undertakes geothermal operation without having obtained the appropriate license;
        2. makes a false statement or fraudulent misrepresentation in connection with anapplication or relating to a license; or
    ii. Any licensee who:
        1. conducts geothermal operations in a reckless, grossly negligent or willfully improper manner;
        2. conducts geothermal operations in an unsustainable manner, inconsistent with the reservoir engineering report;
        3. commits repeated violations of obligations relating to environment, health, safety or other geothermal operations; or
        4. fails repeatedly and materially to meet administrative and fiscal obligations; shall be liable for a primary infraction.
e. Secondary Infractions
    i. A licensee who:
        1. fails to maintain books and records or other documents or materials required or maintains books and records which are materially incorrect or incomplete, fails to file reports or other documents or fails to give notices required;
        2. conducts geothermal operations in a negligent manner or in a way which endangers the health or safety of any person, the environment or the resource, fails to observe good geothermal wellfield development and use practices generally, or fails to observe an obligation of a license;
        3. fails to make any payment when due under the Proclamation or these regulations; or
        4. fails to grant a duly authorized official of the Licensing Authority entry into the license area, the area covered by a license or access to any other site or premises of the geothermal operations or to his books, records, other documents or materials, or fails to carry out a lawful order or instruction of such official; shall be liable for a secondary infraction.
f. Administrative violation

i. Any licensee who:
    1. fails to maintain his books and records in a complete, accurate and current manner, excluding such deficiencies which are materially incorrect or incomplete.
    2. fails in a timely manner to file all reports and other documents or to give notices required; or
    3. fails to carry out geothermal operations in a proper and prudent manner or to observe regulations or directives, but which failure does not endanger the health or safety of any person, the environment or the geothermal reservoir; shall be liable for an administrative violation.

g. Sanctions for infractions
    i. The sanction for an act or an omission which constitutes a primary infraction under these Regulations may include the immediate revocation of the license to which the infraction is related and a fine not exceeding _____Birr, and if the person commits another act or omission which constitutes a further such infraction, the amount of the fine may be doubled.
    ii. If the licensee immediately takes remedial action to correct an action or omission which constitutes a secondary infraction under Article___ of these Regulations after being given notice of the infraction, the applicable sanction shall be a fine not exceeding _____ Birr. If, however, the person concerned cannot or does not take remedial action, the amount of the fine may be doubled. In addition, if the licensee does not take remedial action or if the infraction results in an imminent or continuing danger to the health and safety of any person, the environment or the geothermal resource, the Licensing Authority may immediately order the Licensee to suspend its geothermal operations pending correction of the infraction, and the License shall be suspended until such act, omission or condition is rectified.

h. If the Licensee does not immediately take remedial action after being given notice of an act or omission which constitutes an administrative violation under these Regulations, it shall be subject to a fine not exceeding _____ Birr per day.

i. If any act or omission which constitutes a secondary infraction or an administrative violation is of a continuing or repeated nature, the Licensing Authority may deem it to constitute a primary or a secondary infraction, respectively, and the licensee concerned shall be subject to the applicable sanctions.

j. Any person who violates the provisions of these Regulations other than those stated in this Article shall be subject to the penalties provided for under Article 49 of the Proclamation.
k. The Ministry shall by regulationestablish the amount of fines and penalties, and shall revise the amount of fines provided under this Article every five years as it thinks appropriate reflecting the changes of circumstances.

20. Records and Reports
    a. All Licensees shall maintain in Ethiopia during the term of the license:
        i. regular records of:
            1. accidents or incidents that endanger or harm human health or the environment, and shall report the same without delay after the event;
            2. changes to facilities and operations;
            3. all employees (by category);
            4. inventories of all equipment, machinery and other physical assets.
        ii. copies of all analyses and technical and other reports relating tothe environment and geothermalresources in the license area;
        iii. records of data required to be collected as provided in the License, based on the work program elements and in compliance with the African Union Code of Practice for Geothermal Drilling.
    b. The holder of an Exploration license shall record:
        i. detailed data on well development, including well logs;
        ii. detailed data on temperature, pressures and flows recordedon a daily basis for periods when wells are in production or reinjection; and
        iii. other information as provided in the License.
    c. The holder of an Exploration License shall record and submit to the Licensing Authority:
        i. fordrillingand testing operations, for every well, a monthly report including, as appropriate, logs relating to the well, as well as any testresults.
        ii. once a year, within sixty (60) days aftertheanniversaryof the issuance of the license, a report with respect to the previous year, specifying:
            1. the progress of operations pursuant to the work program,
            2. the results obtained;
            3. events of significance, includingaccidents or spills;
            4. the number of persons employed, by category; and
            5. expenditures by type.

d. The holder of a Class I Geothermal Wellfield Development and Use license shall submit to the Licensing Authority each year within sixty (60) days aftertheanniversary of license issuance a report specifying for each month in the previous year:
   i. the total quantities of geothermal fluids extracted and any subsequent variations of their physical and chemical characteristics;
   ii. the specific quantities of geothermal fluids delivered to the facility;
   iii. the quantities of by-products, if any, extracted from geothermal fluids;
   iv. all occurrences and accidents resulting in serious injury or death;
   v. the number of persons employed, by category; and
   vi. the amount of electricity transmitted from a busbar or other agreed point of delivery to the transmission grid.

e. The holder of a Class I Wellfield Development and Use license shall submit to the Licensing Authority at least every five years an updated reservoir engineer's report including numerical model that is acceptable to the Licensing Authority.

f. Where a holder of a Class I Wellfield Development and Use license or a Class II Geothermal Resources License is a juridical person, the holder shall submit to the Licensing Authority, in triplicate, within the month following every annual general meeting, the report of the Board and that of the auditors, the complete statement of accounts relating to the last financial year, and copies of the resolutions, if any, adopted at the meeting.

21. Confidentiality

a. At no time shall the government disclose, without the written consent of the person supplying it, to any person other than Government advisers, financial institution or donor agencies from which Government may wish to seek funding assistance for geothermal projects, or persons employed by or on behalf of the Government, any proprietary information explicitly identified as such in reports and records of the licensee; provided that resource-related information thus identified shall be made publicly available upon surrender or termination of the License.

b. Notwithstanding sub-article (a) this Article 22, the Licensing Authority may use information provided to it by the Licensee for the purpose of preparing and publishing reports and returns required by law, preparing and publishing reports and surveys of a general nature, or providing evidence in any legal proceeding in which the Licensing Authority is a party.

PART V
BIDDING

22. Competitive Bidding

The Licensing Authority may issue Exploration Licenses and Class I Wellfield Development and Use Licenses by competitive bidding as provided in Article 17 of the Proclamation and this regulation.

23. Establishment of a Geothermal Advisory Council.

a. The Licensing Authority mayestablish a process for selection of a Geothermal Advisory Council to provide advice on such geothermal matters as it may from time to time determine, including the review of and provision of recommendations related to procedures for bidding, areas open for bidding, establishment of minimum requirements for bids, preparation of bid documents, evaluation of bids, bid award and conditions of award.
b. The Geothermal Advisory Council shall consist of such number of members covering required areas of expertise as determined by the Licensing Authority, including persons with experience in exploration management, reservoir engineering, finance, economic modeling, geophysics, geology and geochemistry as applied togeothermal projects.
c. Such Council shall not be a standing committee, but shall be selected for a term to be determined by the Licensing Authority, and shall provide services on an as-needed basis.

24. Responsibilities and Authorities of the Licensing Authority.

In tendering a License area for bid tender, the Licensing Authority shall, with the advice and recommendations of the Geothermal Advisory Council, if such Council has been established,

a. Establish a schedule for the bid tender and selection process;
b. Determine the area available for bid;
c. Establish technical and financial minimum qualifications for incorporation in bid packages;
d. Establish criteria, including a point system; and a process for evaluation of bids, including evaluation criteria relating to the establishment of the power plant, the generation of electricity,and the tariffscharged by generation licensees;
e. Prepare bid documents, including, for Class I Wellfield Development and Use Licenses, terms of a power purchase agreement, and other project agreements as applicable;
f. Establish the minimum bid amount and the terms of acceptable cash payment or other financial arrangements, for each bid tender.

g. Establish a secure electronic data room to be accessible by potential bidders only upon payment of fee for the bid package and execution of a non-disclosure agreement;
h. Announce the tender through appropriate means;
i. Evaluate bids received;
j. Identify a prospective successful winning bid;
k. Negotiate and finalize terms of a license to be issued to the successful bidder, or if no winning bid is received, withdraw the proposed License Area from competitive consideration, or, for Exploration License, if an application has been submitted by one applicant prior to the bid tender, the Licensing Authority shall review the application and issue a licenseto a qualifying licensee, consistent with the terms in the bid package;
    i. collect fees and ensure posting of adequate bonds as required; and
    ii. inform bidders on the outcome of the bidding process and, may, upon request by a bidder within 30 days of the receipt of the outcome, provide a debriefing to that bidder on the evaluation of its bid.

25. Competitive Process for Obtaining anExploration License or Class I Wellfield Development and UseLicense.
    a. The Licensing Authority shall, where required by the Proclamation and subject to any limitations therein, conduct competitive bidding and issuance of licenses except for any area where an existing geothermal license has been issued under the Mining Proclamation and is in effect as of the date of adoption of the Proclamation.
    b. The competitive licensing process consists of the following steps:
        i. where the Licensing Authority receives an application for an Exploration License,
            1. subject to the provisions of Article 17 of the Proclamation, the Licensing Authority shall,within 30 days,determine whether the application is complete and valid, whether the information provided by the applicant and information otherwise available to the Licensing Authorityjustify initiating a competitive bidding process for the area applied for or part thereof, provide notice by publication in a national newspaper inviting other interested persons to applywithin thirty (30) days by means of a short application to be established by directives, expressing interest and providing preliminary information about the technical ability and financial capacity of the interested party;
            2. ifno expressions of interest are received following the public notice, the application shall be reviewed and a decision made

as to issuance and terms and conditions based on the application;

3. if expressions of interest are received following public notice the Licensing Authority shall notify the applicant and other interested parties of its intent to initiate the competitive bidding process;
4. within 60 days of notice to the applicant and other parties of its intent to initiate a competitive bidding process, the Licensing Authority shall prepare a bid package and conduct a bidding process as provided in subsequent Articles of this Regulation and offering a license to the successful bidder; provided that, if the applicant is the sole bidder, the bidding process shall be deemed complete and a license may be issued based on the license application and negotiations with the applicant.

ii. absentsubmission of anApplication for an Exploration License triggering the process described in sub-article (b) (i) of this Article, the Licensing Authoritymay initiate a bidding process in its discretionand may offer a license to the successful bidder pursuant to the terms of the bid tender.

26. Bid Package

A bid package shall be assembled by the Licensing Authorityor a bid evaluation committee including technically competent members, with the advice of the Geothermal Advisory Council if such Council has been established. The bid package shall be made available to prospective bidders upon request and payment of the applicable fee. The bid package shall be available at anelectronic data room established for the purpose, upon payment of a fee, and shall contain the following information:

a. Deadline for submission and opening of proposals;
b. The basis and process for determining the winning bid;
c. Model Development and Use license and model power generation license containing the proposed terms and conditions of a license including exhibits and other documentation;
d. Minimum bid amounts, whichmay be based in part on considerations of expenditures by the Government of Ethiopia in exploratory work, including reservoir confirmation drilling;
e. Terms of payment of bid amounts by the winning bidder, including
    i. payment of a minimum of 20% of the total bid amount at the time of bid award, and
    ii. payment of the remainderof the bid amount at the time of Licensee's closing of long term project financing or within one year of power plant commissioning, whichever is earlier;

f. Evaluation criteria and selection method to be used;
g. Requirements of payments and/or posting of performance bonds or other security by a successful bidder, which requirements may be based on the type of financial terms offered.
h. Preliminary terms of a power purchase agreement and other project documents, and
i. All other information or materials determined by the Licensing Authority relevant to effective implementation of these regulations.

27. Publication of Notice and Solicitation of Bids for Competitive License Bid Tender
    a. At least 90 days before the date of bid opening, and 30 days after that first notice, the Licensing Authority shall provide notice of a License bid tender by the following means:
        i. by publishing a notice in the national *NegaritGazetta*;
        ii. by posting a notice in the Licensing Authority office and on its website;
        iii. by publishing a notice in a newspaper of general circulation in Ethiopia;
        iv. by providing a notice for publication by international associations and organizations supporting and promoting geothermal resource development;
        v. by making notice available for posting to other Government offices having jurisdiction over any of the included lands.
        vi. issuing news releases; and
        vii. notifying interested parties of the license tender.
    b. The call to start the bidding shall contain:
        i. name or designator number of the proposed license area covered by the tendering procedure;
        ii. maps showing the location, satellite images if available, and GPS coordinates of the proposed license area;
        iii. information regarding where the bidder may secure a bid package and access to the bidding electronic data room, required payment for bid package, and signing of a non-disclosure agreement;
        iv. the place, dates and times of the bid tender, acceptance of bids, the amount of the bid bond required, and fees; and
        v. other information as determined by the Licensing Authority to encourage participation in the proceedings.

28. Submittal of Bids
    a. Bidders must submit bids in a form and with contents that are consistent with the requirements of Article 8 of these regulations and the bid package, and shall:

i. submit bids during the time period and to the Licensing Authority office specified in the License Bid tender notice;
ii. submit bids on a form to be provided by the Licensing Authority and by a method required by the Licensing Authority;
iii. include in each bid the bid bond as determined by the Licensing Authority;
iv. submit technical information as required in the bid package, a work program and associated budget, schedule for execution of the work program, and letter of commitment by financial backerscommitting to the project should the bid be successful;
v. provide a financial proposal of a type prescribed in the bid package;
vi. provide a complete license application; and
vii. label each envelope containing a bid with the license area name or number and the statement "Not to be opened before [date posted in the tender notice];'' and submit the envelope, with required bond to the Licensing Authority office by the date and time specified in the bid package, together with two electronic copies addressed to the address specified.
viii. collusion amongst bidders or intimidation of bidders is prohibited.

29. Minimum Requirements for a Successful Bid
    a. For licenses that may be issued as a result of the auction, the bidder must meet the requirements of the Proclamation and this regulation.
    b. Bidders shall post bonds as required, including bonds thatwill remain in effect until project commissioning.
    c. The bidder must meet technical and financial qualifications and terms established by the Licensing Authority.
    d. A bidder may not withdraw a bid after closing of the bid acceptance period. Submittal of a bid constitutes a legally binding commitment by the bidder.
    e. The Licensing Authority may reject a bid if:
        i. there is no bid above a minimum bid amount set by the Licensing Authority; and
        ii. the Licensing Authority determines that no bidder meets the technical or financial qualifications in the bid package.

30. Bidding Process and Award
    a. Bids shall be submitted within 90 days from the issuance of the bid notice.
    b. Secure bids received in response to the notice of license bid tender shall be opened by the Licensing Authority at a public bid opening on the 90th day following notice of bid tender, at an hour specified in the notice.

i. the opening of bids is for the sole purpose of publicly announcing and recording the bids received.
ii. no bids shall be accepted or rejected at that time.
iii. the Government of Ethiopia reserves the right to reject any and all bids received for any area proposed for bid tender; provided, however, that the Government of Ethiopia may not reject bids that exceed a minimum threshold on the basis of bid amount alone.

c. The Licensing Authority shall provide the bids to the Bid Evaluation Committee, and, on the condition of confidentiality, request its assessment of the qualifications and financial terms of the award and its recommendation of the most qualified bidder.
d. The Licensing Authority shall consider the recommendation of the Bid Evaluation Committee in selecting the winning bid. If the Licensing Authority does not agree with the recommendation of the Bid Evaluation Committee, it shall refer the matter back with the reasons for its decision.
e. Within 120 days of the bid opening,the Licensing Authority shall provide written notice of the final decision on the bids to those bidders whose bonds have been posted in accordance with instructions set forth in the notice of bid tender.
f. If a bid is awarded, within 60 days and upon execution of the power purchase agreement and other project documents, and a determination by the Licensing Authority that the biddermeets the requirements for license issuance,two (2) originalsof the license, executed by the Licensing Authority, shall within 60 days be transmitted with the notice of acceptance to the successful bidder.
    i. the bidder shall, not later than the 15th day after receipt of the license, shall sign both originalsof the license as acknowledgement of receipt and acceptance of license terms including terms of associated documents, and shall return one signed original of the license to the Licensing Authority, together with the first year's regional state rental as provided in directives, any other fees as identified in the bid documents, and minimum payments as provided in Article 4(f) of these regulations.
    ii. bonds shall be released for rejected bids, upon acceptance of the license by the successful bidder.
g. If the successful bidder fails to execute the license within the prescribed time or otherwise fails to comply with the applicable regulations, the bond shall be forfeited and deposited in the geothermal fund.
h. If the awarded license is executed by an attorney-in-fact acting on behalf of the bidder, the license shall be accompanied by evidence that the bidder authorized the attorney-in-fact to execute the license on its behalf. Reference should be made to the name or number of the License area.

i. The fully executed license shall be recorded in the Register of Geothermal Resources, as provided in Article 9 of the Proclamation and this regulation, and the Licensee shall provide written confirmation of recording to the Licensee.

31. Submittal of Payments Following Bid Award
    a. The selected bidder must make payments by means deemed acceptable by the Licensing Authority.
    b. By the close of official business hours on the day of the bid award or such other time thereafter as the Licensing Authority may specify, the successful bidder must submit for each license area:
        i. financial payment or arrangement and/or pledge of security acceptable to the Licensing Authority, as provided in the bid package;
        ii. the fullamount of the first year's land use fees; and
        iii. theapplicable Class I Wellfield Development and Use license fees.
    c. Additional payments by the selected bidder shall be made within a timeframe consistent with financial terms established pursuant to bid award.
    d. If the successful bidder fails to make all payments required under this section the Licensing Authority may revoke acceptance of the bid and keep all money that has been submitted; and the bidder shall forfeit its bid bond to the Licensing Authority.

32. Objections
    a. License bid tender participants may submit objections to the Licensing Authority in writing based on an assertion of deviation from the procedure stipulated in bid documents. An objection shall include specific reasons for objection, facts supporting the objection, and shall be submitted to the Licensing Authority within ten (10) working days from the notification of the bid outcome.
    b. Upon receipt of an objection as provided in sub-article (a) of this Article, the Licensing Authority shall immediately cease processing bid documents or licenses or any other ancillary processes or documents relating to that bid, pending resolution of the objection, and shall provide its reasoned response within ten (10) working days from the receipt of the objection letter.
    c. In the event the objection referred to in sub-article (a) is supported by the facts provided by the bid participant, the bids may be re-evaluated based on the outcome of the objection, or the process may be repeated, in the discretion of the Licensing Authority.

33. Permits

The Licensing Authorityshall provide reasonable assistance to the licensee or winning bidderin securing the necessary permits and approvals required under other laws and regulations of Ethiopia, provided, however, that the licensee shall at all times be fully responsible to secure and comply with all permitsand permissions required under the laws of Ethiopia.

PART VI
DATA MANAGEMENT

34. Establishment of Data Management Program

The Licensing Authority shall establish a process for geothermal resources data collection and management in cooperation with GSE or its successor entity responsible for geothermal data acquisition management and accessibility. Coordination between the Licensing Authority and GSE or its successor entity will be guided by the following actions and principles:

a. The Licensing Authority and GSE or its successor entity shall execute a memorandum of understanding relating to responsibilities for data acquisition management and accessibility.
b. GSE or its successor entity shall ensure data integrity through appointment of a person who is responsible for establishing and overseeing implementation of standardized, consistent data recording and reporting protocols.
c. The Licensing Authority shall provide information upon request according to applicable law and established procedures and may charge reasonable fees as appropriate.
d. Upon establishment of the process and repository for geothermal resources data, electronic data rooms shall be developed containing information about geothermal resources in Ethiopia, and a process for access to those data rooms by the general public shall be established in directives; in addition, special data rooms for each bid tender shall be established, with access limited to entities who have paid a fee for a bid package, as provided in Article 4(g) of these regulations.
e. The long-term goal is to build capacity in an existing or new government entity that is responsible for establishing and managing electronic databases, with metadata to identify the source of data, and dissemination of data in response to public- and private-sector requests.

PART VII
GEOTHERMAL DRILLING OPERATIONS

35. Applicability

These regulations establish permitting and operating requirements for drilling Class I geothermal wells. Unless otherwise provided in these regulations, all planning and development of infrastructure required prior to drilling a well, drilling of wells and conduct of related activities for the purpose of performing flow tests, producing geothermal fluids, injecting fluids into a geothermal reservoir, or plugging and abandonment of wells shall be conducted consistent with the directives issued by the Licensing Authority or the relevant Minister.

36. General Standards Applicable to Drilling Operations.

Drilling operations must:

a. Meet all environmental standards, including standards relating to air emissions and water quality;
b. Be conducted according to international best practices;
c. Prevent unnecessary impacts to surface and subsurface resources;
d. Conserve geothermal resources and minimize waste;
e. Protect public health, safety and property;
f. Ensure worker safety; and
g. Comply with other requirements as may be established by law, regulation, directive or rules.

37. Orders or Instructions Issued by the Licensing Authority.

The Licensing Authority may:

a. Approve plans of development;
b. Approve drilling programs;
c. Approve well design plans and well drilling permit applications for individual wells;
d. Issue directives and rules; and
e. Issue written instructions and orders.

38. Establishment of a Selection Process for Peer Review

a. The Licensing Authority shall establish a process for selection of qualified individuals or entities to provide peer review for well design plans and permit applications.
b. The process shall include publication of Terms of Reference for submittal of qualifications, and selection of qualified individuals or firms shall be based on experience and expertise in geothermal drilling.
c. The Licensing Authority may establish a short list of companies pre-approved and certified to provide peer review; such list shall be updated at least every two years.

39. Approval ofPlan of Development
    a. A plan of development describes the overall program of the infrastructure and facilities proposed for development of the project, including roads, pipelines, wells, sumps, water source development and water storage facilities.
    b. The Licensee must send the Licensing Authority:
        i. a complete plan of development accompanied by the appropriate fee;
        ii. a health and safety plan; and
        iii. baseline environmental information.
    c. The Licensee may initiate site improvements upon approval of the plan of development, including environmental assessment and social and community safeguards; provided that the Licensee may not start any drilling operations until the Licensing Authority has approved the drilling program, and well design plan for one or more wells and well permit for each well.

40. Drilling Program and Approval of Drilling Program
    a. A drilling program describes how the Licensee will drill for and test the geothermal resources covered by its license. The plan may include multiple locations at which the Licensee proposes to drill within the license area, and describes the number of well pads and number of wells that are anticipated to be developed.
    b. A drilling program shall be submitted in the proper form and accompanied by the appropriate fee.
    c. The Licensing Authority shall review the drilling programin coordination with the authorized environmental and health and safety authorities and may issue an approval in a form to be determined by the Licensing Authority or relevant Minister in directives.
    d. The drilling program must provide sufficient information to assess the environmental and social impacts of the proposed operations for each well, including:
        i. well pad layout and design;
        ii. a description of existing and planned access roads;
        iii. a description of any ancillary facilities/infrastructure required;
        iv. the source of drill pad and road building material;
        v. the water source purposes of use and quantities;
        vi. plans for surface reclamation;
        vii. a description of procedures to protect the environment and other resources;
        viii. environmental assessment;
        ix. social and community assessment and safeguards; and
        x. any other information the Licensing Authority may reasonably require.

41. Time for Submittal of Licensee's Drilling Program
    a. The Licensee may not start any activities described in the drilling program until the Licensing Authority approves the drilling program.
    b. The Licensee may submit its drilling program as part of its annual update to the work program, an amendment to an existing program; or, if the proposed drilling program is not inconsistent with the Licensee's existing work program, the Licensee may submit its drilling program, and if approved, shall update its work program accordingly, following approval or as part of its annual update.
    c. The Licensing Authority shall within 30 days approve the drilling program, and if no decision is issued within 30 days, the drilling program shall be deemed to be approved.

42. Variance of Drilling Program
    a. The Licensee must submit a written request for variance to the Licensing Authority describing proposed changes to the drilling program.
    b. The Licensee is not required to request a variance if it proposes to do less work than proposed in the original drilling program, as long as it does not involve changing drilling plans in a way that might compromise well integrity, or health, safety, and environmental controls.
    c. The Licensee may not proceed with any change to the drilling program until the Licensing Authority has provided written approval of a variance.
    d. A variance shall be granted if it does not involve significant changes in expected geology or reservoir conditions, or infrastructure changes substantially affecting the environment or the community.
    e. The Licensing Authority shall within 5 working days approve avariance to drilling program, and if no decision is issued within 5 working days, the variance to the drilling program shall be deemed to be approved.

43. Well Design Plan and Well Drilling Permit Application
    a. A well design plan describes the proposed design and all the operational aspects of the Licensee's proposal to drill, including drilling, logging, testing and completion of a well, and shall conform to the provisions of the African Union Code of Practice for Geothermal Drilling.
    b. The well design plan will be submitted for each individual well and shall provide sufficient information to allow for an objective determination as to the suitability of the design including description of the geologic target, any proposed directional drilling, and the detailed casing program and materials.
    c. The Licensee shall engage the services of a peer review of the well design plan and shall pay for the review.The peer review report will be provided directly to the Licensing Authority with its findings and recommendation; if the peer

review report recommends approval, the Licensing Authorityshall, within 10 (ten) days of receipt of the report, issue a written notice to the Licensee approving the well design plan and/or well drilling permit(s); if no decision is issued within 10 days, the well design plan shall be deemed to be approved.

44. Applicability of Drilling Program to More than One Well
    a. The Licensee's drilling program may apply to more than one well, provided the Licensee will drill the wells in the same manner and expects to encounter similar geologic and reservoir conditions.
    b. The Licensee must submit a separate well design plan and well drilling permit applications for each well to be drilled, and may submit applications for multiple wells simultaneously, so long as an application is submitted and approved for each well identified in the plan.

45. Amendment or Variance to Well Design Plan or Well Drilling Permit Application
    a. The Licensee shall file with the Licensing Authority a written and signed statement describing a proposed amendment or variance to the Licensee's well design plan or well drilling permit application,providing the basis and justification of the amendment or variance, and including a statement by a third party peer reviewer that the new or changed design plan or permit will maintain well integrity and will not unreasonably increase risk in implementing the well design plan and well drilling.
    b. Upon the Licensee's filing of a written, signed statement as provided in sub-article (a) of this Article, the Licensee may proceed with implementation of the well design plan or well drilling permit application consistent with the amendment or variance described in the statement.

46. Posting of Bond
    a. Before starting any drilling operation, the Licensee must send the Licensing Authority a bond,in the amount to be determined by the Licensing Authority, prior to commencingdrillingthe well(s); and
    b. the Licensee shall secure the Licensing Authority's approval of the Licensee's bond.

47. Release of Drilling Bond

The Licensing Authority will release a drilling bond upon request by the Licensee if the Licensing Authority determines that the Licensee has:

    a. Plugged and abandoned the well covered by the bond; or
    b. Transferred ownership and control of the well, in good condition, consistent with the laws of Ethiopia and any applicable drilling code. If transferred to the Government of Ethiopia, no replacing bond is required; if transferred to a

private entity, the bond must be replaced by the transfereeby a substituting bond in the same amount and with similar conditions.

48. Conducting Drilling Operations
    a. Operational requirements for drilling a well shall include the following:
        i. prior to drilling a well and during drilling, the Licensee must:
            1. conduct training, to ensure its personnel are capable of performing standard and emergency procedures quickly and effectively;
            2. use properly maintained equipment;
            3. implement operational practices that allow for quick and effective emergency response;
            4. prior to initiation of drilling, have a certification of well control; and
            5. keep the well under control at all times;
            6. conduct safety meetings weekly.
        ii. the Licensee's operation must at all times comply with the requirements of The African Union Code of Practice for Geothermal Drilling or as established in directives.

49. Environmental and Health and Safety Requirements for Drilling and Operations
    a. The Licensee must conduct its drilling and operations to:
        i. protect the quality of surface and subsurface water, air, natural resources, wildlife, soil, vegetation, and natural history;
        ii. protect the quality of cultural, scenic, and recreational resources;
        iii. accommodate, as necessary, other land uses;
        iv. minimize noise; and
        v. prevent property damage and unnecessary or undue degradation of the lands.
    b. The Licensee must remove or, with the Licensing Authority's approval, properly store all equipment and materials that are not in use;
    c. The Licensee must retain all fluids from drilling and testing the well in properly designed pits, sumps, or tanks;
    d. When the Licensee no longer needs a pit or sump, it must abandon it and restore the site as the Licensing Authority directs it to;
    e. In the event of exceedance of environmental standards or requirements, the Licensee must immediately take steps to abate the exceedance and mitigate any impacts on the environment;
    f. The Licensee must minimize the volume of any hazardous chemicals and explosives on site to that amount necessary for efficient operations and must

transport, manage and store consistent with international standards and best practices and the laws of Ethiopia;

g. The Licensee must immediately report to the local authorities and the Licensing Authority
   i. loss of control of the well;
   ii. all incidents or accidents resulting in or potentially threatening harm, including injury or death, to persons in the License Area or nearby communities; and
   iii. discharges to the environment of materials of types or in volumes detrimental to the environment.

h. The Licensing Authority may establish a safety inspection program, including a designated safety inspector, to ensure compliance with health and safety requirements, and, in addition to any health and safety plans required as a condition of license approval, may require the Licensee to prepare an emergency response plan or contingency plan showing how the Licensee will respond to emergency situations threatening the public health and safety, worker safety, property, or the environment.

50. Certifications
   a. All tool pushers, drilling superintendents, and permittees' representatives (when the permittee is in control of the drilling) are required to have completed an internationally recognized well control certification program and furnish the certification of satisfactory of completion to the Licensing Authority prior to the start of any drilling operations. The certification must be renewed every two years.
   b. Welding of wellhead connections must be performed by a certified welder using materials in conformance with directives established for this purpose.

PART VIII
CLASS II LICENSES

51. Authority to Issue Class II Geothermal Resources Licenses
   a. All Class II Geothermal Resources License applications shall be submitted to the Licensing Authority for registration and initial review.
   b. If a Class II Geothermal ResourcesLicense application submitted to the License Authority indicates that the project will utilize a more than 2,000,000 cubic meters of Geothermal Resources annually and the anticipated temperature of the resource is greater than120 degrees Celsius, the Licensing Authority shall process the application in accordance with the applicable health, safety, environmental and drilling requirements for Class I Wellfield Development and Use Licenses; provided, that the Licensing Authority

shallcoordinate its review with the State that is the location of the proposed project.

c. If a Class II Geothermal ResourcesLicense application submitted to the Licensing Authority indicates that the project will utilize a total of 2,000,000 cubic meters or less of Geothermal Resources annually and the anticipated temperature of the resource is 120 degrees Celsius or lower, the Licensing Authority shall, following registration and initial review of the Application, promptly send/transfer the application to theauthorized licensing entity in the State where the proposed project would be located for further review and issuance or denial of a license by the State, provided that, at any time, a State may request that the Licensing Authority retain or undertake review of a Class II Geothermal Resources License Application, issue a Class II Geothermal Resources license pursuant to such Application, orundertake regulatory authority over all or part of a Class II Geothermal Resourcesproject that would otherwise be subject to oversight by the State.

52. Application for Class II Geothermal Resources License

An application for a Class II Geothermal Resources License shall be made in writing to the Licensing Authority on the prescribed form, accompanied by the prescribed application fees, and shall include the following particulars:

a. Where the applicant is a natural person:
   i. full name, nationality, and date of birth,
   ii. profession; and
   iii. country of residence and address.
b. Where the applicant is a juridical person:
   i. its name, legal form, nature of business and principal place of business;
   ii. address of its head office; and
   iii. name, address, telephone number, and email address of the applicant's designated agent or representative in Ethiopia.
   iv. copies of its memorandum and articles of association;
   v. the name and nationality of every director or equivalent officer; and, if the juridical person holds a capital share, the name of any person who is the beneficial owner of more than five per cent of the issued capital share;
   vi. a copy of the latest annual report of the board of directors, if any;
   vii. copies of balance sheets, profit and loss statements and auditor's reports for the previous three years, if any;
   viii. a list of the names of the board of directors, showing the address and nationality of each; and

ix. the name and title of any person or persons authorized to sign on behalf of the applicant.

c. For any applicant, whether a natural or juridical person:
   i. proof of registration to conduct business in Ethiopia;
   ii. a short summary of information available to the applicant that describes how and why the area has the potential for geothermal development and use, including –
      1. detailed geological maps of the area, indicating location of major structural features and manifestation and/or areas of alteration;
      2. geothermometer temperatures based on water and gas sampling;
      3. interpretation of any geophysical surveys conducted, including any maps;
   iii. a proposal for delineation of the area to be covered by thelicense, with preliminary analysis of available information justifying the requested License Area;
   iv. site plan showing planned improvements;
   v. proposed access to the License Area;
   vi. any geothermal license the applicant currently holds or has previously held in Ethiopia;
   vii. description of the physical characteristics of the proposed license area;
   viii. identification of human habitation and communities in the proposed license area including nomadic communities, focusing on areas where proposed activities will take place under a license; impacts on local communities and proposed mitigation of such impacts;
   ix. business plan;
   x. information related to the technical and financial capacity of the applicant to carry out the work identified in the work program
   xi. a description of anticipated Class II geothermal resources production, discharge and injection and the time periods within which geothermal resourceuse shall commence;
   xii. an adequate testing and monitoring plan to measure fluid temperature;
   xiii. community outreach and coordination activities already undertaken by the applicant, if any, and a plan for coordinating with local communities to determine and address impacts;
   xiv. environmental and social impact assessment including a plan for avoiding or mitigating impacts;
   xv. program of employment and training including proposals with respect to the employment and training of citizens ofEthiopia; and

xvi. a description of the types of goods and services that will be obtained within Ethiopia and those that will be obtained from outside of Ethiopia.

53. Registration and Publication of Notice of Applications
    a. Promptly upon receipt the Licensing Authority shall mark each application for Class II Geothermal Resources License, renewal, extension, surrender, transfer, assignment, or any form of encumbrance with a date of receipt and enter the application in the Geothermal Register.
    b. The authority concernedshall publish a notice of Class II Geothermal Resources License Application in a newspaper of wide circulation, describing the proposed project, its location and other particulars as provided in directives.
    c. Within 10 working days of the end for the 30-day notice period, if there are no objections, the Authority concerned shall approve the proposed project, with conditions, as appropriate.
    d. The Applicant shall pay all costs for registration and publication.

54. Issuance of Class II Geothermal Resources License
    a. A Class II Geothermal Resources License shall be issued on an exclusive noncompetitive basis for direct use of geothermal resources.
    b. A Class II Geothermal Resources License shall be issued for a maximum period of 25 years and may be renewed at the end of the period on substantially the same terms and conditions as the original license, as provided in directives.
    c. A Class II Geothermal Resources License may be granted without the Applicant having previously held a Reconnaissance License or Exploration License;
    d. A Class II Geothermal Resources License shall include
        i. a requirement of annual measurement and reporting of:
            1. flow of steam and/or hot water;
            2. temperature into the facility;
            3. temperature out of the facility; and
            4. additional measurements required by the Licensing Authority depending on the type of facility, the type and quality of the resource, and the terms of any sales contract.
        ii. a condition that in the following circumstances, a holder of a Class II Geothermal Resources Licenseissued by either the Licensing Authority or a State shall immediately cease drilling operations and shall notify the Licensing Authority: ifa well reaches, or may reasonably be expected to reach, a depth of between 150 m and 250 m, and contains steam or hot

water that may reasonably be expected to exert a shut-in pressure at the wellhead of 0.5 MPa or greater; or has expected or actual downhole temperatures within 20°C of the boiling point for depth (BPD) temperature as measured from the local water level; in that event, the Licensing Authority shall immediately assume responsibility for oversight of drilling operations, including an assessment of the potential applicability of Class I Wellfield Development and Use License drilling standards, and shall provide notice of its assumption of authority and additional direction to the State and the Licensee, with a request for relevant records.

iii. a condition that upon the occurrence of circumstances described in sub-article (iii), the licensee may apply for a Class I Wellfield Development and Use license in accordance with the provisions of the Proclamation and the regulations; and, if the Licensee does not wish to apply fora Class I Wellfield Development and Use License, it shall complete site closure and shall surrender its Class II Geothermal Resources License and any right to use geothermal resources or the land included in the license area.

55. Lodging of Objections and Appeals
    a. Objections and appeals related to decisions of the Licensing Authority with respect toClass II Geothermal Resources Applications or Licensesshall be subject to the requirements of Article ___ of the Proclamation and Article ___ of these regulations.
    b. Objections to decisions of a State with respect to a Class II Geothermal Resources License application, including a License for which the Licensing Authority has reserved certain authorities or undertaken authority at the request of a State, shall be subject to State processes for review of objections and appeals.

56. Determination of License Area and Number of Licenses held by Licensees
    a. The size and dimensions of the License Area for a Class II Geothermal Resources License Area shall be limited to the area reasonably necessary for Class II operations, which shall be determined on the basis of the applicant's proposal and justification provided therein, and other relevant information available to the Licensing Authority or State.
    b. There are no limitations on the number of Class II Geothermal Resources Licenses held by a Licensee, so long as the applicant meets the requirements for applying for and holding a License.

57. Revocation and Suspension
    a. Revocation or suspension of Licenses issued by the Licensing Authority shall be subject to the requirements of Article 20 of these regulations.
    b. Revocation or suspension of Licenses issued by an authority other than the Licensing Authority shall be in accordance withapplicable laws and regulations.

58. Records and Reports
    a. The holder of a Class II Geothermal ResourcesLicense, whether such License is issued by the Licensing Authority or the State, shall submit to the Licensing Authority and the State
        i. immediately, any occurrence or accident resulting in or potentially resulting in injury or death to humans or detrimental impacts to water or air quality
        ii. each year within sixty (60) days after the anniversary of license issuance a report specifying for the previous year:
            1. the results of monitoring of the resource as provided in the Licensee's monitoring plan;
            2. the volume of geothermal fluids extracted and used;
            3. the quantities of by-products, if any, extracted from geothermal fluids, or products from commercial operations;
            4. the number of persons employed, by category.

59. Drilling of Class II Geothermal ResourceWells
    Subject to the limitations in Article 6(b)(iii) of these Regulations, drilling of wells under Class II Geothermal Resources Licenses issued by either a State or the Licensing Authority shall be subject to the rules for development of water wells, including certification requirements for water well drillers.

PART IX
FEES

60. License Fees
    a. The license fees to be paid by an applicant for a license pursuant to Article 47 of the proclamation shall be as follows:
        i. Reconnaissance License …….. Birr xxxx
        ii. Exploration License ……. Birr xxxx
        iii. Class I Wellfield Development and Use License …… Birr xxxx
        iv. Class II Geothermal Resources License …….. Birr xxxx

61. License Renewal Fees
    a. The license renewal fees to be paid by an applicant for a license pursuant to Article 47 of the proclamation shall be as follows:
        i. Reconnaissance License …….. Birr xxxx
        ii. Exploration License ……. Birr xxxx
        iii. Class I Wellfield Development and Use License …… Birr xxxx
        iv. Class II Geothermal Resources License …….. Birr xxxx

62. License Registration Fees
    a. The license registration fees to be paid by an applicant for a license pursuant to theseregulations shall include costs associated with data management and publication of license information, and are as follows:
        i. Reconnaissance License …….. Birr xxxx
        ii. Exploration License ……. Birr xxxx
        iii. Class I Wellfield Development and Use License …… Birr xxxx
        iv. Class II Geothermal Resources License …….. Birr xxxx

63. Issuance of License Copy Fees
    a. The license copy fees to be paid by alicense holderare as follows:
        i. Reconnaissance License …….. Birr xxxx
        ii. Exploration License ……. Birr xxxx
        iii. Class I Wellfield Development and Use License …… Birr xxxx
        iv. Class II Geothermal Resources License …….. Birr xxxx

64. License Replacement Fees
    a. The license replacement fees to be paid by alicense holderare as follows:
        i. Reconnaissance License …….. Birr xxxx
        ii. Exploration License ……. Birr xxxx
        iii. Class I Wellfield Development and Use License …… Birr xxxx
        iv. Class II Geothermal Resources License …….. Birr xxxx

65. License Transfer Fees
    a. The license transfer fees to be paid by alicense holderare as follows:
        i. Reconnaissance License …….. Birr xxxx
        ii. Exploration License ……. Birr xxxx
        iii. Class I Wellfield Development and Use License …… Birr xxxx
        iv. Class II Geothermal Resources License …….. Birr xxxx

66. Bidding Fees
    a. Bid package fee ……. Birr xxxx

b. Data access fee …….. Birr xxxx

67. Drilling Fees

a. Drilling plan of development review fee ……... Birr xxxx
b. Drilling program review fee …….. Birr xxxx
c. Well design review fee …….. Birr xxxx
d. Drilling program variance review fee …… Birr xxxx

67. Effective Date

This regulation shall come into effect on the date of publication thereof in the national *NegaritGazeta*.