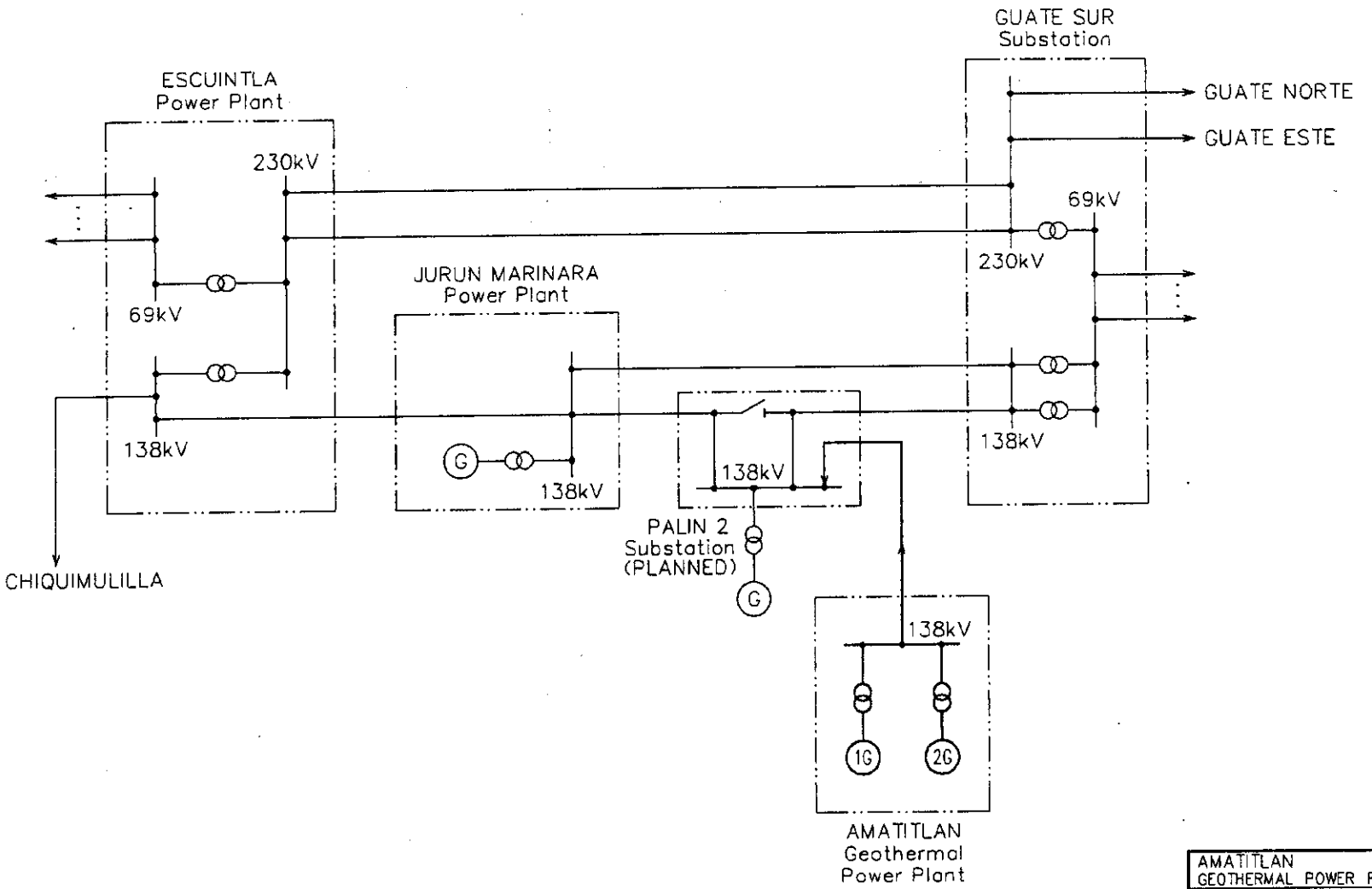


Fig 3-2-9
送電線系統図
TRANSMISSION NETWORK DIAGRAM

FOR REFERENCE

AMATITLAN GEOTHERMAL POWER PLANT FEASIBILITY STUDY					
DWG.TITELE: TRANSMISSION NETWORK DIAGRAM					
SCALE	DRAWN	CHECKED	APPROVED	DATE: OCTOBER, 2001 / JOB.No	
NON				DWG.No.	REV.No. ◇
WEST JAPAN ENGINEERING CONSULTANTS INC.					

Fig. 3-2-10 CONSTRUCTION SCHEDULE (CASE 1)

建設計画 (CASE 1)

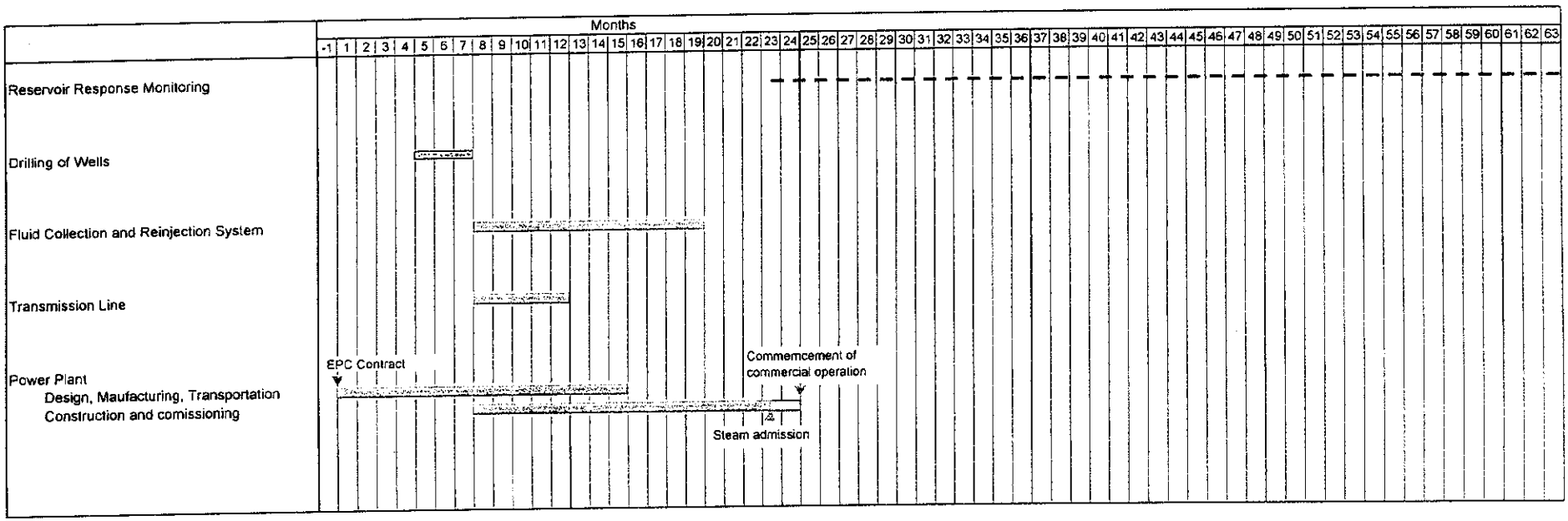


Fig. 3-2-11 CONSTRUCTION SCHEDULE (CASE 2)
建設計画 (CASE 2)

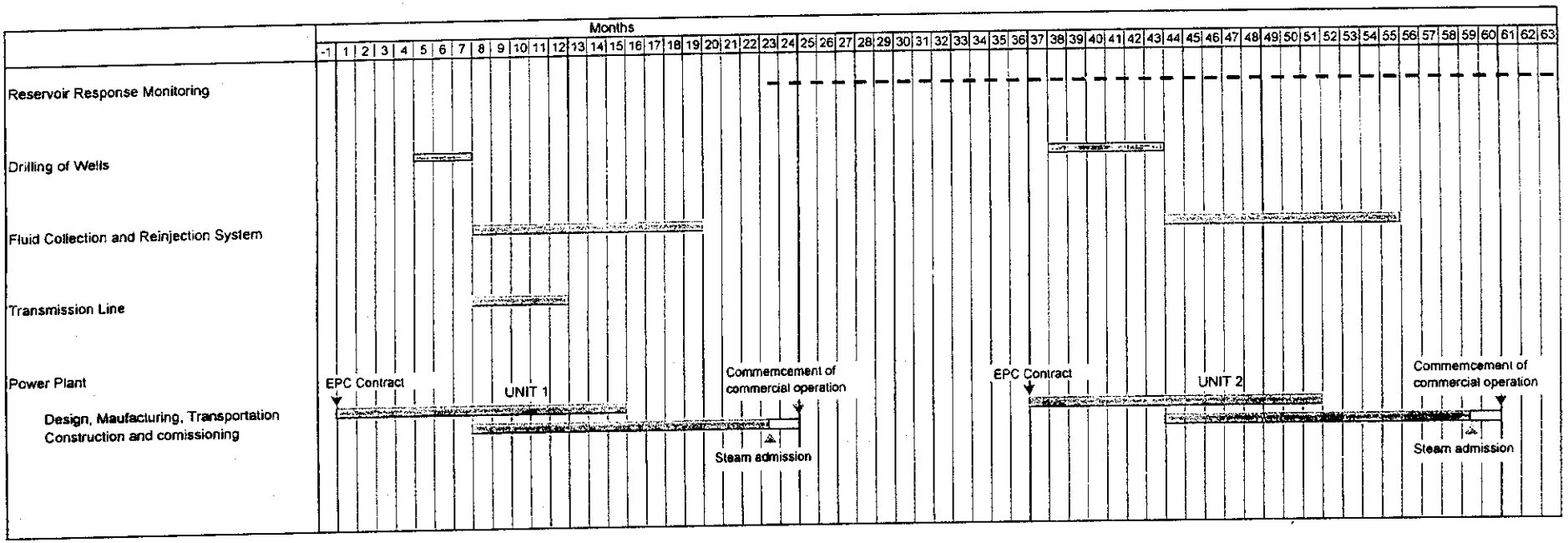


Fig. 3-2-12 CONSTRUCTION SCHEDULE (CASE 3)

建設計画 (CASE 3)

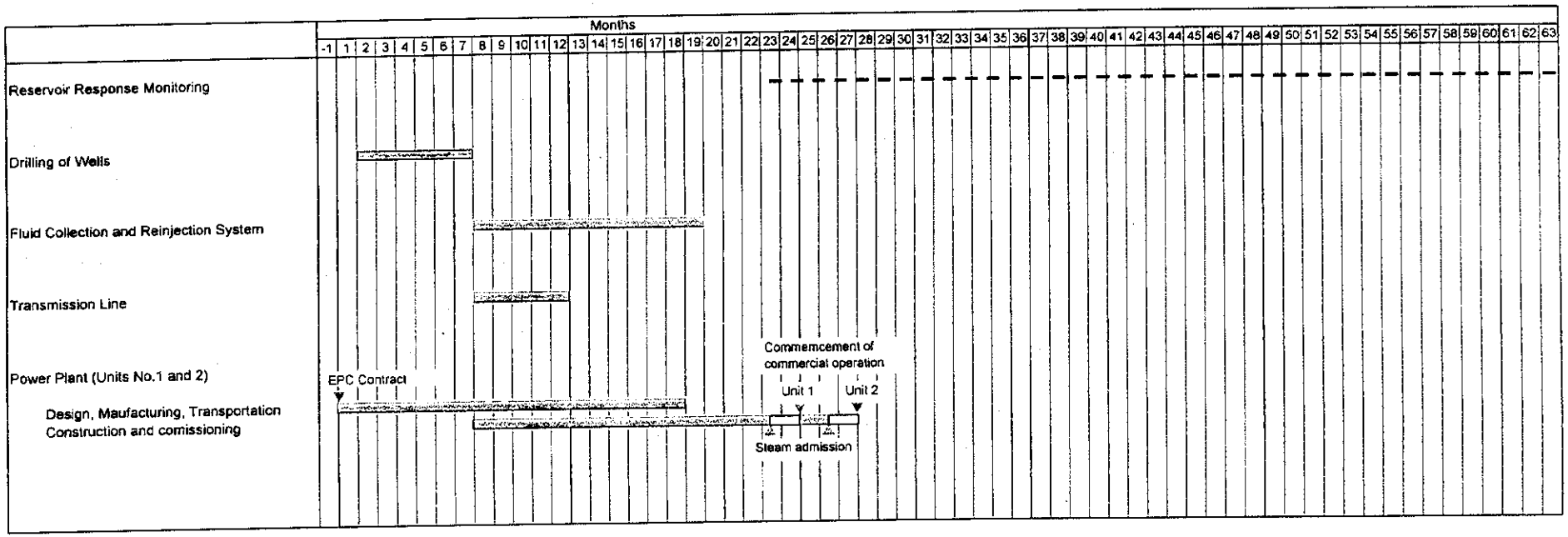
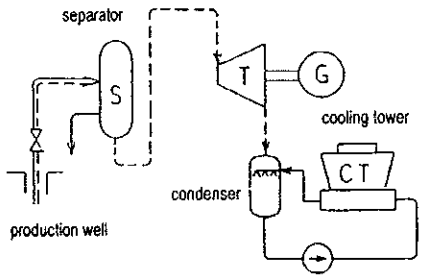
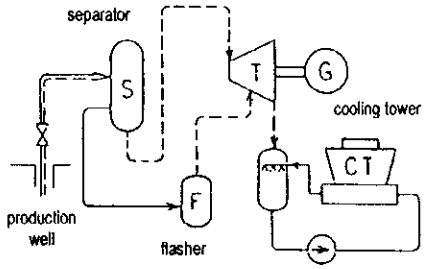


Table 3-2-1 Selection of Generating Technology
発電方式の候補

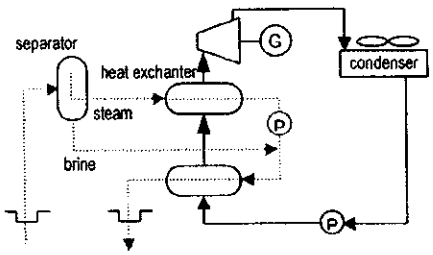
(1) Single Flashed Steam Cycle with Condensing Steam Turbine
--> RECOMMENDED FOR THIS PROJECT



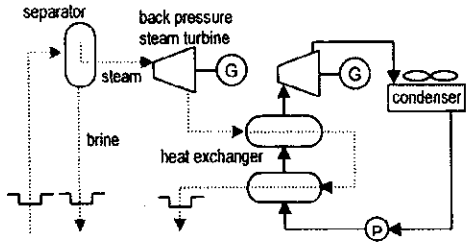
(2) Double Flashed Steam Cycle with Condensing Steam Turbine



(3) Two-phase (Biphase) Binary



(4) Combined Binary Cycle



(5) Hybrid Type (Bottoming Cycle)

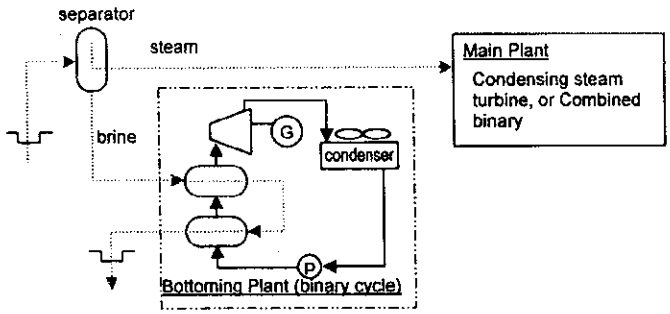


Table 3-2-2 Estimated Project Cost (Plant Site I, Outside Caldera)
工事費見積（発電所建設地点Ⅰ：カルデラ外）

	Scenario 1	Scenario 2	Scenario 3
1. Well Drilling			
Base cost	3.20	9.60	8.00
Price contingency	0.09	0.68	0.25
Physical contingency	0.16	0.51	0.41
2. Fluid Collection and Reinjection System			
Base cost	10.10	11.00	11.00
Price contingency	0.30	0.39	0.33
Physical contingency	0.52	0.57	0.57
3. Power Plant			
Base cost	29.15	55.65	53.00
Price contingency	0.88	3.35	1.76
Physical contingency	0.90	1.77	1.64
4. Transmission Line and Substation			
Base cost	2.90	3.50	3.50
Price contingency	0.09	0.14	0.11
Physical contingency	0.09	0.11	0.10
5. Geoscientific, General and Administrative Cost			
Base cost	5.46	10.92	7.55
Price contingency	0.16	0.67	0.26
Physical contingency	0.28	0.58	0.39
6. Land Acquisition and Compensation			
Base cost	0.75	1.50	1.50
Price contingency	0.02	0.08	0.05
Physical contingency	0.04	0.08	0.08
Project Cost Total			
Base cost	51.56	92.17	84.55
Price contingency	1.54	5.31	2.76
Physical contingency	1.99	3.62	3.19
TOTAL	**55.09**	**101.10**	**90.50**

Table 3-2-3 Estimated Project Cost (Plant Site II, Outside Caldera)
工事費見積（発電所建設地点Ⅱ：カルデラ内）

	Scenario 1	Scenario 2	Scenario 3
1. Well Drilling			
Base cost	3.20	9.60	8.00
Price contingency	0.09	0.68	0.25
Physical contingency	0.16	0.51	0.41
2. Fluid Collection and Reinjection System			
Base cost	7.30	8.20	8.20
Price contingency	0.22	0.31	0.25
Physical contingency	0.38	0.43	0.42
3. Power Plant			
Base cost	29.15	55.65	53.00
Price contingency	0.88	3.35	1.76
Physical contingency	0.90	1.77	1.64
4. Transmission Line and Substation			
Base cost	3.10	3.70	3.70
Price contingency	0.09	0.14	0.11
Physical contingency	0.10	0.12	0.12
5. Geoscientific, General and Administrative Cost			
Base cost	5.46	10.92	7.55
Price contingency	0.16	0.67	0.26
Physical contingency	0.28	0.58	0.39
6. Land Acquisition and Compensation			
Base cost	1.20	2.40	2.40
Price contingency	0.02	0.12	0.07
Physical contingency	0.06	0.13	0.12
Project Cost Total			
Base cost	49.41	90.47	82.85
Price contingency	1.46	5.27	2.70
Physical contingency	1.88	3.54	3.10
TOTAL	**52.75**	**99.28**	**88.65**

3.3 Envionmental Impact Assessment

3.3.1 Object of the Exaination

3.3.2 Environmental Regulation and Guidelines in Guatemala

3.3.3 Outline of the Field Survey Results

3.3.4 Environmental Monitoring during the Wells Drilling & Well Tests

3.3.5 Environmental Impact Assessment

3.3.6 General Recommendation for Next Project

3.3 ENVIRONMENTAL IMPACT ASSESSMENT

3.3.1 Object of the Examination

The environmental impact survey and analysis were performed to identify and evaluate the environmental sensitive aspects, and to provide the mitigation methods for these impacts during the drilling preparation works, drilling and production test base on "Environmental monitoring schedule". The initial environmental examination (IEE) was carried out in October 1998 before in position to start preparation of drilling of AMJ-1&2 base on the JICA's investigation program. Then, the environmental impact assessment and analysis were carried out in November – December 2000 in the area during wells drilling and well tests period.

The object of this examination is to support to make the "Environmental impact assessment" regarding construction plan of geothermal power plant that must be identified by results of the field survey.

3.3.2 Environmental regulation and guidelines in Guatemala

1. Correspondence for Environmental Survey

Environmental regulations in Guatemala have changed in recent years, so in order to execute any kind of works relate to well drilling in connection with geothermal survey that is required to have an authorization extended by Ministry of Environment (MOE). Besides of MOE, The CONAP (The National Protected Areas Commission) and INAB (The National Forestry Institute, in charge of the Volcan de Pacaya National Park) that are belong to governmental organization exist in conjunction with environmental affairs. However, to drill even within a National Park, once the permit from MOE is obtained, there is no need to obtain permits from other Organization.

Therefore, before in position to start preparation of drilling operation by this project, a report on the Environmental Impact Assessment (EIA) addressed to describe the possible impact on the environment caused by the construction of drilling pads, access roads, drilling operations and production test was required. A scheme of monitoring plan, outline of contents of the EIA and related reference data were already presented to INDE at the end of December of 1998. INDE prepared the EIA report on this project and have got the authorization from MOE.

INDE also made the schedule on a) monitoring plan, b) environmental mitigation plan and c) security / contingency plans for drilling operation that was required by MOE, and presented its. Then, the environmental impact survey has been carrying out along these schedules.

2. Standard of Environmental Assessment Index

a. MOE's Standards for Environmental Assessment

In the standards book published by MOE, no definite description regarding the environmental regulation and on the standard value was found. Up to day, EIA applications submitted to MOE standard value set

forth by the WHO or IDB have been adopted.

b. Related Standard of Environmental Assessment Index

1) Water effluent

a) Limit of waste water

The limits of wastewater to discharge to the public areas are regulated on IEE of the progress report (March,1999). It is mentioned that pH:6-9, COD(Chemical oxygen Demand) : below 250mg/l, TSS(Total Suspended Solid) : below 50mg/l, As:0.1mg/l etc. And, the limits of sewage from the geothermal power plant are basically also as same as those limits.

b) Limit of drinking water

The limits of items related to geothermal fluids set forth by the standard of drinking water regulated by WHO (World Health Organization; 1993) are shown in IEE of the progress report. It is mentioned that As limit is below 0.01ppm. But, the limits of Cl (below 250ppm), H_2S (below 0.05ppm) and NH_3(below 1.5ppm) are standardized according to smell and taste. Although, the limit of B is 0.3 ppm in WHO standard, that of CCREM (Canadian Council of Resource and Environment Minister's water Quality Guidelines; 1991) is 5 ppm.

2) Air emission

a) Limit for industrial estates

The standard values set forth on the environmental guideline of WB in industrial production are shown in IEE of the progress report. It is mentioned that the limit of H_2S is below 10ppm (15mg/Nm^3).

b) Limit of property boundary

The standard value of air conditions at property boundary set forth on the environmental guidelines of WB in all industries is also shown in IEE of the progress report.

c) Limit of exposure

Several standard of exposure limit of H_2S, CO_2, Hg and SiO_2 (amorphous silica) in the air are shown in IEE of the progress report (by Kevin Blown,1995). The limits of H_2S of TLV ACGIH(Threshold Limit Values of American Conference of Governmental and Industrial Hygienists) and MAK(Maximum Concentrations at the Workplace) are defined as 10ppm.

3) Noise

a) Limit of duration at the noise level

The limit of noise on the workplace set forth by OSHA (Occupational

Safety and Health Administration that is one of the American Organization) is shown in IEE of the progress report. The duration of noise level of 85 dB(A) is allowed within 8 hours a day.

b) Limit for the surrounding circumstances

The limit of noise for the surrounding circumstances set forth on the environmental guidelines of WB in industrial production is shown in IEE of the progress report. It describe that the ambient noise level around residential area at the day time (7:00-22:00) is allowed within 55dB(A).

c) Others

The items of Environmental Impact Assessment (EIA) to proceed the geothermal exploitation are the effect for plant and animals, vibration, fluctuation of underground water level, sinking, etc. other than the above mentioned water effluent, air emission and noise. However, these items are not regulated definitely.

3.3.3 Outline of the Field Survey Results

The target area for geothermal exploitation is located between Laguna de Calderas and active volcano, Mt. Pacaya. The altitude of this area ranges from 1,500 to 2,000 m.a.s.l.. Most of the area lies within a National Park. La Lagunilla as the famous heritage is slightly apart from the area. San Vincente Pacaya and San Jose Calderas are medium size residential zones (the most important within the Amatitlan geothermal prospect) close to the targeted area while small villages such as Concepcion, El Cedro, San Francisco de Sales, etc. lies within the area. Due to the lack of rivers or streams with continuous water current, the inhabitants use the water of Laguna de Calderas as their main potable water supply.

In this area, two geothermal wells such as AMF-1 and AMF-2 have been drilled at the west edge of Laguna de Calderas. During the field survey it was found that the background concentration of gases like H_2S and SOx were though to be higher than it should be predicted. The reason might be several fumaroles around wells site and the Pacaya volcano which is still active.

3.3.4 Results of Environmental Monitoring during the Wells drilling & Well Tests

The utmost care about environmental issue on the surrounding geothermal developing area must be taken with respect to the following items.

- Monitoring for water effluent
- Monitoring for hydrogen sulfide emission
- Monitoring for noise impact on the surrounding residential area

1. Impact on Water Quality

The monitoring points such as water streams, shallow drill hole of 50m depth and lake water in Calderas that is 12 in all for measurement on water fluids were selected around the geothermal developing area.

According to the monitoring results, there were no evidence that can be affected by well drilling and well test of AMJ-1&2. The concentration of Cl

and B in the monitored water samples was lower than limit in the standard of CCREM. But, the judgments for toxic elements like As and Hg in monitored points ware cancelled because of lack of data.

2. Impact on Air Quality (H_2S Emission)

The H_2S concentration around the area where AMJ-2 was drilled and its blowout test was carried out, shown in IEE of the interim report (March,2001).

The whole of H_2S concentration during blowout test (Nov.27, 2000) were below 0.010ppm. The standard value set forth on the environmental guideline of WB (World Bank) for industrial production shows 10ppm.

In the developing area, 2 of geothermal production wells ware existing close to the site where 2 of new observation wells named AMJ-1&2 were drilled in Amatitlan. The backpressure turbine using steam produced from AMF-1&2 wells has been generating with 5MW. H_2S monitoring related with power plant operation was carried out every week around area. It was shown in IEE of the interim report. The maximum concentration of H_2S (after April of 2000) was 0.012ppm. Other measured concentrations were around 0.00Xppm that is fairly low concentration.

3. Noise Impact

The noise level comparison with noise level of background (after blowout) around the area where AMJ-1&2 were drilled during drilling works and blowout test was shown in IEE of the interim report.

Maximum noise level when blowout (fully open) of AMJ-1 was 116dB beside of the well, also measured 88 – 116dB at the pad. Noise levels of background were 74 – 95dB at the same points. The point No.5 an entrance way to the pad (100m a way from the pad) shown 76 – 88dB. This level is exceeding the background noise level, but almost same level of background / typical noise level in major city (1993, A.Freeston). The point No.9 San Francisco church atrium in the center of the village where close to the drilling pad, shown 58 – 66dB. Background level was 57dB at the same point.

Other hand, maximum noise levels of AMJ-2 during blowout operation were 75 – 99dB around pad, it was relatively low level compared with AMJ-1. In case of AMJ-2's blowout test, an entrance gate to pad point No.5 was 63dB, and the San Francisco church atrium point No.9 shown 58dB. Those levels are as same as background level.

4. Conclusions

The study on the Environmental Impact Evaluation regarding wells drilling and blowout test of AMJ-1&2 in the Amatitlan geothermal area, it will be concluded following.

1) Regarding water samples such as water streams, shallow drill hole of 50m depth and lake water in Calderas, there were no evidence that can be affected by well drilling of AMJ-1&2.

2) The whole of H_2S concentration around drilling pad were relatively low

and it's concentration during blowout test of AMJ-2 were below 0.010ppm.

3) Maximum concentration of H_2S related with power plant (5MW) operation was 0.010ppm, and another measured concentrations around power plant were extremely low.

4) Whole of monitoring points without drilling pad, the noise levels were almost same as background level, even in near by residential area.

5) The drilling mud and cuttings were buried. Whole of geothermal hot water was disposed into reinjection well, and drainage was dumped to waste water pit.

3.3.5 Environmental Impact Assessment

1. Conditions for Case Study

- Install capacity of newly power plant : 20,000kW
- Utilizing rate of power plant : 90%
- Type of power generation : Single flash & Steam turbine / Steam condensate
- Steam consumption for generation : 141t/h
- Non-condensable gas content in steam : 1.78wt%
- CO_2 concentration in N.C gas : 93.0%
- H_2S concentration in N.C gas : 5.5%
- Volume of hot water : 320t/h
- Exhausted air volume from cooling tower: 4.6×10^6 Nm^3/h
- Place of the power plant : out of the caldera rim

2. Environmental Impact Assessment

a. Water Effluent

Any of water effluents on the environmental issues related to the wells drilling in this area couldn't be recognized above mentioned by the environmental monitoring. Even so, some influence might be affected from wasted water or drainage from working places regarding power plant construction because the topography of this area shows with in a basin structure where is occupied the lowest elevation of Calderas lake, even if the power plant will be constructed within the Caldera. Therefore, it is recommended by this point of view.

1) Disposal of geothermal hot water

Whole amount of geothermal hot water discharged from 4 wells (AMF-1&2 and AMJ-1&2) will reach around 165t/h (at 20MW operation:320t/h)

showing Table 3-3-1. And major chemical components of hot water are shown in Table 3-3-2. The toxic elements like As (7-8ppm), B (40-50ppm) in geothermal hot water are extremely high, then whole of geothermal hot water should be disposed into the reinjection wells to under ground. On the other side, reninjection of hot water is necessary to help recharge the reservoir to maintain pressures in the reservoir.

2) Disposal of over flow water from cooling water system

The presence of water quality of over flowed cooling water at power plant operation stage cannot infer at the moment. The quality of the water is depending on the characteristic of condensate in general. The chemical components of steam condensate from 2 geothermal wells (AMJ-1&2) are shown in Table 3-3-3. Both As and Hg concentration in the condensate are lower than the limit (As:0.1mg/l, Hg:0.05mg/l) for process wastewater on the environmental guideline of WB, but the concentration of these are slight higher than the limit (As:0.001ppm, Hg:0.001ppm) on standards and guidelines for drinking water of WHO. Concentration of As,Hg and B in steam condensate in a world average selected geothermal fluids are also slight high compared with limit on WHO standards for drinking water. The contaminant concentration in selected geothermal fluids in a world average is showing Table 3-3-4 (by Jenny G.WEBSTER,1995).

As an operation stage of power plant, it seems to be used a kind of chemicals like "Biocide" to be added into the cooling water system due to prevent occurring of oxidizing bacteria and algae. From this point, an over flow water from cooling water system shall be injected into another reinjection well.

3) Disposal of waste water and drainage from working area

Whole of wasted water and drainage discharged from working area should be disposed to the pond and neutralized as same as a way of treatment at the wells drilling.

4) Disposal of drilling mud and other waste

The drilling mud and drilling fluids like cuttings shale be exhausted to drainage pit at first, after the evaporation, waste dumps shall be buried as same as a way of treatment at the wells drilling.

b. Hydrogen sulfide emission

1) H_2S concentration at the wells drilling stages

The whole of H_2S concentration during blowout test (Nov.27, 2000) were below 0.010ppm. These concentrations were extremely low compared with a standard value which is set forth on the environmental guideline of WB (World Bank) for industrial production shows 10ppm. Even so, it will be needed about consideration how to release H_2S safely into the atmosphere, because H_2S smell is well detectable at very low concentration under 0.3ppm. Incidentally, 5 MW power plant using steam produced from AMF-1&2 has been generating, but H_2S

concentration around area was 0.012ppm (Max) fairly low concentration.

2) Properties of H_2S

In general, hydrogen sulfide gas (H_2S) exist in common geothermal fields and it has a characteristic like rotten eggs odor which is well detectable at very low concentration under 0.3ppm. H_2S is a heavy gas compared with air, and extremely flammable gas and highly toxic. Due to funny odor and toxic gas, it is kept out of working places or residential area. The standard value set forth on the environmental guideline of WB (World Bank) for industrial production and TLVACGIH (Threshold Limit Value of American Conference of Government and Industrial Hygienists) shows 10ppm. As the concentration increase, the odor becomes sweeter and finally disappears above 105ppm. Consequently a human may die within one hour if concentration of H_2S exceed 600 ppm. H_2S is a kind of heavy gas and will accumulate in low lying area, then it may travel some distance in gullies, drain or pipe pits without significant diluting or mixing with air. Therefore, it can say that the concentration of H_2S in environmental circumstances is affected by atmospheric conditions. The concentration will reach high enough with weak wind, decrease in atmospheric temperature and increase in humidity. Consequently, the concentration of H_2S in circumstances at geothermal developing site can be controlled by atmospheric condition with winds, temperature and humidity.

The effects of H_2S on the wider environment are likely to be limited mainly to the secondary effects of any unoxidised gas remaining as hydrogen sulfide in the rainwater, and potential contamination of surface waters. Although, a part of H_2S will converted to sulfuric acid, and have been identified as components of acid-rain, but no direct link between H_2S emission and acidification of rainwater has been established.

3) Examination on H_2S emission

a) Conditions as a case study

- Install capacity of newly power plant : 20,000kW
- Steam consumption for generation : 141t/h
- Non-condensable gas content in steam : 1.78wt%
- H_2S concentration in NC.Gas : 5.5%
- Exhausted air volume from cooling tower : 4.6×10^6 Nm^3/h

b) Estimation of H_2S emission

- Gas flow : $141 \times 1.78/100 = 2.51$t/h
- H_2S emission : $2.51 \times 5.5/100 \times 10^{-3} = 138$g/h
- Total H_2S emission : $138 \times 22.4/34 = 91 Nm^3/h$

c) Estimation of H_2S emission from cooling water

- H_2S concentration at cooling tower exhaust : $91/4.6 \times 10^6 \times 10^6$=20ppm

d) Comparison on H_2S emission

Total H_2S emission ($91Nm^3/h$) and H_2S concentration (20ppm) at cooling tower exhaust were examined in case of 20 MW out put. Then, estimated values were evaluated compared with other existing geothermal power plants. Table 3-3-5 shows comparison results. From this, estimated H_2S concentration around power plant won't high comparatively.

4) Planning for Mitigation of H_2S Emission

It was assumed that H_2S concentration exhausted from cooling tower is fairly low in comparison with other existing power plants above mention. An ambient H_2S concentration around developing area won't exceed the limit of 10ppm which is set forth on the environmental guideline of WB and TLVACGIH. Although, the concentration of H_2S in circumstances at the site can be controlled by atmospheric conditions with winds, temperature and humidity, and affected by land scope. Therefore, it is better choice that the power plant shall be constructed out of the caldera rim.

General options on planning for mitigation of H_2S emission for electric power generation are summarized on following subjects;

- An enlargement of forced draft due to dilution and dissemination.
- An adoption of gathering cooling tower system for well dilution.
- An adoption of completely closed system like Binary plants.
- An adoption of H_2S abatement apparatus, there are various process shown in Fig. 3-3-1.

c. Noise

When the blow out operation (fully open) of AMJ-1, maximum noise level was 116dB beside of the well, also measured 76 – 88dB at the point No.5 an entrance way to the pad (100m a part from the wells pad). This level is exceeding the background noise level, but almost same level of background / typical noise level in major city (1993, A.Freeston). Noise impacts in regard to the environmental issue depend on the relation between noise level and distance to the residential area. Noise level around residential area at the blow out test of AMJ-2 was 58dB as same level as background noise level.

Noise levels when the power plant is completed and operated on normal condition won't exceed the noise levels at the blow out operation of wells.

When the power plant will be installed at the site adjacent to the wells pad for AMJ-1&2 (out of the caldera rim), noise level around residential area won't exceed the standard value set forth on the environmental guideline

of WB for industrial production, from the relation between noise levels and actual distance to the residential area.

3.3.6 General Recommendation for Next project

1) The educative activities related with geothermal development should be implemented to the local communities in case of continued project.

2) Special attention must be paid to recover or repair the circumstances related to the project.

3) In case of further development program, through the construction of the power plant and operation, the Environmental Impact Evaluation plan must be implemented continuously.

4) In case of newly evaluation on further Environmental Impact Assessment, a) Plan for environmental impact monitoring (air, water, noise) b) Plan for environmental impact mitigation during drilling preparation, well drilling and blow out test c) Plan for human health protection and security on drilling preparation, drilling and blow out test shall be implemented with enrich the contents. For the monitoring of air, water and noise, measurement skill, measurement detector/devices and staffs shall be built up.

Fig. 3-3-1 H_2S Abatement Process/Technology for Geothermal Application

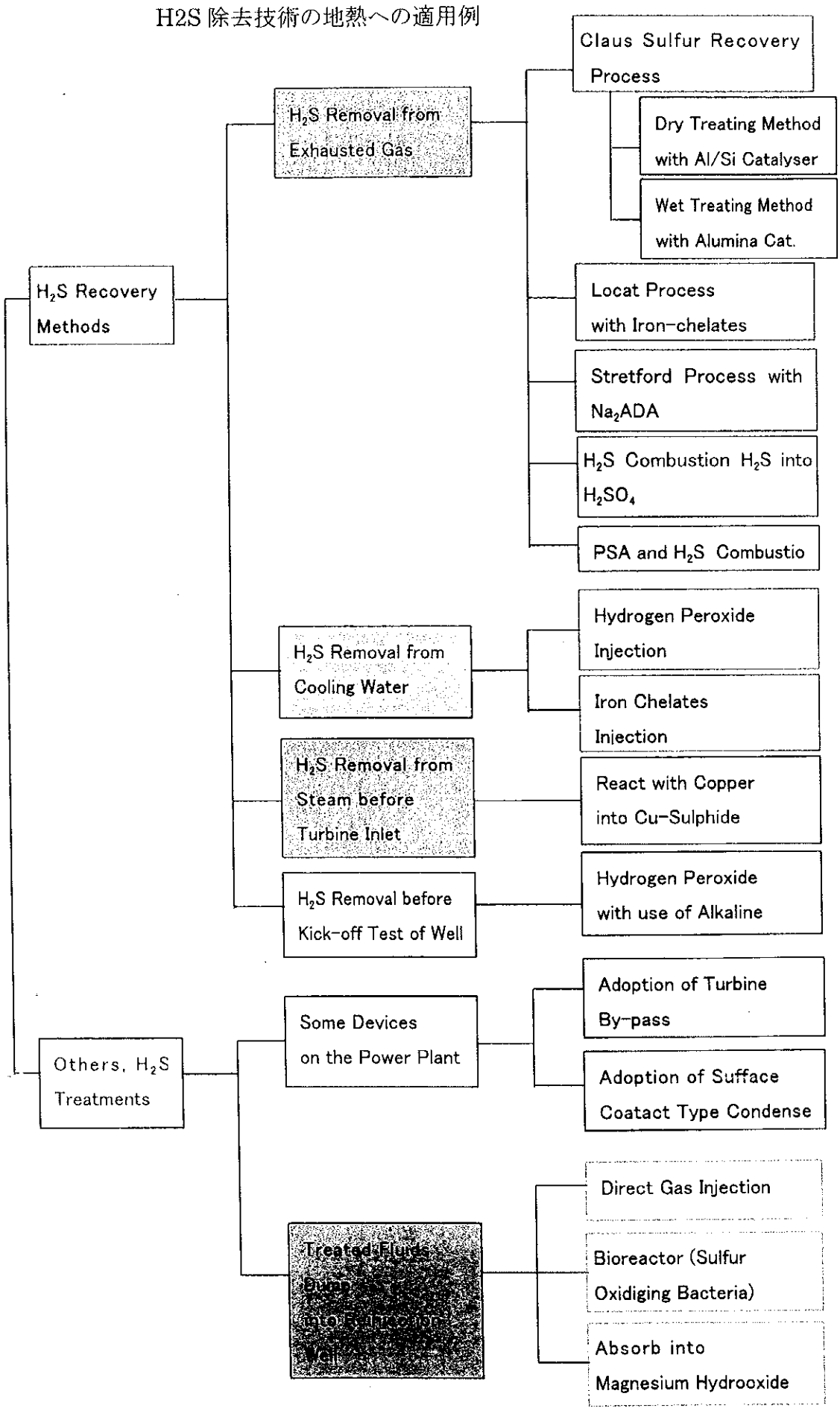


Table 3-3-1 Hot water volume of each wells.

坑井からの熱水量

	AMF-1	AMF-2	AMJ-1	AMJ-2	Total
Hot Water (t/h)	125	25	1.2	12.9	164.1

Table 3-3-2 Chemical components of hot water.

熱水の化学組成

	AMF-1	AMF-2	AMJ-1	AMJ-2
Data	before	Oct./22/1998	Nov./25/2000	Nov./28/2000
pH	7.01	5.25	7.95	7.56
TSM (mg/l)	7610	6150	3230	9500
Na (〃)	2298	1630	760	2520
K (〃)	495	345	132	524
Ca (〃)	79.2	39.1	10.3	72.5
Mg (〃)	0.16	0.02	0.07	0.09
T-SiO_2(〃)	567	745	765	1100
Cl (〃)	4049	2970	1220	4500
SO_4 (〃)	28	11.7	28.2	36.7
HCO_3(〃)	38	37	137	54
B (〃)	43.3	45.9	42.0	77.1
As (〃)	7.59	5.39	3.56	8.64
Hg (〃)	—	0.0009	—	4500

Table 3-3-3 Chemical components of condensed water.

凝縮水の化学組成

	AMJ-1	AMJ-2
PH	5.85	5.03
Cl (mg/・)	0.54	0.12
As (〃)	0.013	0.031
Hg (〃)	0.0011	< 0.0005

Table 3-3-4 Contamination Concentrations in selected Geothermal Fluids and Gases* and in a World Average Freshwater
地熱熱水・ガスの汚染物質濃度と清水の化学成分濃度

(ppm)

	Li	B	As	Hg	H2S	NH3
Freshwater	0.003	0.01	0.002	0.00004	<dl	0.04
Deep well Waters						
Salton Sea (US)	215	390	12	0.006	16	386
Cerro Prieto (Mex)	-	19	2.3	0.00005	0.16	127
Wairakei (NZ)	14	30	4.7	0.0002	1.7	0.20
Steam(s) or Non-condensable Gases(ncg)						
Geysers (US) (s)	-	16	0.019	0.005	540	700
Geysers(US) (ncg)	-	-	-	-	222	52
Cerro Prieto (s)	-	-	-	0.04	-	-
Cerro Prieto (ncg)	-	-	-	-	350	190
Wairakei (s)	-	0.23	-	0.002	52	4
Wairakei (ncg)	-	0.052	-	-	400	7.5

(Jenny Gr. Webster, 1995)

* Gas concentrations units here are ppm by weight, or mg/kg.

Table 3-3-5 Comparison on Total H_2S Emission and H_2S Concentration with Other Existing P/P

総 H2S 排出量と H2S 濃度の他の地熱発電所との比較

Name of Power plant	Out Put (MW)	H2S Concentration at cooling tower (ppm)	H2S Emission (Nm3/h)	Predicted H2S around P/P (ppm)
Amatitlan	(20)	45	117	———
A	27.5	62～120	58	0.03～0.06
B	50	14～120	140	0.006～0.008
C	65	49～110	～730	0.141～0.193
D	55×2	6～10	128	0.006～0.007

3.4 Economical and Financial Evaluation

3.4.1 Necessity of Project

3.4.2 Least Cost Solution

3.4.3 Financial Evaluation

3.4 ECONOMIC AND FINANCIAL EVALUATION

Among 3 each project implementation case inside and outside Caldera for Amatitlan Geothermal Power Development, the least generating cost case at the present value will be sought for at the economic evaluation. At the financial evaluation, financial soundness of each case will be evaluated with the financial internal rate of return method as well as cash flow based on the most plausible assumptions. The calculation process of each case will be presented in a form of electric files to INDE for further detailed study or review of some assumptions when the project will actually be implemented.

3.4.1 Necessity of Project

1. Power Demand

Since 1990, the power demand in Guatemala has been increasing supported by an average increase of GNP at 4% and active and robust trade with Central American countries. Although the rate has shown a slight decline recently, the demand increase rate still shows about 10%. After new Electric Enterprise Bill has been promulgated in 1996, the electrification rate in the country at 46.4% in 1990 increased to 73.4% in 1999. According to the Ministry of Energy and Mine, the total electrification is forecast to be attained by 2003.

As shown in Table 3.4-1, the country's dependable installed capacity was about 1,380 MW at the end of 1999 while the electric energy consumption reached 5,348 GWh at the peak demand of 1,049 MW. INDE forecast the demand increase at an average of 7.7% to 8.0% for coming 10 years in its medium scenario. When this project would be completed in 2005 or 2006, the forecast noted that total install capacity of about 1,600 MW, additional 200 MW or so capacity, would be necessary. So, taking into account the existing aged power generating facilities soon to be retired, the introduction of geothermal power units with a capacity of 20 MW x 2 units will be very significant for stable power supply and power system diversification because the geothermal power can generate at a higher capacity factor using indigenous energy source.

Table 3.4-1 Existing Power Facilities, MW (1999)

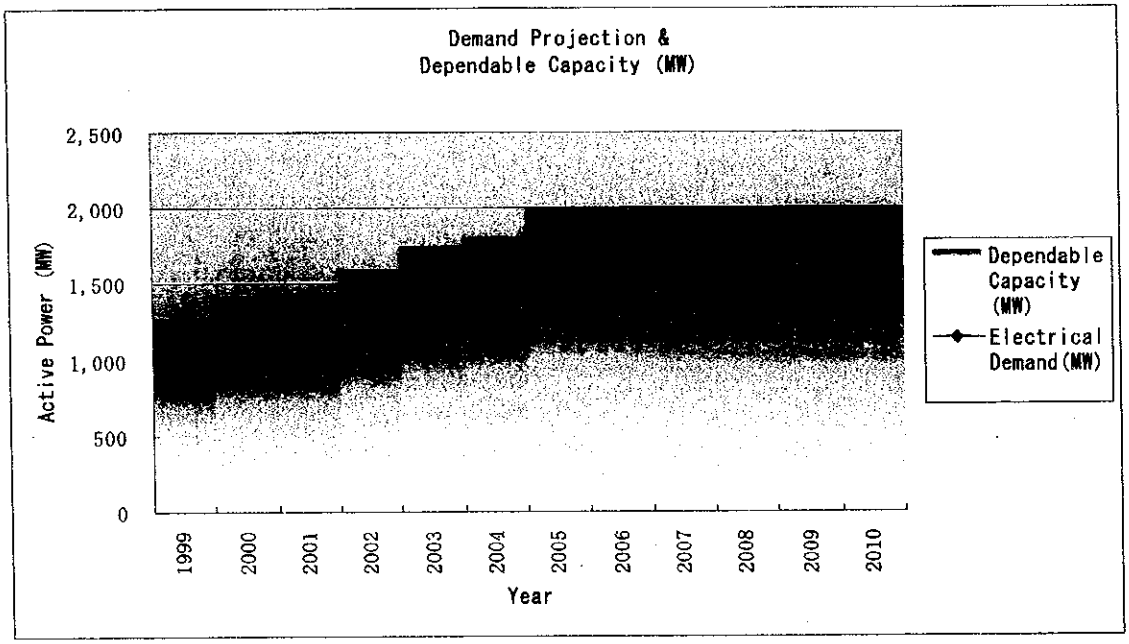
Facilties	Type	Installed Capacity	Dependable Capacity
Public Corporation			
INDE	Hydro	498.6	429.0
	Thermal	219.9	125.8
Private Company			
EEGSA	Hydro	123.0	92.0
Others	Thermal	661.4	612.1
	Geothermal	29.0	29.0
	Coal	120.0	120.0
Total		1,651.9	1,379.2

(Source, INDE, 2000)

Table 3.4-2 Demand Forecast

Year	Peak Load (MW)	Growth Rate (%)	Generated Energy (GWh)	Growth Rate (%)
2000	1,049	-	5,348	-
2001	1,137	8.4	5,819	8.8
2002	1,231	8.3	6,319	8.6
2003	1,322	7.4	6,812	7.8
2004	1,414	7.0	7,309	7.3
2005	1,505	6.4	7,806	6.8
2006	1,595	6.1	8,306	6.4
2007	1,689	5.8	8,821	6.2
2008	1,779	5.3	9,350	6.0
2009	1,874	5.3	9.883	5.7
2010	1,967	5.0	10,407	5.3

(Source : MEM Medium Scenario)



2. Effective Use of Renewable Energy

As Table 3.4-1 shows of the power plant type organization in Guatemala, thermal power by fossil fuel (mainly heavy oil) occupies more than 50%. The country is a sole oil producing country in Central America. Of the potential 2,900 million barrels of oil reserve, 625 million barrel reserve is confirmed for production. Guatemala's current refinery capacity, however, stands at 20,000 barrels per day and majority of the country's production at nearly 30,000 barrels are shipped to the US for processing. On the other hand, the consumption has been increasing year by year and exceeded the country's production capacity from 1998. Physically, the country becomes an oil importing country.

Under the circumstances, the geothermal power utilizes its own indigenous renewable energy resource. Once 40 MW geothermal power should be implemented, it can avoid power generation by diesel power with the equivalent annual power generation at 308 GWh and the fuel saving and therefore foreign exchange saving would amount to 30.2 million US$ annually.

In addition, the geothermal power scarcely emissions CO_2 hugely produced by combustion of fossil fuel fired thermal power, and so favorable attention has been paid to geothermal power which may greatly contribute to global environmental preservation. Thus, once CO_2 transaction among developed countries according to the Kyoto Protocol would have been realized, the country could transact CO_2 reduction with this geothermal power project.

In this connection, the government of Guatemala took positive measures for promotion of effective use of renewable energy sources including geothermal power, and gives incentive to foreign investors by exemption of import and income taxes.

3.4.2 Least Cost Solution

1. Project

INDE intends to carry out the development of geothermal power project by inviting the private investors for BOO. The plausible project implementation configurations are:

Case 1: To develop 20 MW x 1 unit using existing available 4 production wells as well as drill one each supplementary production and reinjection well. The transmission line, however, will have a capacity suitable for future geothermal power development. The project period is 2 years.

Case 2: To develop additional 20 MW x 1 unit with an interval of one year for geothermal reservoir monitoring after Case 1. For this purpose, 3 supplementary production wells and one reinjection wells will be drilled. The project period is 5 years.

Case 3: To develop additional 20 MW x 1 in parallel with Case 1 with a time lag of 6 months. Six supplementary production wells and 3 reinjection wells will be drilled. The project period is 2.5 years.

In addition, two project site options are technically and environmentally considered, i.e., inside and outside Caldera. The following economic considerations are made.

- Transmission line length
- Proximity to steam gathering and disposal system from Power Plant
- Land acquisition, compensation to agricultural products and house removal

1. Base Cost

With respect to a total of 6 cases, the base costs as of the year 2001 were estimated. This base cost does not consider physical and price contingencies.

Table 3.4-3 Project Base Cost

(Unit: Million US$)

	Case 1 20 MW x 1	Case 2 20 MW x 2	Case 3 20 MW x 2
Inside Caldera	49.41	90.47	82.85
Outside Caldera	51.56	92.17	84.55

2. kW Unit Construction Cost and Generating Cost Comparison

Based on the above estimate, the unit construction costs per kW were calculated and the generating costs at substation end with an annualized capital cost for 25 years operation were calculated and compared.

a. Exchange Rate

Economic and financial evaluation here use the following exchange rates and the currency used here is unified to US$.

1 US$ =120 Yen = 7.850 Quezal

b. Operating Conditions

The operating conditions of this project are assumed as follows taking into consideration of the existing geothermal power plant in the world. The O&M costs include annual reservoir monitoring cost and plant overhaul cost to be carried out every 2 years.

Table 3.4-4 Geothermal Plant Operating Conditions

Installed Capacity	MW	20	40
Life	Years	25	25
Capacity Factor	%	88%	88%
Annual Power Generation	GWh	154.18	308.35
House Service Power	k W	1,136	2,272
Transmission Losses	k W	27	108
Salable Energy (S/S end)	GWh	145.21	290.01
Annual O&M (Steam Production)	MM$	1.13	1.35
Annual O&M (Power Plant)	MM$	0.30	0.60
Total O&M	MM$	1.43	1.95

c. kW Unit Construction Cost and Generating Cost

For each case, the construction unit cost per kW of the total output was calculated. Then, the generating cost at substation end, using the operation conditions above and annualized capital cost at the discount rate of 10% for 25 years, was calculated. As for the generating cost, a case that INDE's investment for existing wells (4 productions well and 1 reinjection well) was calculated to obtain the least economic solution. The calculation results are tabulated below:

Table 3.4-5 kW Unit Construction Cost and Generating Cost

Case	Inside Caldera			Outside Caldera		
	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3
Total Output, MW	**20**	**40**	**40**	**20**	**40**	**40**
Unit Construction Cost, $/kW	**2,471**	**2,262**	**2,071**	**2,578**	**2,304**	**2.114**
Generating Cost, USCent/kWh	**4.73**	**4.11**	**3.82**	**4.89**	**4.17**	**3.88**
Where the investment of exist. wells is considered. USCent/kWh	**5.33**	**4.41**	**4.12**	**5.50**	**4.48**	**4.19**

3. Conclusion

As the table above shows, the Case 3 Inside Caldera, construction of 20 MW x 2 Units in parallel, can provide the least cost both for unit construction cost per kW and generating cost. On the contrary, the Case 1 Outside Caldera, 20 MW x 1 Unit, shows the highest cost. The construction of 1 unit becomes higher in

generating cost, and the development of 20 MW only is wasteful in view of effective use of energy resources, because owing to the detailed geoscientific investigation and existing well prove that the area has a potential for 40 MW geothermal power generating capacity.

Nonetheless, even this highest generating cost case of 20 MW development is still competitive with the other thermal power under operation as its total generating cost including the conceivable steam cost of 1.1 cent/kWh becomes 5.99 cent/kWh. Meanwhile, there are not so big differences between development of inside and outside caldera, 0.16 cent/kWh for Case 1 and 0.06 cent/kWh for Case 2 and 3. Thus, the selection between inside and outside will be made at the practical stage taking into detailed investigation on land acquisition, compensation, etc.

In case that 40 MW geothermal power should avoid the diesel power generation with an equivalent annual power generation of 308 GWh, the fuel saving amounts to 29,000 gallon of diesel oil at the cost of 31.22 million US$. The geothermal power could save a large amount of precious foreign exchange.

So, it is concluded that the geothermal power development in the country is a highly economic solution and worth to pursue.

3.4.3 Financial Evaluation

1. Evaluation Methodology

Financial internal rate of return (FIRR, a discount rate which equalizes the financial costs and profit of the project in a stream of the project life) for each case of assumed development plan will be obtained, and the financial viability of each case will be evaluated by comparison between the obtained FIRR and opportunity cost of capital. In addition, the cash flow of each case will be prepared to check for financial soundness of the project. Further, the sensitivity analysis on several factors that are considered to affect greatly the profitability of the project, i.e., a plant capacity factor, steam and power rates, etc. The calculation results will be presented, with electric files, to INDE for its financial review when the project will be actually taken place in the very near future.

2. Evaluation Conditions

a. Plant Operating Conditions

The plant operating conditions are the same used for economic evaluation.

b. Project Cost and Contingencies

The project cost is estimated adding the price and physical contingencies to the base cost estimated in Chapter 3.2.6 and given in Table 3.4-3 above. The price contingency considers 2% of annual escalation and the physical contingency 3% for plant facilities and 5% for geothermal field development. Usually, about 10% of physical contingency is considered for the geothermal field development, but for this project the half the rate is considered sufficient because 5 geothermal wells were successfully drilled at the Amatitlan

geothermal field.

Table 3.4-6 Project Cost

Unit: Million US$

Case	Inside Caldera			Outside Caldera		
	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3
Base Cost	49.41	90.47	82.85	51.56	92.17	84.55
Price Contingency	1.46	5.27	2.70	1.54	5.31	2.76
Physical Contingency	1.88	3.54	3.10	1.99	3.62	3.19
Project Cost	52.75	99.28	88.65	55.09	101.10	90.50

c. Financial Terms and Opportunity Cost of Capital

As a result of study on the most probable financial source for this project, loans from a Bank in Japan and the International Development Bank, which INDE has experience in getting the finance for power projects are considered. The project is assumed to be carried out with loans from these two international banking institutes. The terms of the Loan are summarized in the following table.

Table 3.4-7 Loan Term

	Japanese Bank	Int'l Develop. Bank
Currency	US$	US$
Share	40%	60%
Interest Rate	6.03% +3.08%	8.0%
Repayment	12 years	20 years
Grace Period	2 years (3 years) *	2 years (3 years)

Note to * : The grace period of Case 3 is considered 3 years as the construction period is scheduled for 2. 5 years.

From the table above, the WACC (weighted average cost of capital) becomes 8.44% and the value is an opportunity cost of capital for comparison with FIRR.

d. Steam and Power Rate

The steam cost is set in consideration of capital recovery from the investment to the existing geothermal wells and the power rate considers the current average power selling rate in Guatemala as follows:

Steam Rate: 1.1 US Cent/kWh
Power Rate: 8.0 US Cent/kWh

e. Depreciation

The geothermal wells and steam supply facilities are depreciated for 10 years and the power plant facilities for 20 years. The both are calculated with a straight line method without residual value.

f. Tax

A tax rate of 31% as against sales profit is considered.

3. Financial Internal Rate of Return

As a result of calculations with the conditions mentioned above, the obtained financial internal rate of returns are tabulated below and the calculation process of each case is shown in Appendix.

Table 3.4-8 FIRR

	Financial Internal Rate of Return	
	Inside Caldera	Outside Caldera
Case 1	11.14%	10.57%
Case 2	11.15%	10.87%
Case 3	13.75%	13.40%

As shown above, all the cases exceeds the opportunity cost of capital at 8.44% and are concluded as financially feasible. Because FIRRs of Case 1 and Case 2 are close to the opportunity cost of capital and subject to further study by cash flow, the Case 3, constructed and attained commissioning in a shorter period, is the most suitable to pursue.

4. Cash Flow

Table 3.4-9 Accumulated Profit

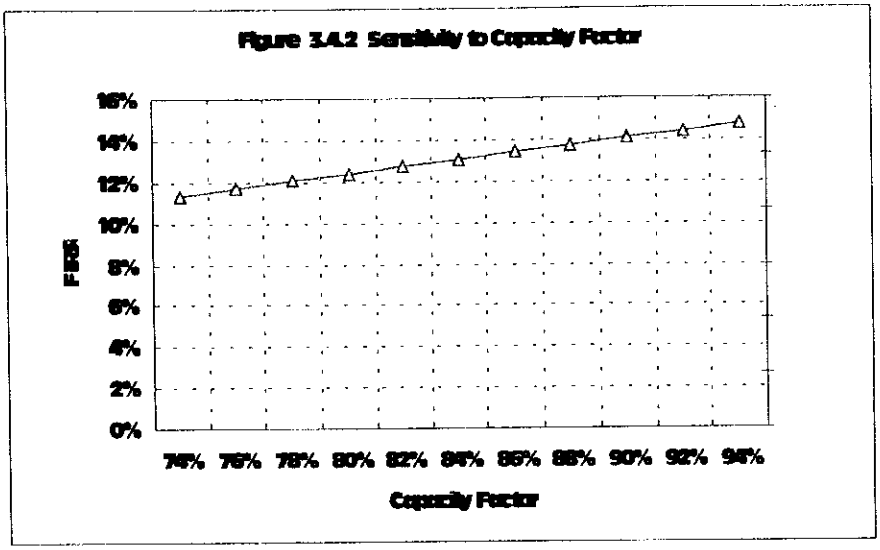
	Accumulated Profit (Million US$)	
	Inside Caldera	Outside Caldera
Case 1	47.22	35.79
Case 2	76.81	73.44
Case 3	111.33	106.56

From the point of cash flow, the Case 1 and Case 2 will fall into short working fund for several years after commissioning, mainly due to repayment burden. On the other hand, the Case 3 could appropriate the profit soon after commissioning and will only fall in short fund in the year when the supplementary well will become necessary. Such a shortfall could be sufficiently recovered with the accumulated profit. In view of the debt service ratio, the Case 1 and Case 2 can not be said financially feasible. As a conclusion, only Case 3 is financially feasible. (Refer to the calculation processes in Appendix)

5. Sensitivity Analysis

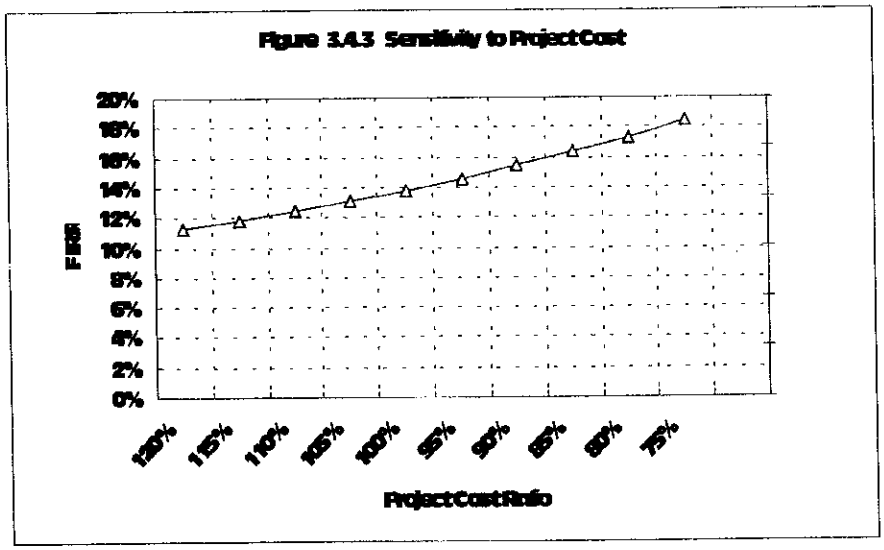
Using the Case 3 which is regarded financially feasible, the sensitivity of FIRR to the power plant capacity factor, project cost, power rate and steam rate are tested. Detailed figures are given in Appendix.

a. Plant Capacity Factor



Because geothermal power does not consume the variable cost during operation, it is usually used as a base load carrying power unit. In Japan, most of the geothermal power renders the services at the plant factor of more than 90%. The assumed 88% in this project is supposed to be attained without difficulty, as the power units will be dispatched in the order of less variable cost plant in the case of the electricity sales free market in Guatemala. It should be noted, however, that once the capacity factor should fall less than 77%, the financial soundness will be jeopardized. Thus, it is important to maintain the factor at least more than 80%.

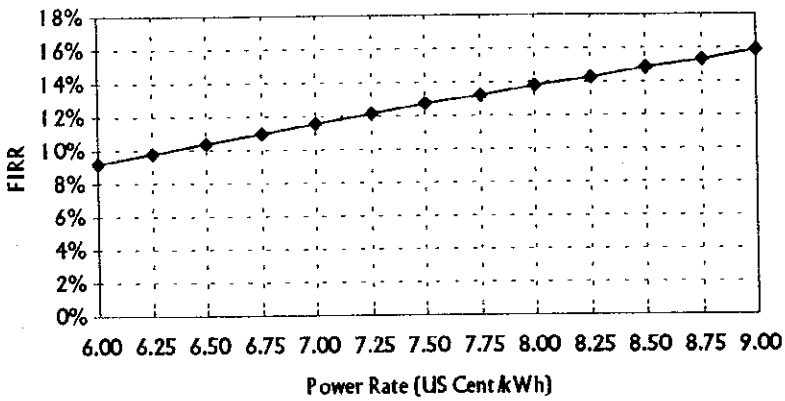
b. Project Cost



As Fig.3.4-3 shows, 5% cost reduction is effective to increase the FIRR by 1% approximately. So, introduction of effective and efficient engineering expertise and management may result in reduction of construction cost, and attaining the financial profitability.

c. Power Rate

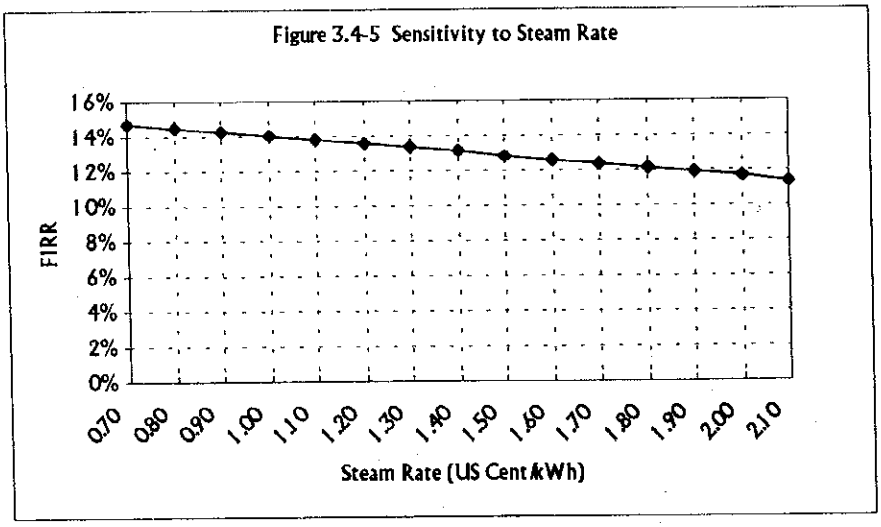
Figure 3.4-4 Sensitivity to Power Rate



As the electricity free market progresses, there is a possibility that the power rate will become lower. According to the figure above, the project could maintain the FIRR above 12% even if the power rate should fall less than 7.25 cent/kWh.

d. Steam Rate

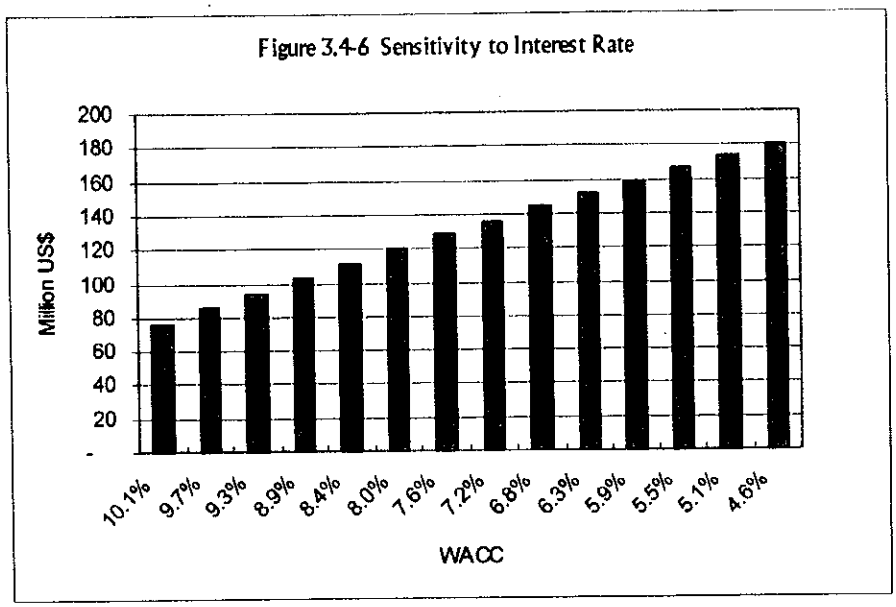
Figure 3.4-5 Sensitivity to Steam Rate



The steam rate, at which project developer to be selected through bid by INDE will pay to INDE or the government, has not yet decided. For INDE, it is necessary to recover the cost so far INDE invested for geothermal development at Amatitlan area. The higher it is set for, the less incentive and

attractive for the developer to invest to the project. Then, the development of geothermal power will be delayed. So, the most appropriate steam rate should be set forth. If the lowest possible FIRR value should be 12%, the steam rate could be raised to 1.8 cent/kWh.

e. Accumulated Profit to WACC



The table above shows the change of accumulated profit with a variable of WACC (Weighted Average Cost of Capital). With the WACC at 8.4% in this project, only initial investment value could be recovered after operation of 25 years, and such value will not so attractive for the investors. So, the loan with the more favorable loan conditions should be studied and selected.

6. Conclusion

As a result of financial evaluation, it is concluded that Case 3 is financially feasible. In view of cash flow, however, it is necessary to investigate the financial procurement in term of interest rate, grace period and repayment period. It is recommended that INDE seek for the more favorable loan than the assumed ones.

4 INTEGRATION AND RECOMMENDATION

4.1 Integration

4.2 Recommendation

4. INTEGRATION AND RECOMMENDATIONS

4.1 INTEGRATION

The exploitation of electric power in Guatemala is the urgent matter due to the increase of electric demand in recent years. Guatemala has abundant geothermal resources, which are scarcely negative environmental impact and renewable. Therefore, geothermal power generation is placed on the very important project for Guatemala.

Since the high temperature geothermal reservoir had been recognized to exist in Amatitlan area prior to the beginning of the Amatitlan Geothermal Development Project, it was desired to undertake the detailed exploration and feasibility study for confirmation of the extent and volume of the exploitable reservoir.

The present project was commenced at 1998 and had done two exploratory well so far. As a result of successful production test, we could identify the extent of geothermal reservoir and calculate the exploitable resources and the optimum generating scale.

The outline of the result is shown in the following.

4.1.1 Geothermal Conceptual Model

From geo-scientific surveys such as geological reconnaissance, geochemical and geophysical survey and well surveys, the geothermal conceptual model in the Amatitlan area was prepared and updated. Based on these surveys, two exploratory wells, AMJ-1 and AMJ-2, were drilled and the production test was run. Finally, the extent and volume of geothermal reservoir was revealed and the exploitable resource was calculated within the target area.

An uplift zone related to faults in N-S direction and a dacitic intrusion characterizes the geological structure in the Amatitlan geothermal field. The geothermal reservoir exists place in the deeper portion along fractures developed with the formation of these geological structures. From the result of drilling wells, AMJ-1 and AMJ-2, the fracturing typed reservoir is recognized to locate at the volcanic rocks above the granitic basement. In addition, it is highly probable that the geothermal fluids flow even in granitic basement rocks.

At least 3 times of hydrothermal alteration activities are supposed to take place after the formation of the Amatitlan Caldera. It is also thought that the center of

the volocanic activities have migrated towards the south during the geological history in the Amatitlan area.

The geothermal system in this area is the hydrothermal convection type. Dacite intrusion plays a role as the direct heat source at the deeper portion beneath western Calderas and meteoric water comes from the southern highland and Amatitlan Lake. Volcanic activities has been activating since the Late Pleistocene (around 0.7Ma), representing as Pacaya Volcano. The residual magma reservoir and volcanic gas resulted in these activities became the regional heat source in Amatitlan geothermal area.

The meteoric water infiltrated into the deep underground is heated by the remaining magma and volcanic gas, and it forms the neutral Cl-typed reservoir with the temperature of 300 to 340℃ in the granitic basement. This deep hot water is estimated to become the parental fluid in Amatitlan geothermal system. This parental fluid flows and rises along fractures at the western edge of NE-SW uplift zone and ring-shaped faults by caldera rim. Through these passages, the neutral-typed reservoir with the temperature of 290 to 300℃ (Cl content; 2,700mg/l) is formed at the elevation of 500masl.

This hot water migrates from southwest to northeast along the NE-SW trend fracture at the great depth and partly flows toward west to northwest through the south rim of Amatitlan Caldera.

From the chemical analysis of well fluid, it was clarified that the geothermal fluid around the drilled wells shows neutral in pH, high Cl content, 260 to 280℃ and is distributed from the same above-mentioned reservoir. In addition, it is recognized that wells AMJ-1 and AMJ-2 are hydrologically connected with well AMF-2 from isotopic analysis and interference test. The fluid from all of these wells is suitable for the geothermal generating use.

Of two JICA wells, well AMJ-1 was interpreted to have been drilled close to the western border of the targeted reservoir from the evidence of two-phase fluid condition and relatively low permeability around the well. On the other hand, two feed zones were found in well AMJ-2. An upper feed zone shows steam dominant and the lower zone indicates water dominant. Well AMJ-2 is similar to well AMF-2 in the outflow condition

4.1.2 Resource Assessment

The exploitable geothermal reservoir in Amatitlan area is located at the deeper

portion of the western part of Calderas. It made clear from well survey that the geothermal reservoir of 260 to 300℃ extends widely along faults and fractures.

The total existing power potential in wells AMF-1, AMF-2, AMJ-1 and AMJ-2 is not sufficient to generate the 20MW output. However, according to the result of numerical simulation based on 3-D model, we could get a conclusion that there is the capacity of 50MW generation in Amatitlan geothermal resource.

Furthermore, well AMF-1 shows 1,160kJ/kg in enthalpy and constant steam/water ratio. While, well AMF-2 has produced for last 2 years with 1,600kJ/kg in enthalpy and constant steam/water ratio as well as well AMF-1. Therefore, these facts suggest the possibility of the huge geothermal potential in Amatitlan area.

4.1.3 Forecasting and Field Potential

The generating output was calculated by three kinds of scenarios and the additional drilling was scheduled for each scenario. The exploitable reservoir is targeted at the inside of the Calderas depression in all cases. Two alternatives of power plant locations are set as follows; one is inside the Calderas depression and the second is close to INDE's warehouse at EL Cedro. The scenarios are:

1. Scenario 1: Production of only 20MW
2. Scenario 2: Production of 40MW in two steps. 20 initial MW and after 3 years the second step of 20MW.
3. Scenario 3: Production of 40MW with two units of 20MW

The total existing power potential in wells AMF-1, AMF-2, AMJ-1 and AMJ-2 is not sufficient to generate the target power output of either scenario. Additional and spare drilling is required. The total simulation time was 25 years.

In the case of scenario 1, the reservoir is able to sustain the 20MW power plant without much difficulty with two additional wells,1 production well and 1 reinjection well.

In the case of scenario 2, it needs the well number as same as scenario 1 for the initial power plant (20MW). However, it takes a long lead-time to operate the second plant due to the additional drilling (production well:4 to 5, reinjection well: 2) and the necessity of reservoir stability for 1 year.

In the case of scenario 3, the reservoir is able to sustain the two 20MW power plants without much difficulty with the same number of production and reinjection well as scenario 2. But, compared that scenario 2, this scenario make

shorten the construction period for 2.5 years and has economical merit.

Each scenario was economically evaluated to add one production well and one reinjection well for spare.

4.1.4 Development plan of Power Plant

Two sites are proposed for power plant construction taking into consideration distances from the production and reinjection wells, topographic/geological feature, and environmental issues. Site-I is near INDE's warehouse to west of the caldera where is advantageous in access and H_2S gas dispersion. Site-II is easily accessible to the existing production wells in the west of caldera.

For medium specific enthalpy geofluid, relatively low non-condensable gas (NCG) content and silica-rich brine produced in Amatitlan geothermal area, the single flashed steam cycle with condensing turbine is recommended for this project and the brine in the reinjection system will be kept at high pressure and high temperature.

The exploitable capacity of power plant is evaluated to be 40MW over from the reservoir simulation and the steam equivalent to 15MW is already available from the existing wells. Taking into consideration of INDE's opinion, the power plant was conceptually designed by two cases; 20MW x 1 unit and 20MW x 2 units. In case of 40MW P/P construction, both units will be installed at the same site.

The output of Amatitlan geothermal power plant will be connected to 138kV substation, named Palin 2 substation.

Regarding fluid collection and reinjection system (FCRS), steam/brine separate pipeline is employed because it has advantages in pressure loss and flow stability when the pipeline cross the caldera ridge.

The plant site is about 150m x 120m, and includes two 20MW generating units, switchyard, and administration office. The cooling towers should be in the downwind of the switchyard and the turbine buildings so that cooling tower exhaust with corrosive non-condensable gas and mist will not affect plant equipment. The cooling towers are placed in the south of the power plant site considering the annual prevailing wind direction.

The steam turbine for this project shall be designed and proven for geothermal application. Skid-mounted modular type turbine is preferred because of shorter design and manufacturing period, easy to transport, smaller foot print, faster

installation at site and lower construction cost.

4.1.5 Environmental Impact Assessment

Environmental regulations in Guatemala have changed recently, so in order to execute any kind of works relate to well drilling in connection with geothermal survey that is required to have an authorization extended by CONAMA. In the standards book published by CONAMA, no definite description regarding the environmental regulation and on the standard value was found. Up to day, EIA applications submitted to CONAMA standard value set forth by the WHO or IDB have been adopted.

On the basis of the proposed conceptual design of power plant, the measurement regarding water effluent, air emission and noise was assessed. Since the elements like As (7 to 8 ppm) and B (40 to 50 ppm) in geothermal hot water are high, the whole exhausted water from power plant should be disposed into the reinjection wells to the underground. The reinjection of hot water is necessary to help recharge the reservoir to maintain pressures in the reservoir. In addition, over flow water from cooling water system shall be also injected into the underground. Though H_2S concentration exhausted from cooling tower in Amatitlan field is fairly low in comparison with other existing power plants, it is desired to mitigate of H2S emission by dilution and dissemination.

Regarding the noise, Noise level around residential area at the blow out test of AMJ-2 was 58dB as same level as background noise level. Noise levels when the power plant is completed and operated on normal condition won't exceed the noise levels at the blow out operation of wells.

4.1.6 Economic and Financial Evaluation

The country's effective installed capacity was about 1,380 MW at the end of 1999 while the peak demand of electric energy consumption reached 1,049 MW. When this project would be completed in 2005 or 2006, the forecast noted that the effective capacity of about 1,600 MW would be necessary. So, the introduction of geothermal power unit with a capacity of 40 MW will be very significant for stable power supply and power system diversification because the geothermal power can generate at a higher capacity factor using indigenous energy source.

The geothermal power utilizes its own indigenous renewable energy resource. Once 40 MW geothermal power should be implemented, it can avoid power

generation by diesel power and therefore foreign exchange saving would amount to 31.22 million US$ annually.

In addition, two project site options are technically and environmentally considered, i.e., inside and outside caldera. With respect to a total of 6 cases, the base costs as of the year 2001 were estimated. The following economic considerations are made; transmission line length, proximity to steam gathering and disposal system from power plant, land acquisition, compensation to agricultural products and house removal.

Based on the above estimate, the unit construction costs and the generating costs at substation end per kW were calculated and compared. Economic and financial evaluation use the following exchange rate: 1 US$ = 120 Yen = 7.850 Quezal.

For each case, the construction unit cost per kW of the total output was calculated. Then the generating cost at substation end, using the operation conditions above and annualized capital cost at the discount rate of 10% for 25 years, was calculated.

The result is as follow:

	Generating Cost (US Cent/kWh)		
	Scenario 1	Scenario 2	Scenario 3
Inside Caldera	4. 73	4. 11	3. 82
Outside Caldera	4. 89	4. 17	3. 88

As the above, the Scenario 3 Inside Caldera, construction of 20MW x 2 Units in parallel, can provide the least generating cost. On the contrary, the Scenario 1 Outside Caldera, 20MW x 1 Unit, shows the highest cost.

Nonetheless, even this highest generating cost scenario of 20 MW development is still competitive with the other thermal power under operation as its total generating cost including the conceivable steam cost of 1.1 cent/kWh becomes 5.99 cent/kWh. Meanwhile, there are not so big differences between development of inside and outside caldera, 0.06 to 0.16 cent/kWh.

Financial internal rate of return (FIRR) for each case of assumed development plan was obtained, and the financial viability of each case was evaluated by comparison between the obtained FIRR and opportunity cost of capital. In addition, the cash flow of each case was prepared to check for financial soundness of the project. Further, the sensitivity analysis on several factors that were considered to affect greatly the profitability of the project, i.e., a plant capacity

factor, steam and power rates, etc. The calculation results were presented, with electric files, to INDE for its financial review when the project will be actually taken place in the very near future.

The power rate was set at 8.0 US cent/kWh in consideration of the current average power selling rate in Guatemala. The geothermal wells and steam supply facilities are depreciated for 10 years and the power plant facilities for 20 years.

All the cases are within 10 to 14 % in FIRR and are concluded as financially feasible. Because FIRRs of Case 1 and Case 2 are close to the opportunity cost of capital and subject to further study by cash flow, the Case 3, constructed and attained commissioning in a shorter period, is the most suitable to pursue. From the point of cash flow, the Case 1 and Case 2 will fall into short working fund for several years after commissioning, mainly due to repayment burden. On the other hand, the Case 3 could appropriate the profit soon after commissioning and will only fall in short fund in the year when the supplementary well will become necessary. As a conclusion, only Case 3 is financially feasible.

4.2 RECOMMENDATION

4.2.1 Exploitation in Amatitlan Geothermal Field

Reservoir evaluation in the survey area was done based on the conceptual model constructed and the reservoir characteristics from geothermal wells. From this evaluation, it became clear that the geothermal resources with the capacity of 40MW generation exist in Amatitlan area. Among 6 alternatives of exploitation scheme, the most economical alternative is evaluated to be scenario 3, which constructs 20MW x 2 units at the same time for the shortest lead time to the operation start. Furthermore, instead of the loan of US$ currency from the International Development Bank and/or the Japanese Bank to avoid risk of variable exchange rate, it should take into consideration of using the loan of Japanese Yen currency from the Japanese Bank for the more favorable loan conditions. And it must select a loan condition not to fall into lack of the fund by the careful examination of grace period and repayment period, and so on. As an alternative of project financial viability, it is recommended to apply for Japanese government's yen credit (interest rate: about 2%), ordinary credit or environmental credit.

4.2.2 Site of Power Plant

Two sites are considered for power plant construction. One (site-I) is near INDE's warehouse outside caldera and the other (site-II) is adjacent to the center of the targeted geothermal reservoir inside caldera. Site-II is close to the existing wells and shows relatively lower generating cost compared than Site-I. However, at the point of environmental preservation, some disadvantage remains in H2S gas emission and dilution due to the topographical caldera feature. Since there are not so big differences between development of inside and outside caldera in economical evaluation, Site-I is desirable for plant construction.

4.2.3 Educative Activities and Understanding to Local Communities

In order to proceed smoothly to geothermal exploitation project following this survey, it is necessary to implement the educative activities related with geothermal development to the local communities in understanding and cooperation with CONAMA. If the site of power plant is selected inside caldera, it must be examined to install the H2S removal device in the power plant. In addition, it hopes for the additional simulation based on the detailed examination regarding wind direction, too.

4.2.4 Geothermal Potential in Surrounding Areas

As for the amount of the geothermal resources, the generating potential is clarified beyond 40MW inside caldera within the survey area. According the existing report and the 1st year survey, dacite dome is reported to exist in the northern part of the survey area in addition to dacite intrusion close to well AMF-2 and magma chamber beneath Pacaya volcano. Since the residual magma chamber related to this dacite dome has the possibility to play a role of another heat source, the exploitable geothermal reservoir might spread to the south of the Amatitlan Lake.

Including the surrounding area, geothermal potential becomes huge amount of generating resources. It is also important to explore at the northern dacite dome area in effective utilization of geothermal resource, as well as electricity generating in Calderas.

Appendix 1:

Financial Evaluation

(Inside Caldera)

Financial Evaluation: Inside Caldera

Case 1
Case 2
Case 3

- Financial Internal Rate of Return (FIRR)
- Income Statement
- Cash Flow
- Dept Service Ratio
- Repayment Schedule

FIRR Case 1-I - 12

Project Amatitlan Geothermal
Subject FIRR - Case 1-Inside
File Name
Date 1999/5/21
Rev. 2001/10/12

財務內部收益率(FIRR): Case 1 - Inside
Financial Internal Rate of Return

FIRR = 11.14%

			Project Undertaking									
No	Year	Project Cost	Salable Energy	Supple. Wells	O&M for Steam Prod.	O&M for P. Plant	Steam Cost	Tax	Generat. Cost Tf	Project Cost Total	Revenue	Balance
		MM$	GWh	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	26.77	-	-	-	-	-	-	-	26.77	-	(26.77)
2	2003	25.98	-	-	-	-	-	-	-	25.98	-	(25.98)
3	2004	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
4	2005	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
5	2006	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
6	2007	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
7	2008	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
8	2009	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
9	2010	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
10	2011	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
11	2012	-	145.21	-	1.13	0.30	1.70	1.61	4.74	4.74	11.62	6.88
12	2013	-	145.21	4.26	1.13	0.30	1.70	0.29	7.68	7.68	11.62	3.94
13	2014	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
14	2015	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
15	2016	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
16	2017	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
17	2018	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
18	2019	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
19	2020	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
20	2021	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
21	2022	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
22	2023	-	145.21	-	1.13	0.30	1.70	1.89	5.02	5.02	11.62	6.60
23	2024	-	145.21	-	1.13	0.30	1.70	2.50	5.63	5.63	11.62	5.99
24	2025	-	145.21	-	1.13	0.30	1.70	2.50	5.63	5.63	11.62	5.99
25	2026	-	145.21	-	1.13	0.30	1.70	2.63	5.76	5.76	11.62	5.86
26	2027	-	145.21	-	1.13	0.30	1.70	2.63	5.76	5.76	11.62	5.86
27	2028	-	145.21	-	1.13	0.30	1.70	2.63	5.76	5.76	11.62	5.86
28	2029	-	145.21	-	1.13	0.30	1.70	2.63	5.76	5.76	11.62	5.86
29	2030	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-
Total		52.75	3,775.46	4.26	29.34	7.75	44.20	49.20	134.75	187.50	302.12	114.62

Profit And Loss Statement
損益計算書 Case 1 – Inside

			Project Undertaking															
			Sales Revenue		Operating Cost			Steam Cost	Depreciation		Cost	Profit		Profit	Interest Payment			Net
No.	Year	Generated Energy	Salable Energy	Revenue	Supple. Well	O&M Steam	O&M P. Plant		Steam Supply	Power Plant	Total		Tax	After Tax	Japan Bank	Int'l Bank	Total	INCOME
		GWH	GWH	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2002		-	-	-	-	-	-	-	-	-	-	-	-	0.98	1.28	2.26	(2.26)
2	2003		-	-	-	-	-	-	-	-	-	-	-	-	2.01	2.64	4.65	(4.65)
3	2004	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	2.19	2.85	5.04	(1.46)
4	2005	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	2.08	2.79	4.87	(1.29)
5	2006	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	1.97	2.72	4.69	(1.11)
6	2007	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	1.84	2.64	4.48	(0.90)
7	2008	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	1.70	2.57	4.27	(0.69)
8	2009	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	1.55	2.49	4.04	(0.46)
9	2010	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	1.38	2.40	3.78	(0.20)
10	2011	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	1.19	2.30	3.49	0.09
11	2012	154.18	145.21	11.62	-	1.13	0.30	1.70	1.32	1.98	6.43	5.19	1.61	3.58	1.00	2.19	3.19	0.39
12	2013	154.18	145.21	11.62	4.26	1.13	0.30	1.70	1.32	1.98	10.69	0.93	0.29	0.64	0.78	2.08	2.86	(2.22)
13	2014	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	0.55	1.95	2.50	1.70
14	2015	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	0.28	1.82	2.10	2.10
15	2016	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	1.68	1.68	2.52
16	2017	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	1.52	1.52	2.68
17	2018	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	1.35	1.35	2.85
18	2019	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	1.17	1.17	3.03
19	2020	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	0.97	0.97	3.23
20	2021	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	0.76	0.76	3.44
21	2022	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	0.53	0.53	3.67
22	2023	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	1.98	5.53	6.09	1.89	4.20	-	0.29	0.29	3.91
23	2024	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	-	3.55	8.07	2.50	5.57	-	-	-	5.57
24	2025	154.18	145.21	11.62	-	1.13	0.30	1.70	0.43	-	3.55	8.07	2.50	5.57	-	-	-	5.57
25	2026	154.18	145.21	11.62	-	1.13	0.30	1.70	-	-	3.13	8.49	2.63	5.86	-	-	-	5.86
26	2027	154.18	145.21	11.62	-	1.13	0.30	1.70	-	-	3.13	8.49	2.63	5.86	-	-	-	5.86
27	2028	154.18	145.21	11.62	-	1.13	0.30	1.70	-	-	3.13	8.49	2.63	5.86	-	-	-	5.86
28	2029	154.18	145.21	11.62	-	1.13	0.30	1.70	-	-	3.13	8.49	2.63	5.86	-	-	-	5.86
29	2030		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			3,775.46	302.12		29.34	7.75	44.20	18.31	39.60	143.46	158.66	49.20	109.46	19.50	40.99	60.49	48.97

Cash Flow Statement

キャッシュフロー Case 1 - Inside

			Cash Flow Out				Cash Flow In				Balance	
No	Year	Loan	Net Income	Dep. Steam Facilities	Dep. P. Plant Facilities	Total	Project Cost	Japan Bank Principal Payment	Int'l Bank Principal Payment	Total	Annual Balance	Balance
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	26.77	(2.26)	-	-	24.51	26.77	-	-	26.77	(2.26)	(2.26)
2	2003	25.98	(4.65)	-	-	21.33	25.98	-	-	25.98	(4.65)	(6.91)
3	2004	-	(1.46)	1.32	1.98	1.84	-	1.19	0.77	1.96	(0.12)	(7.03)
4	2005	-	(1.29)	1.32	1.98	2.01	-	1.30	0.83	2.13	(0.12)	(7.15)
5	2006	-	(1.11)	1.32	1.98	2.19	-	1.41	0.90	2.31	(0.12)	(7.27)
6	2007	-	(0.90)	1.32	1.98	2.40	-	1.54	0.98	2.52	(0.12)	(7.39)
7	2008	-	(0.69)	1.32	1.98	2.61	-	1.68	1.05	2.73	(0.12)	(7.51)
8	2009	-	(0.46)	1.32	1.98	2.84	-	1.83	1.13	2.96	(0.12)	(7.63)
9	2010	-	(0.20)	1.32	1.98	3.10	-	2.00	1.22	3.22	(0.12)	(7.75)
10	2011	-	0.09	1.32	1.98	3.39	-	2.19	1.32	3.51	(0.12)	(7.87)
11	2012	-	0.39	1.32	1.98	3.69	-	2.38	1.43	3.81	(0.12)	(7.98)
12	2013	-	(2.22)	1.32	1.98	1.08	-	2.60	1.54	4.14	(3.06)	(11.04)
13	2014	-	1.70	0.43	1.98	4.10	-	2.83	1.67	4.50	(0.40)	(11.44)
14	2015	-	2.10	0.43	1.98	4.50	-	3.11	1.80	4.91	(0.40)	(11.85)
15	2016	-	2.52	0.43	1.98	4.92	-	-	1.94	1.94	2.98	(8.86)
16	2017	-	2.68	0.43	1.98	5.08	-	-	2.10	2.10	2.98	(5.88)
17	2018	-	2.85	0.43	1.98	5.25	-	-	2.27	2.27	2.98	(2.90)
18	2019	-	3.03	0.43	1.98	5.43	-	-	2.45	2.45	2.98	0.09
19	2020	-	3.23	0.43	1.98	5.63	-	-	2.65	2.65	2.98	3.07
20	2021	-	3.44	0.43	1.98	5.84	-	-	2.86	2.86	2.98	6.05
21	2022	-	3.67	0.43	1.98	6.07	-	-	3.09	3.09	2.98	9.04
22	2023	-	3.91	0.43	1.98	6.31	-	-	3.57	3.57	2.74	11.78
23	2024	-	5.57	0.43	-	5.99	-	-	-	-	5.99	17.78
24	2025	-	5.57	0.43	-	5.99	-	-	-	-	5.99	23.77
25	2026	-	5.86	-	-	5.86	-	-	-	-	5.86	29.63
26	2027	-	5.86	-	-	5.86	-	-	-	-	5.86	35.50
27	2028	-	5.86	-	-	5.86	-	-	-	-	5.86	41.36
28	2029	-	5.86	-	-	5.86	-	-	-	-	5.86	47.22
29	2030	-	-	-	-	-	-	-	-	-	-	-
30	2031		-	-	-	-	-	-	-	-	-	-
Total		52.75	48.97	18.31	39.60	159.63	52.75	24.09	35.57	112.41	47.22	-33.13

Debt Service Ratio Case 1 - Inside

		Cash Generation				Loan Payment				
No	Year	Operating Revenue	Depreciation	Total	Total	Interest Payment	Principal Payment	Total	Accumu Total	Dept Service Ratio
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	
0	2001	-	-	-	-	-	-	-	-	-
1	2002	-	-	-	-	2.26	-	2.26	2.26	-
2	2003	-	-	-	-	4.65	-	4.65	6.91	-
3	2004	3.58	3.30	6.88	6.88	5.04	1.96	7.00	13.91	0.49
4	2005	3.58	3.30	6.88	13.77	4.87	2.13	7.00	20.92	0.66
5	2006	3.58	3.30	6.88	20.65	4.69	2.31	7.00	27.92	0.74
6	2007	3.58	3.30	6.88	27.53	4.48	2.52	7.00	34.92	0.79
7	2008	3.58	3.30	6.88	34.42	4.27	2.73	7.00	41.93	0.82
8	2009	3.58	3.30	6.88	41.30	4.04	2.96	7.00	48.93	0.84
9	2010	3.58	3.30	6.88	48.19	3.78	3.22	7.00	55.93	0.86
10	2011	3.58	3.30	6.88	55.07	3.49	3.51	7.00	62.93	0.88
11	2012	3.58	3.30	6.88	61.95	3.19	3.81	7.00	69.94	0.89
12	2013	0.64	3.30	3.94	65.90	2.86	4.14	7.00	76.94	0.86
13	2014	4.20	2.41	6.60	72.50	2.50	4.50	7.00	83.94	0.86
14	2015	4.20	2.41	6.60	79.10	2.10	4.91	7.01	90.95	0.87
15	2016	4.20	2.41	6.60	85.71	1.68	1.94	3.62	94.57	0.91
16	2017	4.20	2.41	6.60	92.31	1.52	2.10	3.62	98.19	0.94
17	2018	4.20	2.41	6.60	98.91	1.35	2.27	3.62	101.81	0.97
18	2019	4.20	2.41	6.60	105.52	1.17	2.45	3.62	105.43	1.00
19	2020	4.20	2.41	6.60	112.12	0.97	2.65	3.62	109.05	1.03
20	2021	4.20	2.41	6.60	118.72	0.76	2.86	3.62	112.67	1.05
21	2022	4.20	2.41	6.60	125.33	0.53	3.09	3.62	116.29	1.08
22	2023	4.20	2.41	6.60	131.93	0.29	3.57	3.86	120.15	1.10
23	2024	5.57	0.43	5.99	137.93	-	-	-	120.15	1.15
24	2025	5.57	0.43	5.99	143.92	-	-	-	120.15	1.20
25	2026	5.86	-	5.86	149.78	-	-	-	120.15	1.25
26	2027	5.86	-	5.86	155.65	-	-	-	120.15	1.30
27	2028	5.86	-	5.86	161.51	-	-	-	120.15	1.34
28	2029	5.86	-	5.86	167.37	-	-	-	120.15	1.39
29	2030	-	-	-		-	-	-	-	-
30	2031	-	-	-		-	-	-	-	-
Total		109.46	57.91	167.37	2,313.97	60.49	59.66	120.15		

Project Amatitlan Geothermal
Subject Repayment Schedule, Case 3-inside
File Name
Date
Rev. ########

FOR REPAYMENT SCHEDULE

	Total	Japan	Intl	TOTAL
YEAR		40%	60%	
	MM$	MM$	MM$	MM$
1	26.77	10.71	16.06	26.77
2	25.98	10.39	15.59	25.98
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
	52.75	21.10	31.65	52.75

LOAN TERM		Japan	Intl
Interest	%	9.11%	8.00%
Grace P.	Year	2	2
Repayment	Years	12	20
WACC			8.44%

Japan Bank Loan Repayment Schedule (Million US$), Case 1 - inside

UNIT: Million US$

		2002 Loan					2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
0	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.98	-	-	11.69
1	2002	10.71	-	0.98	-	11.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.01	-	-	24.09
2	2003	10.39	-	1.06	-	12.75	-	0.95	-	11.34	-	-	-	-	-	-	-	-	-	-	-	-	1.19	-	2.19	3.38	22.90
3	2004	-	0.63	1.16	1.79	12.12	0.56	1.03	1.59	10.78	-	-	-	-	-	-	-	-	-	-	-	-	1.30	-	2.08	3.38	21.59
4	2005	-	0.69	1.10	1.79	11.43	0.61	0.98	1.59	10.17	-	-	-	-	-	-	-	-	-	-	-	-	1.41	-	1.97	3.38	20.18
5	2006	-	0.75	1.04	1.79	10.68	0.66	0.93	1.59	9.50	-	-	-	-	-	-	-	-	-	-	-	-	1.54	-	1.84	3.38	18.64
6	2007	-	0.82	0.97	1.79	9.86	0.72	0.87	1.59	8.78	-	-	-	-	-	-	-	-	-	-	-	-	1.68	-	1.70	3.38	16.96
7	2008	-	0.89	0.90	1.79	8.97	0.79	0.80	1.59	7.99	-	-	-	-	-	-	-	-	-	-	-	-	1.83	-	1.55	3.38	15.12
8	2009	-	0.97	0.82	1.79	8.00	0.86	0.73	1.59	7.12	-	-	-	-	-	-	-	-	-	-	-	-	2.00	-	1.38	3.38	13.12
9	2010	-	1.06	0.73	1.79	6.94	0.94	0.65	1.59	6.18	-	-	-	-	-	-	-	-	-	-	-	-	2.19	-	1.19	3.38	10.93
10	2011	-	1.16	0.63	1.79	5.78	1.03	0.56	1.59	5.15	-	-	-	-	-	-	-	-	-	-	-	-	2.38	-	1.00	3.38	8.54
11	2012	-	1.26	0.53	1.79	4.52	1.12	0.47	1.59	4.03	-	-	-	-	-	-	-	-	-	-	-	-	2.60	-	0.78	3.38	5.94
12	2013	-	1.38	0.41	1.79	3.14	1.22	0.37	1.59	2.80	-	-	-	-	-	-	-	-	-	-	-	-	2.83	-	0.55	3.38	3.11
13	2014	-	1.50	0.29	1.79	1.64	1.33	0.26	1.59	1.47	-	-	-	-	-	-	-	-	-	-	-	-	3.11	-	0.28	3.39	-
14	2015	-	1.64	0.15	1.79	-	1.47	0.13	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	2024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	2026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	2027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		21.10	12.75	10.77	21.48		11.34	8.73	19.12		-	-	-	-	-	-	-	-	-	-	-	-	24.09	2.99	16.51	40.60	

International Bank Loan Repayment Schedule (Million US$), Case 1 Inside

UNIT: Million US$

			2002 Loan				2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
-	2,001.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.26	-	-	17.34
1.00	2,002.00	16.06	-	1.28	-	17.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.64	-	-	35.57
2.00	2,003.00	15.59	-	1.39	-	18.73	-	1.25	-	16.84	-	-	-	-	-	-	-	-	-	-	-	-	0.77	2.85	-	3.62	34.80
3.00	2,004.00	-	0.41	1.50	1.91	18.32	0.36	1.35	1.71	16.48	-	-	-	-	-	-	-	-	-	-	-	-	0.83	-	2.79	3.62	33.97
4.00	2,005.00	-	0.44	1.47	1.91	17.88	0.39	1.32	1.71	16.09	-	-	-	-	-	-	-	-	-	-	-	-	0.90	-	2.72	3.62	33.07
5.00	2,006.00	-	0.48	1.43	1.91	17.40	0.42	1.29	1.71	15.67	-	-	-	-	-	-	-	-	-	-	-	-	0.98	-	2.64	3.62	32.09
6.00	2,007.00	-	0.52	1.39	1.91	16.88	0.46	1.25	1.71	15.21	-	-	-	-	-	-	-	-	-	-	-	-	1.05	-	2.57	3.62	31.04
7.00	2,008.00	-	0.56	1.35	1.91	16.32	0.49	1.22	1.71	14.72	-	-	-	-	-	-	-	-	-	-	-	-	1.13	-	2.49	3.62	29.91
8.00	2,009.00	-	0.60	1.31	1.91	15.72	0.53	1.18	1.71	14.19	-	-	-	-	-	-	-	-	-	-	-	-	1.22	-	2.40	3.62	28.69
9.00	2,010.00	-	0.65	1.26	1.91	15.07	0.57	1.14	1.71	13.62	-	-	-	-	-	-	-	-	-	-	-	-	1.32	-	2.30	3.62	27.37
10.00	2,011.00	-	0.70	1.21	1.91	14.37	0.62	1.09	1.71	13.00	-	-	-	-	-	-	-	-	-	-	-	-	1.43	-	2.19	3.62	25.94
11.00	2,012.00	-	0.76	1.15	1.91	13.61	0.67	1.04	1.71	12.33	-	-	-	-	-	-	-	-	-	-	-	-	1.54	-	2.08	3.62	24.40
12.00	2,013.00	-	0.82	1.09	1.91	12.79	0.72	0.99	1.71	11.61	-	-	-	-	-	-	-	-	-	-	-	-	1.67	-	1.95	3.62	22.73
13.00	2,014.00	-	0.89	1.02	1.91	11.90	0.78	0.93	1.71	10.83	-	-	-	-	-	-	-	-	-	-	-	-	1.80	-	1.82	3.62	20.93
14.00	2,015.00	-	0.96	0.95	1.91	10.94	0.84	0.87	1.71	9.99	-	-	-	-	-	-	-	-	-	-	-	-	1.94	-	1.68	3.62	18.99
15.00	2,016.00	-	1.03	0.88	1.91	9.91	0.91	0.80	1.71	9.08	-	-	-	-	-	-	-	-	-	-	-	-	2.10	-	1.52	3.62	16.89
16.00	2,017.00	-	1.12	0.79	1.91	8.79	0.98	0.73	1.71	8.10	-	-	-	-	-	-	-	-	-	-	-	-	2.27	-	1.35	3.62	14.62
17.00	2,018.00	-	1.21	0.70	1.91	7.58	1.06	0.65	1.71	7.04	-	-	-	-	-	-	-	-	-	-	-	-	2.45	-	1.17	3.62	12.17
18.00	2,019.00	-	1.30	0.61	1.91	6.28	1.15	0.56	1.71	5.89	-	-	-	-	-	-	-	-	-	-	-	-	2.65	-	0.97	3.62	9.52
19.00	2,020.00	-	1.41	0.50	1.91	4.87	1.24	0.47	1.71	4.65	-	-	-	-	-	-	-	-	-	-	-	-	2.86	-	0.76	3.62	6.66
20.00	2,021.00	-	1.52	0.39	1.91	3.35	1.34	0.37	1.71	3.31	-	-	-	-	-	-	-	-	-	-	-	-	3.09	-	0.53	3.62	3.57
21.00	2,022.00	-	1.64	0.27	1.91	1.71	1.45	0.26	1.71	1.86	-	-	-	-	-	-	-	-	-	-	-	-	3.57	-	0.29	3.86	-
22.00	2,023.00	-	1.71	0.14	1.85	-	1.86	0.15	2.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23.00	2,024.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	2,025.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.00	2,026.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26.00	2,027.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	2,028.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28.00	2,029.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29.00	2,030.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	2,031.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		31.65	18.73	22.08	38.14		16.84	16.91	34.50		-	-	-		-	-	-		-	-	-		35.57	6.77	34.22	72.64	

FIRR Case 2-I - 12

Project Amatitlan Geothermal
Subject FIRR - Case 2 - Inside
File Name
Date 1999/5/21
Rev. 2001/10/12

財務內部收益率(FIRR): Case 2 - Inside
Financial Internal Rate of Return

FIRR = 11.15%

		Project Undertaking										
No	Year	Project Cost	Salable Energy	Supple. Wells	O&M for Steam Prod.	O&M for P. Plant	Steam Cost	Tax	Generat. Cost Ttl	Project Cost Total	Revenue	Balance
		MM$	GWh	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	26.77	-	-	-	-	-	-	-	26.77	-	(26.77)
2	2003	25.98	-	-	-	-	-	-	-	25.98	-	(25.98)
3	2004	-	145.01	-	1.13	0.30	1.70	1.60	4.73	4.73	11.60	6.87
4	2005	24.06	145.01	-	1.13	0.30	1.70	1.60	4.73	28.79	11.60	(17.19)
5	2006	22.47	145.01	-	1.13	0.30	1.70	1.60	4.73	27.20	11.60	(15.60)
6	2007		290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
7	2008	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
8	2009	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
9	2010	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
10	2011	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
11	2012	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
12	2013	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
13	2014	-	290.01	-	1.35	1.35	3.39	4.69	10.79	10.79	23.20	12.41
14	2015	-	290.01	-	1.35	1.35	3.39	4.69	10.79	10.79	23.20	12.41
15	2016	-	290.01	4.53	1.35	1.35	3.39	3.14	13.77	13.77	23.20	9.43
16	2017	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
17	2018	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
18	2019	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
19	2020	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
20	2021	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
21	2022	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
22	2023	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
23	2024	-	290.01	-	1.35	1.35	3.39	5.16	11.26	11.26	23.20	11.94
24	2025	-	290.01	-	1.35	1.35	3.39	5.16	11.26	11.26	23.20	11.94
25	2026	-	290.01	-	1.35	1.35	3.39	5.30	11.40	11.40	23.20	11.80
26	2027	-	290.01	-	1.35	1.35	3.39	5.30	11.40	11.40	23.20	11.80
27	2028	-	290.01	-	1.35	1.35	3.39	5.30	11.40	11.40	23.20	11.80
28	2029	-	145.01	-	1.13	0.30	1.70	2.63	5.76	5.76	11.60	5.84
29	2030	-	145.01	-	1.13	0.30	1.13	2.63	5.18	5.18	11.60	6.42
30	2031	-	145.01	-	1.13	0.30	1.13	2.63	4.06	4.06	11.60	7.54
Total		99.28	7,250.25	4.53	36.58	31.58	83.64	113.24	268.41	367.69	580.00	212.31

Profit And Loss Statement
損益計算書 Case 2 – Inside

		Project Undertaking																
		Sales Revenue			Operating Cost		Steam Cost	Depreciation		Cost	Profit		Profit	Interest Payment			Net
No.	Year	Generated Energy	Salable Energy	Revenue	Supple. Well	O&M Steam	O&M P. Plant		Steam Supply	Power Plant	Total		Tax	After Tax	Japan Bank	Int'l Bank	Total	INCOME
		GWH	GWH	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	0.98	1.28	2.26	(2.26)
2	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	2.01	2.64	4.65	(4.65)
3	2004	154.18	145.01	11.60	-	1.13	0.30	1.70	1.32	1.98	6.43	5.17	1.60	3.57	2.19	2.85	5.04	(1.47)
4	2005	154.18	145.01	11.60	-	1.13	0.30	1.70	1.32	1.98	6.43	5.17	1.60	3.57	2.96	3.94	6.90	(3.33)
5	2006	154.18	145.01	11.60	-	1.13	0.30	1.70	1.32	1.98	6.43	5.17	1.60	3.57	3.80	5.05	8.85	(5.28)
6	2007	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	4.11	5.15	9.26	0.26
7	2008	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	3.85	5.03	8.88	0.64
8	2009	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	3.58	4.89	8.47	1.05
9	2010	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	3.28	4.73	8.01	1.51
10	2011	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	2.95	4.57	7.52	2.00
11	2012	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	2.59	4.39	6.98	2.54
12	2013	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	2.20	4.19	6.39	3.13
13	2014	308.35	290.01	23.20	-	1.35	1.35	3.39	-	1.98	8.08	15.12	4.69	10.43	1.79	3.98	5.77	4.66
14	2015	308.35	290.01	23.20	-	1.35	1.35	3.39	-	1.98	8.08	15.12	4.69	10.43	1.31	3.76	5.07	5.36
15	2016	308.35	290.01	23.20	4.53	1.35	1.35	3.39	0.45	1.98	13.06	10.14	3.14	7.00	0.80	3.52	4.32	2.68
16	2017	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	0.55	3.25	3.80	6.32
17	2018	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	0.29	2.96	3.25	6.87
18	2019	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	2.66	2.66	7.46
19	2020	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	2.32	2.32	7.80
20	2021	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	1.96	1.96	8.16
21	2022	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	1.57	1.57	8.55
22	2023	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	1.16	1.16	8.96
23	2024	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	-	6.55	16.65	5.16	11.49	-	0.68	0.68	10.81
24	2025	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	-	6.55	16.65	5.16	11.49	-	0.48	0.48	11.01
25	2026	308.35	290.01	23.20	-	1.35	1.35	3.39	-	-	6.10	17.10	5.30	11.80	-	0.27	0.27	11.53
26	2027	308.35	290.01	23.20	-	1.35	1.35	3.39	-	-	6.10	17.10	5.30	11.80	-	-	-	11.80
27	2028	308.35	290.01	23.20	-	1.35	1.35	3.39	-	-	6.10	17.10	5.30	11.80	-	-	-	11.80
28	2029	154.18	145.01	11.60	-	1.13	0.30	1.70	-	-	3.13	8.47	2.63	5.84	-	-	-	5.84
29	2030	154.18	145.01	11.60	-	1.13	0.30	1.70	-	-	3.13	8.47	2.63	5.84	-	-	-	5.84
30	2031	154.18	145.01	11.60	-	1.13	0.30	1.70	-	-	3.13	8.47	2.63	5.84	-	-	-	5.84
Total			7,250.25	580.00		36.56	31.58	84.78	17.73	39.60	214.77	365.23	113.24	251.99	39.24	77.28	116.52	135.47

Cash Flow Statement
キャッシュフロー Case 2 - Inside

			Cash Flow Out				Cash Flow In				Balance	
No	Year	Loan	Net Income	Dep. Steam Facilities	Dep. P. Plant Facilities	Total	Project Cost	Japan Bank Principal Payment	Int'l Bank Principal Payment	Total	Annual Balance	Balance
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	26.77	(2.26)	-	-	24.51	26.77	-	-	26.77	(2.26)	(2.26)
2	2003	25.98	(4.65)	-	-	21.33	25.98	-	-	25.98	(4.65)	(6.91)
3	2004	-	(1.47)	1.32	1.98	1.83	-	1.19	0.77	1.96	(0.13)	(7.04)
4	2005	24.06	(3.33)	1.32	1.98	24.03	24.06	1.30	0.83	26.19	(2.16)	(9.20)
5	2006	22.47	(5.28)	1.32	1.98	20.49	22.47	1.41	0.90	24.78	(4.29)	(13.49)
6	2007	-	0.26	1.32	1.98	3.56	-	2.78	1.66	4.44	(0.87)	(14.36)
7	2008	-	0.64	1.32	1.98	3.94	-	3.04	1.78	4.82	(0.87)	(15.24)
8	2009	-	1.05	1.32	1.98	4.35	-	3.31	1.92	5.23	(0.87)	(16.11)
9	2010	-	1.51	1.32	1.98	4.81	-	3.61	2.08	5.69	(0.87)	(16.98)
10	2011	-	2.00	1.32	1.98	5.30	-	3.94	2.24	6.18	(0.87)	(17.86)
11	2012	-	2.54	1.32	1.98	5.84	-	4.30	2.42	6.72	(0.87)	(18.73)
12	2013	-	3.13	1.32	1.98	6.43	-	4.69	2.62	7.31	(0.87)	(19.61)
13	2014	-	4.66	-	1.98	6.64	-	5.10	2.83	7.93	(1.28)	(20.89)
14	2015	-	5.36	-	1.98	7.34	-	5.58	3.05	8.63	(1.29)	(22.18)
15	2016	-	2.68	0.45	1.98	5.11	-	2.70	3.29	5.99	(0.88)	(23.06)
16	2017	-	6.32	0.45	1.98	8.75	-	2.95	3.56	6.51	2.24	(20.82)
17	2018	-	6.87	0.45	1.98	9.30	-	3.14	3.85	6.99	2.31	(18.51)
18	2019	-	7.46	0.45	1.98	9.89	-	-	4.15	4.15	5.74	(12.76)
19	2020	-	7.80	0.45	1.98	10.23	-	-	4.49	4.49	5.74	(7.02)
20	2021	-	8.16	0.45	1.98	10.59	-	-	4.85	4.85	5.74	(1.28)
21	2022	-	8.55	0.45	1.98	10.98	-	-	5.24	5.24	5.74	4.46
22	2023	-	8.96	0.45	1.98	11.39	-	-	5.89	5.89	5.50	9.96
23	2024	-	10.81	0.45	-	11.26	-	-	2.51	2.51	8.75	18.72
24	2025	-	11.01	0.45	-	11.46	-	-	2.71	2.71	8.75	27.47
25	2026	-	11.53	-	-	11.53	-	-	3.33	3.33	8.20	35.67
26	2027	-	11.80	-	-	11.80	-	-	-	-	11.80	47.47
27	2028	-	11.80	-	-	11.80	-	-	-	-	11.80	59.28
28	2029	-	5.84	-	-	5.84	-	-	-	-	5.84	65.12
29	2030	-	5.84	-	-	5.84	-	-	-	-	5.84	70.96
30	2031		5.84	-	-	5.84	-	-	-	-	5.84	76.81
Total		99.28	135.47	17.73	39.60	292.08	99.28	49.02	66.97	215.27	76.81	
												-58.54

Debt Service Ratio Case 2 - Inside

		Cash Generation				Loan Payment				
No	Year	Operating Revenue	Depreciation	Total	Total	Interest Payment	Principal Payment	Total	Accumu. Total	Dept Service Ratio
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	
0	2001	-	-	-	-	-	-	-	-	-
1	2002	-	-	-	-	2.26	-	2.26	2.26	-
2	2003	-	-	-	-	4.65	-	4.65	6.91	-
3	2004	3.57	3.30	6.87	6.87	5.04	1.96	7.00	13.91	0.49
4	2005	3.57	3.30	6.87	13.75	6.90	2.13	9.03	22.95	0.60
5	2006	3.57	3.30	6.87	20.62	8.85	2.31	11.16	34.11	0.60
6	2007	9.52	3.30	12.82	33.44	9.26	4.44	13.70	47.81	0.70
7	2008	9.52	3.30	12.82	46.26	8.88	4.82	13.70	61.50	0.75
8	2009	9.52	3.30	12.82	59.09	8.47	5.23	13.70	75.20	0.79
9	2010	9.52	3.30	12.82	71.91	8.01	5.69	13.70	88.89	0.81
10	2011	9.52	3.30	12.82	84.73	7.52	6.18	13.70	102.59	0.83
11	2012	9.52	3.30	12.82	97.55	6.98	6.72	13.70	116.29	0.84
12	2013	9.52	3.30	12.82	110.38	6.39	7.31	13.70	129.98	0.85
13	2014	10.43	1.98	12.41	122.79	5.77	7.93	13.70	143.68	0.85
14	2015	10.43	1.98	12.41	135.20	5.07	8.63	13.70	157.38	0.86
15	2016	7.00	2.43	9.43	144.63	4.32	5.99	10.31	167.69	0.86
16	2017	10.12	2.43	12.55	157.18	3.80	6.51	10.31	178.00	0.86
17	2018	10.12	2.43	12.55	169.74	3.25	6.99	10.24	188.24	0.90
18	2019	10.12	2.43	12.55	182.29	2.66	4.15	6.81	195.05	0.93
19	2020	10.12	2.43	12.55	194.84	2.32	4.49	6.81	201.86	0.97
20	2021	10.12	2.43	12.55	207.39	1.96	4.85	6.81	208.67	0.99
21	2022	10.12	2.43	12.55	219.94	1.57	5.24	6.81	215.48	1.02
22	2023	10.12	2.43	12.55	232.50	1.16	5.89	7.05	222.53	1.04
23	2024	11.49	0.45	11.94	244.44	0.68	2.51	3.19	225.72	1.08
24	2025	11.49	0.45	11.94	256.38	0.48	2.71	3.19	228.91	1.12
25	2026	11.80	-	11.80	268.18	0.27	3.33	3.60	232.51	1.15
26	2027	11.80	-	11.80	279.98	-	-	-	232.51	1.20
27	2028	11.80	-	11.80	291.79	-	-	-	232.51	1.25
28	2029	5.84	-	5.84	297.63	-	-	-	232.51	1.28
29	2030	5.84	-	5.84	303.47	-	-	-	232.51	1.31
30	2031	5.84	-	5.84	309.32	-	-	-	232.51	1.33
Total		251.99	57.33	309.32	4,562.29	116.52	115.99	232.51		

Project Amatitlan Geothermal
Subject Repayment Schedule, Case 3-Inside
File Name
Date
Rev. ##########

FOR REPAYMENT SCHEDULE

YEAR	Total	Japan 40%	Intl 60%	TOTAL
	MM$	MM$	MM$	MM$
1	26.77	10.71	16.06	26.77
2	25.98	10.39	15.59	25.98
3	-	-	-	-
4	24.06	9.62	14.44	24.06
5	22.47	8.99	13.48	22.47
6	-	-	-	-
	99.28	39.71	59.57	99.28

LOAN TERM		Japan	Intl
Interest	%	9.11%	8.00%
Grace P.	Year	2	2
Repayment	Years	12	20
WACC			8.44%

Japan Bank Loan Repayment Schedule (Million US$), Case 2 - Inside

UNIT: Million US$

			2002 Loan				2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
0	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2002	10.71	-	0.98	-	11.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58	-	-	11.69
2	2003	10.39	-	1.06	-	12.75	-	0.95	-	11.34	-	-	-	-	-	-	-	-	-	-	-	-	-	2.01	-	-	24.09
3	2004	-	0.63	1.16	1.79	12.12	0.56	1.03	1.59	10.78	-	-	-	-	-	-	-	-	-	-	-	-	1.19	-	2.19	3.38	22.90
4	2005	9.62	0.69	1.10	1.79	11.43	0.61	0.98	1.59	10.17	-	-	-	-	-	-	-	-	-	-	-	-	1.30	0.88	2.08	3.38	32.64
5	2006	8.99	0.75	1.04	1.79	10.68	0.66	0.93	1.59	9.50	-	-	-	-	-	0.88	-	11.05	-	-	-	-	1.41	1.83	1.97	3.38	45.11
6	2007	-	0.82	0.97	1.79	9.86	0.72	0.87	1.59	8.78	-	-	-	-	-	1.01	-	12.06	-	0.82	-	12.88	2.78	-	4.11	6.89	42.34
7	2008	-	0.89	0.90	1.79	8.97	0.79	0.80	1.59	7.99	-	-	-	-	0.59	1.10	1.69	11.46	0.64	1.17	1.81	12.24	3.04	-	3.85	6.89	39.30
8	2009	-	0.97	0.82	1.79	8.00	0.86	0.73	1.59	7.12	-	-	-	-	0.65	1.04	1.69	10.81	0.70	1.11	1.81	11.54	3.31	-	3.58	6.89	36.00
9	2010	-	1.06	0.73	1.79	6.94	0.94	0.65	1.59	6.18	-	-	-	-	0.71	0.98	1.69	10.10	0.76	1.05	1.81	10.78	3.61	-	3.28	6.89	32.39
10	2011	-	1.16	0.63	1.79	5.78	1.03	0.56	1.59	5.15	-	-	-	-	0.77	0.92	1.69	9.32	0.83	0.98	1.81	9.95	3.94	-	2.95	6.89	28.45
11	2012	-	1.26	0.53	1.79	4.52	1.12	0.47	1.59	4.03	-	-	-	-	0.84	0.85	1.69	8.48	0.90	0.91	1.81	9.05	4.30	-	2.59	6.89	24.16
12	2013	-	1.38	0.41	1.79	3.14	1.22	0.37	1.59	2.80	-	-	-	-	0.92	0.77	1.69	7.56	0.99	0.82	1.81	8.06	4.69	-	2.20	6.89	19.47
13	2014	-	1.50	0.29	1.79	1.64	1.33	0.26	1.59	1.47	-	-	-	-	1.00	0.69	1.69	6.56	1.08	0.73	1.81	8.98	5.10	-	1.79	6.89	14.38
14	2015	-	1.64	0.15	1.79	-	1.47	0.13	1.60	-	-	-	-	-	1.09	0.60	1.69	5.46	1.17	0.64	1.81	5.81	5.58	-	1.31	6.89	8.80
15	2016	-	-	-	-	-	-	-	-	-	-	-	-	-	1.19	0.50	1.69	4.27	1.28	0.53	1.81	4.53	2.70	-	0.80	3.50	6.09
16	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	1.30	0.39	1.69	2.97	1.40	0.41	1.81	3.13	2.95	-	0.55	3.50	3.14
17	2018	-	-	-	-	-	-	-	-	-	-	-	-	-	1.42	0.27	1.69	1.54	1.53	0.28	1.81	1.60	2.95	-	0.29	3.43	-
18	2019	-	-	-	-	-	-	-	-	-	-	-	-	-	1.54	0.14	1.68	-	1.60	0.15	1.75	-	3.14	-	0.29	3.43	-
19	2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	2024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	2026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	2027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		39.71	12.75	10.77	21.48		11.34	8.73	19.12		-	-	-		12.06	10.14	20.31		12.88	9.60	21.66		49.02	5.70	33.54	82.56	

International Bank Loan Repayment Schedule (Million US$), Case 2 Inside

UNIT: Million US$

		2002 Loan					2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
-	2,001.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.00	2,002.00	16.06	-	1.28	-	17.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.28	-	-	17.34
2.00	2,003.00	15.59	-	1.39	-	18.73	-	1.25	-	16.84	-	-	-	-	-	-	-	-	-	-	-	-	-	2.64	-	-	35.57
3.00	2,004.00	-	0.41	1.50	1.91	18.32	0.36	1.35	1.71	16.48	-	-	-	-	-	-	-	-	-	-	-	-	0.77	-	2.85	3.62	34.80
4.00	2,005.00	14.44	0.44	1.47	1.91	17.88	0.39	1.32	1.71	16.09	-	-	-	-	-	1.15	-	15.59	-	-	-	-	0.83	1.15	2.79	3.62	49.56
5.00	2,006.00	13.48	0.48	1.43	1.91	17.40	0.42	1.29	1.71	15.67	-	-	-	-	-	1.25	-	16.84	-	1.08	-	14.56	0.90	2.33	2.72	3.62	64.47
6.00	2,007.00	-	0.52	1.39	1.91	16.88	0.46	1.25	1.71	15.21	-	-	-	-	0.36	1.35	1.71	16.48	0.32	1.16	1.48	14.24	1.66	-	5.15	6.81	62.81
7.00	2,008.00	-	0.56	1.35	1.91	16.32	0.49	1.22	1.71	14.72	-	-	-	-	0.39	1.32	1.71	16.09	0.34	1.14	1.48	13.90	1.78	-	5.03	6.81	61.03
8.00	2,009.00	-	0.60	1.31	1.91	15.72	0.53	1.18	1.71	14.19	-	-	-	-	0.42	1.29	1.71	15.67	0.37	1.11	1.48	13.53	1.92	-	4.89	6.81	59.11
9.00	2,010.00	-	0.65	1.26	1.91	15.07	0.57	1.14	1.71	13.62	-	-	-	-	0.46	1.25	1.71	15.21	0.40	1.08	1.48	13.13	2.08	-	4.73	6.81	57.03
10.00	2,011.00	-	0.70	1.21	1.91	14.37	0.62	1.09	1.71	13.00	-	-	-	-	0.49	1.22	1.71	14.72	0.43	1.05	1.48	12.70	2.24	-	4.57	6.81	54.79
11.00	2,012.00	-	0.76	1.15	1.91	13.61	0.67	1.04	1.71	12.33	-	-	-	-	0.53	1.18	1.71	14.19	0.46	1.02	1.48	12.24	2.42	-	4.39	6.81	52.37
12.00	2,013.00	-	0.82	1.09	1.91	12.79	0.72	0.99	1.71	11.61	-	-	-	-	0.58	1.13	1.71	13.61	0.50	0.98	1.48	11.74	2.62	-	4.19	6.81	49.75
13.00	2,014.00	-	0.89	1.02	1.91	11.90	0.78	0.93	1.71	10.83	-	-	-	-	0.62	1.09	1.71	12.99	0.54	0.94	1.48	11.20	2.83	-	3.98	6.81	46.92
14.00	2,015.00	-	0.96	0.95	1.91	10.94	0.84	0.87	1.71	9.99	-	-	-	-	0.67	1.04	1.71	12.32	0.58	0.90	1.48	10.62	3.06	-	3.76	6.81	43.87
15.00	2,016.00	-	1.03	0.88	1.91	9.91	0.91	0.80	1.71	9.08	-	-	-	-	0.72	0.99	1.71	11.60	0.63	0.85	1.48	9.99	3.29	-	3.52	6.81	40.58
16.00	2,017.00	-	1.12	0.79	1.91	8.79	0.98	0.73	1.71	8.10	-	-	-	-	0.78	0.93	1.71	10.82	0.68	0.80	1.48	9.31	3.56	-	3.25	6.81	37.02
17.00	2,018.00	-	1.21	0.70	1.91	7.58	1.06	0.65	1.71	7.04	-	-	-	-	0.84	0.87	1.71	9.98	0.74	0.74	1.48	8.57	3.85	-	2.96	6.81	33.17
18.00	2,019.00	-	1.30	0.61	1.91	6.28	1.15	0.56	1.71	5.89	-	-	-	-	0.91	0.80	1.71	9.07	0.79	0.69	1.48	7.78	4.15	-	2.66	6.81	29.02
19.00	2,020.00	-	1.41	0.50	1.91	4.87	1.24	0.47	1.71	4.65	-	-	-	-	0.98	0.73	1.71	8.09	0.86	0.62	1.48	6.92	4.49	-	2.32	6.81	24.53
20.00	2,021.00	-	1.52	0.39	1.91	3.35	1.34	0.37	1.71	3.31	-	-	-	-	1.06	0.65	1.71	7.03	0.93	0.55	1.48	5.99	4.85	-	1.96	6.81	19.68
21.00	2,022.00	-	1.64	0.27	1.91	1.71	1.45	0.26	1.71	1.86	-	-	-	-	1.15	0.56	1.71	5.86	1.00	0.48	1.48	4.99	5.24	-	1.57	6.81	14.44
22.00	2,023.00	-	1.71	0.14	1.85	-	1.86	0.15	2.01	-	-	-	-	-	1.24	0.47	1.71	4.64	1.08	0.40	1.48	3.91	5.89	-	1.16	7.05	8.55
23.00	2,024.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.34	0.37	1.71	3.30	1.17	0.31	1.48	2.74	2.51	-	0.68	3.19	6.04
24.00	2,025.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	0.26	1.71	1.85	1.25	0.22	1.48	1.48	2.71	-	0.48	3.19	3.33
25.00	2,026.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.85	0.15	2.00	-	1.48	0.12	1.60	-	3.33	-	0.27	3.60	-
26.00	2,027.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	2,028.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28.00	2,029.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29.00	2,030.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	2,031.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		59.57	18.73	22.08	38.14		16.84	18.91	34.50		-	-	-		16.84	20.05	34.49		14.56	16.24	29.72		66.97	7.40	69.89	136.85	

FIRR Case 3-I - 12

Project Amatitlan Geothermal
Subject FIRR - Case 3-Inside
File Name
Date 1999/5/21
Rev. 2001/10/12

財務内部収益率(FIRR), Case 3 - Inside
Financial Internal Rate of Return

FIRR = 13.75%

		Project Undertaking										
No	Year	Project Cost	Salable Energy	Supple. Wells	O&M for Steam Prod.	O&M for P. Plant	Steam Cost	Tax	General Cost Ttl	Project Cost Total	Revenue	Balance
		MM$	GWh	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	39.62	-	-	-	-	-	-	-	39.62	-	(39.62)
2	2003	42.14	-	-	-	-	-	-	-	42.14	-	(42.14)
3	2004	6.90	217.51	-	1.02	0.45	2.54	2.47	6.47	13.37	17.40	4.03
4	2005	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
5	2006	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
6	2007	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
7	2008	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
8	2009	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
9	2010	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
10	2011	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
11	2012	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
12	2013	-	290.01	4.26	1.35	0.60	3.39	2.53	12.13	12.13	23.20	11.07
13	2014	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
14	2015	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
15	2016	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
16	2017	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
17	2018	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
18	2019	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
19	2020	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
20	2021	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
21	2022	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
22	2023	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
23	2024	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
24	2025	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
25	2026	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
26	2027	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
27	2028	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
28	2029	-	72.50	-	0.34	0.15	0.85	1.38	2.72	2.72	5.80	3.08
29	2030	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-
Total		88.65	7,250.25	4.26	33.85	14.91	84.75	108.28	246.04	334.70	580.00	245.30

Profit And Loss Statement

損益計算書, Case 3 - Inside

		Project Undertaking																
		Sales Revenue			Operating Cost			Steam Cost	Depreciation		Cost	Profit		Profit	Interest Payment			Net
No.	Year	Generated Energy	Salable Energy	Revenue	Supply. Well	O&M Steam	O&M P Plant		Steam Supply	Power Plant	Total		Tax	After Tax	Japan Bank	Int'l Bank	Total	INCOME
		GWH	GWH	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2002		-	-	-	-	-	-	-	-	-	-	-	-	1.44	1.90	3.34	(3.34)
2	2003		-	-	-	-	-	-	-	-	-	-	-	-	3.11	4.07	7.18	(7.18)
3	2004	231.26	217.51	17.40	-	1.02	0.45	2.54	2.00	3.43	9.44	7.96	2.47	5.49	3.65	4.73	8.38	(2.89)
4	2005	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	3.97	5.12	9.09	(0.51)
5	2006	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	3.78	5.00	8.78	(0.20)
6	2007	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	3.57	4.88	8.45	0.13
7	2008	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	3.33	4.75	8.08	0.50
8	2009	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	3.08	4.61	7.69	0.89
9	2010	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	2.80	4.46	7.26	1.32
10	2011	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	2.50	4.29	6.79	1.79
11	2012	308.35	290.01	23.20	-	1.35	0.60	3.39	2.00	3.43	10.77	12.43	3.85	8.58	2.17	4.11	6.28	2.30
12	2013	308.35	290.01	23.20	4.26	1.35	0.60	3.39	2.00	3.43	15.03	8.17	2.53	5.64	1.81	3.92	5.73	(0.09)
13	2014	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	1.41	3.72	5.13	4.53
14	2015	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	0.98	3.50	4.48	5.18
15	2016	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	0.52	3.24	3.76	5.90
16	2017	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	-	2.98	2.98	6.68
17	2018	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	-	2.71	2.71	6.95
18	2019	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	-	2.41	2.41	7.25
19	2020	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	-	2.08	2.08	7.58
20	2021	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	-	1.72	1.72	7.94
21	2022	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	-	1.34	1.34	8.32
22	2023	308.35	290.01	23.20	-	1.35	0.60	3.39	0.43	3.43	9.20	14.00	4.34	9.66	-	0.93	0.93	8.73
23	2024	308.35	290.01	23.20	-	1.35	0.60	3.39	-	-	5.34	17.86	5.54	12.32	-	0.48	0.48	11.84
24	2025	308.35	290.01	23.20	-	1.35	0.60	3.39	-	-	5.34	17.86	5.54	12.32	-	-	-	12.32
25	2026	308.35	290.01	23.20	-	1.35	0.60	3.39	-	-	5.34	17.86	5.54	12.32	-	-	-	12.32
26	2027	308.35	290.01	23.20	-	1.35	0.60	3.39	-	-	5.34	17.86	5.54	12.32	-	-	-	12.32
27	2028	308.35	290.01	23.20	-	1.35	0.60	3.39	-	-	5.34	17.86	5.54	12.32	-	-	-	12.32
28	2029	77.09	72.50	5.80	-	0.34	0.15	0.85	-	-	1.34	4.46	1.38	3.08	-	-	-	3.08
29	2030		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			7,250.25	580.00		33.85	14.91	84.75	24.27	68.64	230.67	349.33	108.28	241.05	38.12	76.95	115.07	125.98

Cash Flow Statement
キャッシュフロー ,Case 3 - Inside

			Cash Flow Out				Cash Flow In				Balance	
No	Year	Loan	Net Income	Dep. Steam Facilities	Dep. P. Plant Facilities	Total	Project Cost	Japan Bank Principal Payment	Int'l Bank Principal Payment	Total	Annual Balance	Balance
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	39.62	(3.34)	-	-	36.28	39.62	-	-	39.62	(3.34)	(3.34)
2	2003	42.14	(7.18)	-	-	34.96	42.14	-	-	42.14	(7.18)	(10.52)
3	2004	6.90	(2.89)	2.00	3.43	9.45	6.90	-	-	6.90	2.55	(7.97)
4	2005	-	(0.51)	2.00	3.43	4.92	-	2.16	1.39	3.55	1.37	(6.60)
5	2006	-	(0.20)	2.00	3.43	5.23	-	2.35	1.51	3.86	1.37	(5.23)
6	2007	-	0.13	2.00	3.43	5.56	-	2.56	1.63	4.19	1.37	(3.86)
7	2008	-	0.50	2.00	3.43	5.93	-	2.80	1.76	4.56	1.37	(2.49)
8	2009	-	0.89	2.00	3.43	6.32	-	3.05	1.90	4.95	1.37	(1.12)
9	2010	-	1.32	2.00	3.43	6.75	-	3.33	2.05	5.38	1.37	0.25
10	2011	-	1.79	2.00	3.43	7.22	-	3.63	2.22	5.85	1.37	1.62
11	2012	-	2.30	2.00	3.43	7.73	-	3.96	2.40	6.36	1.37	2.99
12	2013	-	(0.09)	2.00	3.43	5.34	-	4.32	2.59	6.91	(1.57)	1.42
13	2014	-	4.53	0.43	3.43	8.39	-	4.72	2.79	7.51	0.88	2.31
14	2015	-	5.18	0.43	3.43	9.04	-	5.15	3.01	8.16	0.88	3.19
15	2016	-	5.90	0.43	3.43	9.76	-	5.64	3.27	8.91	0.85	4.03
16	2017	-	6.68	0.43	3.43	10.54	-	-	3.53	3.53	7.01	11.04
17	2018	-	6.95	0.43	3.43	10.81	-	-	3.80	3.80	7.01	18.05
18	2019	-	7.25	0.43	3.43	11.11	-	-	4.10	4.10	7.01	25.06
19	2020	-	7.58	0.43	3.43	11.44	-	-	4.43	4.43	7.01	32.07
20	2021	-	7.94	0.43	3.43	11.80	-	-	4.79	4.79	7.01	39.08
21	2022	-	8.32	0.43	3.43	12.18	-	-	5.17	5.17	7.01	46.09
22	2023	-	8.73	0.43	3.43	12.59	-	-	5.58	5.58	7.01	53.10
23	2024	-	11.84	-	-	11.84	-	-	5.97	5.97	5.87	58.97
24	2025	-	12.32	-	-	12.32	-	-	-	-	12.32	71.29
25	2026	-	12.32	-	-	12.32	-	-	-	-	12.32	83.61
26	2027	-	12.32	-	-	12.32	-	-	-	-	12.32	95.93
27	2028	-	12.32	-	-	12.32	-	-	-	-	12.32	108.25
28	2029	-	3.08	-	-	3.08	-	-	-	-	3.08	111.33
29	2030	-	-	-	-	-	-	-	-	-	-	-
30	2031		-	-	-	-	-	-	-	-	-	-
Total		88.65	125.98	24.27	68.64	307.54	88.65	43.65	63.89	196.20	111.33	
												50.10

Debt Service Ratio, Case 3 - Inside

		Cash Generation				Loan Payment				
No	Year	Operating Revenue	Depreciation	Total	Total	Interest Payment	Principal Payment	Total	Accumu. Total	Dept Service Ratio
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	
0	2001	-	-	-	-	-	-	-	-	-
1	2002	-	-	-	-	3.34	-	3.34	3.34	-
2	2003	-	-	-	-	7.18	-	7.18	10.52	-
3	2004	5.49	5.43	10.93	10.93	8.38	-	8.38	18.90	0.58
4	2005	8.58	5.43	14.01	24.94	9.09	3.55	12.64	31.54	0.79
5	2006	8.58	5.43	14.01	38.95	8.78	3.86	12.64	44.18	0.88
6	2007	8.58	5.43	14.01	52.96	8.45	4.19	12.64	56.82	0.93
7	2008	8.58	5.43	14.01	66.97	8.08	4.56	12.64	69.46	0.96
8	2009	8.58	5.43	14.01	80.98	7.69	4.95	12.64	82.10	0.99
9	2010	8.58	5.43	14.01	94.99	7.26	5.38	12.64	94.73	1.00
10	2011	8.58	5.43	14.01	109.00	6.79	5.85	12.64	107.37	1.02
11	2012	8.58	5.43	14.01	123.01	6.28	6.36	12.64	120.01	1.02
12	2013	5.64	5.43	11.07	134.08	5.73	6.91	12.64	132.65	1.01
13	2014	9.66	3.86	13.52	147.60	5.13	7.51	12.64	145.29	1.02
14	2015	9.66	3.86	13.52	161.12	4.48	8.16	12.64	157.93	1.02
15	2016	9.66	3.86	13.52	174.64	3.76	8.91	12.67	170.60	1.02
16	2017	9.66	3.86	13.52	188.15	2.98	3.53	6.51	177.11	1.06
17	2018	9.66	3.86	13.52	201.67	2.71	3.80	6.51	183.62	1.10
18	2019	9.66	3.86	13.52	215.19	2.41	4.10	6.51	190.13	1.13
19	2020	9.66	3.86	13.52	228.71	2.08	4.43	6.51	196.64	1.16
20	2021	9.66	3.86	13.52	242.23	1.72	4.79	6.51	203.15	1.19
21	2022	9.66	3.86	13.52	255.75	1.34	5.17	6.51	209.66	1.22
22	2023	9.66	3.86	13.52	269.27	0.93	5.58	6.51	216.17	1.25
23	2024	12.32	-	12.32	281.59	0.48	5.97	6.45	222.62	1.26
24	2025	12.32	-	12.32	293.91	-	-	-	222.62	1.32
25	2026	12.32	-	12.32	306.23	-	-	-	222.62	1.38
26	2027	12.32	-	12.32	318.55	-	-	-	222.62	1.43
27	2028	12.32	-	12.32	330.87	-	-	-	222.62	1.49
28	2029	3.08	-	3.08	333.96	-	-	-	222.62	1.50
29	2030	-	-	-		-	-	-	-	-
30	2031	-	-	-		-	-	-	-	-
Total		241.05	92.91	333.96	4,686.24	115.07	107.55	222.62		

Project: Amatitan Geothermal
Subject: Repayment Schedule, Case 3-Inside
File Name:
Date:
Rev.: ########

FOR REPAYMENT SCHEDULE

YEAR	Total	Japan 40%	Int'l 60%	TOTAL
	MM$	MM$	MM$	MM$
1	39.62	15.85	23.77	39.62
2	42.14	16.85	25.28	42.14
3	6.90	2.76	4.14	6.90
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
	88.65	35.46	53.19	88.65

LOAN TERM		Japan	Int'l
Interest	%	9.11%	8.00%
Grace P.	Year	3	3
Repayment	Years	12	20
WACC			6.44%

Japan Bank Loan Repayment Schedule (Million US$), Case 3 - Inside

UNIT: Million US$

			2002 Loan				2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
0	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.44	-	-	17.29
1	2002	15.85	-	1.44	-	17.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.11	-	-	37.25
2	2003	16.85	-	1.57	-	18.86	-	1.54	-	18.39	-	-	-	-	-	-	-	-	-	-	-	-	-	3.65	-	-	43.56
3	2004	2.76	-	1.72	-	20.58	-	1.68	-	20.07	-	0.25	-	3.01	-	-	-	-	-	-	-	-	2.16	-	3.97	6.13	41.50
4	2005	-	1.02	1.87	2.89	19.56	0.99	1.83	2.82	19.09	0.15	0.27	0.42	2.86	-	-	-	-	-	-	-	-	2.35	-	3.78	6.13	39.15
5	2006	-	1.11	1.78	2.89	18.45	1.08	1.74	2.82	18.01	0.16	0.26	0.42	2.70	-	-	-	-	-	-	-	-	2.56	-	3.57	6.13	36.59
6	2007	-	1.21	1.68	2.89	17.24	1.18	1.64	2.82	16.83	0.17	0.25	0.42	2.53	-	-	-	-	-	-	-	-	2.80	-	3.33	6.13	33.79
7	2008	-	1.32	1.57	2.89	15.92	1.29	1.53	2.82	15.54	0.19	0.23	0.42	2.34	-	-	-	-	-	-	-	-	3.05	-	3.08	6.13	30.75
8	2009	-	1.44	1.45	2.89	14.48	1.40	1.42	2.82	14.14	0.21	0.21	0.42	2.13	-	-	-	-	-	-	-	-	3.33	-	2.80	6.13	27.42
9	2010	-	1.57	1.32	2.89	12.91	1.53	1.29	2.82	12.61	0.23	0.19	0.42	1.90	-	-	-	-	-	-	-	-	3.63	-	2.50	6.13	23.79
10	2011	-	1.71	1.18	2.89	11.20	1.67	1.15	2.82	10.94	0.25	0.17	0.42	1.65	-	-	-	-	-	-	-	-	3.96	-	2.17	6.13	19.83
11	2012	-	1.87	1.02	2.89	9.33	1.82	1.00	2.82	9.12	0.27	0.15	0.42	1.38	-	-	-	-	-	-	-	-	4.32	-	1.81	6.13	15.51
12	2013	-	2.04	0.85	2.89	7.29	1.99	0.83	2.82	7.13	0.29	0.13	0.42	1.09	-	-	-	-	-	-	-	-	4.72	-	1.41	6.13	10.79
13	2014	-	2.23	0.66	2.89	5.06	2.17	0.65	2.82	4.96	0.32	0.10	0.42	0.77	-	-	-	-	-	-	-	-	5.15	-	0.98	6.13	5.64
14	2015	-	2.43	0.46	2.89	2.63	2.37	0.45	2.82	2.60	0.35	0.07	0.42	0.42	-	-	-	-	-	-	-	-	5.64	-	0.52	6.16	-
15	2016	-	2.63	0.24	2.87	-	2.60	0.24	2.84	-	0.42	0.04	0.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	2024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	2026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	2027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		35.46	20.58	18.81	34.66		20.07	16.99	33.84		3.01	2.32	5.08		-	-	-		-	-	-		43.66	8.20	29.92	73.58	

International Bank Loan Repayment Schedule (Million US$), Case 3 Inside

UNIT: Million US$

			2002 Loan				2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
-	2,001.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.90	-	-	25.67
1.00	2,002.00	23.77	-	1.90	-	25.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.07	-	-	55.02
2.00	2,003.00	25.28	-	2.05	-	27.72	-	2.02	-	27.30	-	-	-	-	-	-	-	-	-	-	-	-	-	4.73	-	-	63.89
3.00	2,004.00	4.14	-	2.22	-	29.94	-	2.18	-	29.48	-	0.33	-	4.47	-	-	-	-	-	-	-	-	1.39	-	5.12	6.51	62.50
4.00	2,005.00	-	0.65	2.40	3.05	29.29	0.64	2.36	3.00	28.84	0.10	0.35	0.46	4.37	-	-	-	-	-	-	-	-	1.51	-	5.00	6.51	60.99
5.00	2,006.00	-	0.71	2.34	3.05	28.58	0.69	2.31	3.00	28.15	0.11	0.35	0.46	4.26	-	-	-	-	-	-	-	-	1.63	-	4.88	6.51	59.36
6.00	2,007.00	-	0.76	2.29	3.05	27.82	0.75	2.25	3.00	27.40	0.12	0.34	0.46	4.14	-	-	-	-	-	-	-	-	1.76	-	4.75	6.51	57.60
7.00	2,008.00	-	0.82	2.23	3.05	27.00	0.81	2.19	3.00	26.59	0.13	0.33	0.46	4.01	-	-	-	-	-	-	-	-	1.90	-	4.61	6.51	55.70
8.00	2,009.00	-	0.89	2.16	3.05	26.11	0.87	2.13	3.00	25.72	0.14	0.32	0.46	3.87	-	-	-	-	-	-	-	-	2.05	-	4.46	6.51	53.65
9.00	2,010.00	-	0.96	2.09	3.05	25.15	0.94	2.06	3.00	24.78	0.15	0.31	0.46	3.72	-	-	-	-	-	-	-	-	2.22	-	4.29	6.51	51.43
10.00	2,011.00	-	1.04	2.01	3.05	24.11	1.02	1.98	3.00	23.76	0.16	0.30	0.46	3.56	-	-	-	-	-	-	-	-	2.40	-	4.11	6.51	49.03
11.00	2,012.00	-	1.12	1.93	3.05	22.99	1.10	1.90	3.00	22.66	0.18	0.28	0.46	3.38	-	-	-	-	-	-	-	-	2.59	-	3.92	6.51	46.44
12.00	2,013.00	-	1.21	1.84	3.05	21.78	1.19	1.81	3.00	21.47	0.19	0.27	0.46	3.19	-	-	-	-	-	-	-	-	2.79	-	3.72	6.51	43.65
13.00	2,014.00	-	1.31	1.74	3.05	20.47	1.28	1.72	3.00	20.19	0.20	0.26	0.46	2.99	-	-	-	-	-	-	-	-	3.01	-	3.50	6.51	40.64
14.00	2,015.00	-	1.41	1.64	3.05	19.06	1.38	1.62	3.00	18.81	0.22	0.24	0.46	2.77	-	-	-	-	-	-	-	-	3.27	-	3.24	6.51	37.37
15.00	2,016.00	-	1.53	1.52	3.05	17.53	1.50	1.50	3.00	17.31	0.24	0.22	0.46	2.53	-	-	-	-	-	-	-	-	3.53	-	2.98	6.51	33.84
16.00	2,017.00	-	1.65	1.40	3.05	15.88	1.62	1.38	3.00	15.69	0.26	0.20	0.46	2.27	-	-	-	-	-	-	-	-	3.80	-	2.71	6.51	30.04
17.00	2,018.00	-	1.78	1.27	3.05	14.10	1.74	1.26	3.00	13.95	0.28	0.18	0.46	1.99	-	-	-	-	-	-	-	-	4.10	-	2.41	6.51	25.94
18.00	2,019.00	-	1.92	1.13	3.05	12.18	1.88	1.12	3.00	12.07	0.30	0.16	0.46	1.69	-	-	-	-	-	-	-	-	4.43	-	2.08	6.51	21.51
19.00	2,020.00	-	2.08	0.97	3.05	10.10	2.03	0.97	3.00	10.04	0.32	0.14	0.46	1.37	-	-	-	-	-	-	-	-	4.79	-	1.72	6.51	16.72
20.00	2,021.00	-	2.24	0.81	3.05	7.86	2.20	0.80	3.00	7.84	0.35	0.11	0.46	1.02	-	-	-	-	-	-	-	-	5.17	-	1.34	6.51	11.55
21.00	2,022.00	-	2.42	0.63	3.05	5.44	2.37	0.63	3.00	5.47	0.38	0.08	0.46	0.64	-	-	-	-	-	-	-	-	5.58	-	0.93	6.51	5.97
22.00	2,023.00	-	2.61	0.44	3.05	2.83	2.56	0.44	3.00	2.91	0.41	0.05	0.46	0.23	-	-	-	-	-	-	-	-	5.97	-	0.48	6.45	-
23.00	2,024.00	-	2.83	0.23	3.06	-	2.91	0.23	3.14	-	0.23	0.02	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	2,025.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.00	2,026.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26.00	2,027.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	2,028.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28.00	2,029.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29.00	2,030.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	2,031.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		53.19	29.94	37.24	61.01		29.48	34.86	60.14		4.47	4.85	8.99		-	-	-		-	-	-		63.89	10.70	66.25	130.14	

Appendix 2:

Financial Evaluation

(Outside Caldera)

Financial Evaluation: Outside Caldera

Case 1
Case 2
Case 3

- Financial Internal Rate of Return (FIRR)
- Income Statement
- Cash Flow
- Dept Service Ratio
- Repayment Schedule

FIRR Case 1-O

Project Amatitlan Geothermal
Subject FIRR – Case 1-Outside
File Name
Date 1999/5/21
Rev. 2001/10/12

財務內部收益率(FIRR), Case 1 - Outside
Financial Internal Rate of Return

FIRR = 10.57%

			Project Undertaking									
No	Year	Project Cost	Salable Energy	Supple. Wells	O&M for Steam Prod.	O&M for P. Plant	Steam Cost	Tax	Generat. Cost Ttl	Project Cost Total	Revenue	Balance
		MM$	GWh	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	27.80	-	-	-	-	-	-	-	27.80	-	(27.80)
2	2003	27.50	-	-	-	-	-	-	-	27.50	-	(27.50)
3	2004	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
4	2005	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
5	2006	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
6	2007	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
7	2008	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
8	2009	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
9	2010	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
10	2011	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
11	2012	-	145.21	-	1.13	0.30	1.60	1.64	4.67	4.67	11.62	6.95
12	2013	-	145.21	4.26	1.13	0.30	1.60	0.32	7.61	7.61	11.62	4.01
13	2014	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
14	2015	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
15	2016	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
16	2017	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
17	2018	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
18	2019	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
19	2020	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
20	2021	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
21	2022	-	145.21	-	1.13	0.30	1.60	1.92	4.95	4.95	11.62	6.67
22	2023	-	145.21	-	1.13	0.30	1.60	2.05	5.08	5.08	11.62	6.54
23	2024	-	145.21	-	1.13	0.30	1.60	2.66	5.69	5.69	11.62	5.93
24	2025	-	145.21	-	1.13	0.30	1.60	2.66	5.69	5.69	11.62	5.93
25	2026	-	145.21	-	1.13	0.30	1.60	2.66	5.69	5.69	11.62	5.93
26	2027	-	145.21	-	1.13	0.30	1.60	2.66	5.69	5.69	11.62	5.93
27	2028	-	145.21	-	1.13	0.30	1.60	2.66	5.69	5.69	11.62	5.93
28	2029	-	-	-	-	-	-	-	-	-	-	-
29	2030	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-
Total		55.30	3,630.25	4.26	28.21	7.45	40.00	47.71	127.63	182.93	290.50	107.57

Profit And Loss Statement
損益計算書, Case 1 – Outside

		Project Undertaking																
		Sales Revenue			Operating Cost			Steam Cost	Depreciation		Cost	Profit		Profit	Interest Payment			Net
No.	Year	Generated Energy	Salable Energy	Revenue	Supple. Well	O&M Steam	O&M P. Plant		Steam Supply	Power Plant	Total		Tax	After Tax	Japan Bank	Int'l Bank	Total	INCOME
		GWH	GWH	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2002		-	-	-	-	-	-	-	-	-	-	-	-	1.01	1.33	2.34	(2.34)
2	2003		-	-	-	-	-	-	-	-	-	-	-	-	2.11	2.76	4.87	(4.87)
3	2004	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	2.30	2.99	5.29	(1.64)
4	2005	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	2.19	2.91	5.10	(1.45)
5	2006	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	2.06	2.85	4.91	(1.26)
6	2007	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	1.92	2.77	4.69	(1.04)
7	2008	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	1.77	2.68	4.45	(0.80)
8	2009	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	1.62	2.60	4.22	(0.57)
9	2010	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	1.44	2.50	3.94	(0.29)
10	2011	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	1.25	2.39	3.64	0.01
11	2012	154.18	145.21	11.62	-	1.13	0.30	1.60	1.32	1.98	6.33	5.29	1.64	3.65	1.04	2.29	3.33	0.32
12	2013	154.18	145.21	11.62	4.26	1.13	0.30	1.60	1.32	1.98	10.59	1.03	0.32	0.71	0.81	2.16	2.97	(2.26)
13	2014	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	0.56	2.04	2.60	1.67
14	2015	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	0.29	1.89	2.18	2.09
15	2016	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	-	1.74	1.74	2.53
16	2017	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	-	1.58	1.58	2.69
17	2018	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	-	1.40	1.40	2.87
18	2019	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	-	1.21	1.21	3.06
19	2020	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	-	1.00	1.00	3.27
20	2021	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	-	0.77	0.77	3.50
21	2022	154.18	145.21	11.62	-	1.13	0.30	1.60	0.43	1.98	5.43	6.19	1.92	4.27	-	0.53	0.53	3.74
22	2023	154.18	145.21	11.62	-	1.13	0.30	1.60	-	1.98	5.01	6.61	2.05	4.56	-	0.27	0.27	4.29
23	2024	154.18	145.21	11.62	-	1.13	0.30	1.60	-	-	3.03	8.59	2.66	5.93	-	-	-	5.93
24	2025	154.18	145.21	11.62	-	1.13	0.30	1.60	-	-	3.03	8.59	2.66	5.93	-	-	-	5.93
25	2026	154.18	145.21	11.62	-	1.13	0.30	1.60	-	-	3.03	8.59	2.66	5.93	-	-	-	5.93
26	2027	154.18	145.21	11.62	-	1.13	0.30	1.60	-	-	3.03	8.59	2.66	5.93	-	-	-	5.93
27	2028	154.18	145.21	11.62	-	1.13	0.30	1.60	-	-	3.03	8.59	2.66	5.93	-	-	-	5.93
28	2029	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	2030		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			3,630.25	290.50		28.21	7.45	40.00	17.03	39.60	136.55	153.95	47.71	106.24	20.37	42.66	63.03	43.21

FIRR Case 1-O

Cash Flow Statement

キャッシュフロー ,Case 1 - Outside

			Cash Flow Out				Cash Flow In				Balance	
No	Year	Loan	Net Income	Dep. Steam Facilities	Dep. P. Plant Facilities	Total	Project Cost	Japn Bank Principal Payment	Int'l Bank Principal Payment	Total	Annual Balance	Balance
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	27.80	(2.34)	-	-	25.46	27.80	-	-	27.80	(2.34)	(2.34)
2	2003	27.50	(4.87)	-	-	22.63	27.50	-	-	27.50	(4.87)	(7.21)
3	2004	-	(1.64)	1.32	1.98	1.66	-	1.25	0.81	2.06	(0.40)	(7.61)
4	2005	-	(1.45)	1.32	1.98	1.85	-	1.36	0.89	2.25	(0.40)	(8.00)
5	2006	-	(1.26)	1.32	1.98	2.04	-	1.49	0.95	2.44	(0.40)	(8.40)
6	2007	-	(1.04)	1.32	1.98	2.26	-	1.63	1.03	2.66	(0.40)	(8.80)
7	2008	-	(0.80)	1.32	1.98	2.50	-	1.78	1.12	2.90	(0.40)	(9.19)
8	2009	-	(0.57)	1.32	1.98	2.73	-	1.93	1.20	3.13	(0.40)	(9.59)
9	2010	-	(0.29)	1.32	1.98	3.01	-	2.11	1.30	3.41	(0.40)	(9.98)
10	2011	-	0.01	1.32	1.98	3.31	-	2.30	1.41	3.71	(0.40)	(10.38)
11	2012	-	0.32	1.32	1.98	3.62	-	2.51	1.51	4.02	(0.40)	(10.78)
12	2013	-	(2.26)	1.32	1.98	1.04	-	2.74	1.64	4.38	(3.34)	(14.11)
13	2014	-	1.67	0.43	1.98	4.07	-	2.99	1.76	4.75	(0.68)	(14.79)
14	2015	-	2.09	0.43	1.98	4.49	-	3.15	1.91	5.06	(0.57)	(15.36)
15	2016	-	2.53	0.43	1.98	4.93	-	-	2.06	2.06	2.87	(12.48)
16	2017	-	2.69	0.43	1.98	5.09	-	-	2.22	2.22	2.87	(9.61)
17	2018	-	2.87	0.43	1.98	5.27	-	-	2.40	2.40	2.87	(6.74)
18	2019	-	3.06	0.43	1.98	5.46	-	-	2.59	2.59	2.87	(3.86)
19	2020	-	3.27	0.43	1.98	5.67	-	-	2.80	2.80	2.87	(0.99)
20	2021	-	3.50	0.43	1.98	5.90	-	-	3.03	3.03	2.87	1.88
21	2022	-	3.74	0.43	1.98	6.14	-	-	3.27	3.27	2.87	4.76
22	2023	-	4.29	-	1.98	6.27	-	-	3.37	3.37	2.90	7.66
23	2024	-	5.93	-	-	5.93	-	-	-	-	5.93	13.60
24	2025	-	5.93	-	-	5.93	-	-	-	-	5.93	19.53
25	2026	-	5.93	-	-	5.93	-	-	-	-	5.93	25.46
26	2027	-	5.93	-	-	5.93	-	-	-	-	5.93	31.40
27	2028	-	5.93	-	-	5.93	-	-	-	-	5.93	37.33
28	2029	-	-	-	-	-	-	-	-	-	-	37.33
29	2030	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-
Total		55.30	43.21	17.03	39.60	155.14	55.30	25.24	37.27	117.81	37.33	-49.96

Debt Service Ratio, Case 3 - Outside

No	Year	Cash Generation				Loan Payment				
		Operating Revenue	Depreciation	Total	Total	Interest Payment	Principal Payment	Total	Accumu. Total	Dept Service Ratio
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	
0	2001	-	-	-	-	-	-	-	-	-
1	2002	-	-	-	-	2.34	-	2.34	2.34	-
2	2003	-	-	-	-	4.87	-	4.87	7.21	-
3	2004	3.65	3.30	6.95	6.95	5.29	2.06	7.35	14.56	0.48
4	2005	3.65	3.30	6.95	13.91	5.10	2.25	7.35	21.91	0.63
5	2006	3.65	3.30	6.95	20.86	4.91	2.44	7.35	29.26	0.71
6	2007	3.65	3.30	6.95	27.81	4.69	2.66	7.35	36.61	0.76
7	2008	3.65	3.30	6.95	34.77	4.45	2.90	7.35	43.96	0.79
8	2009	3.65	3.30	6.95	41.72	4.22	3.13	7.35	51.31	0.81
9	2010	3.65	3.30	6.95	48.68	3.94	3.41	7.35	58.66	0.83
10	2011	3.65	3.30	6.95	55.63	3.64	3.71	7.35	66.01	0.84
11	2012	3.65	3.30	6.95	62.58	3.33	4.02	7.35	73.36	0.85
12	2013	0.71	3.30	4.01	66.60	2.97	4.38	7.35	80.71	0.83
13	2014	4.27	2.41	6.67	73.27	2.60	4.75	7.35	88.06	0.83
14	2015	4.27	2.41	6.67	79.94	2.18	5.06	7.24	95.30	0.84
15	2016	4.27	2.41	6.67	86.62	1.74	2.06	3.80	99.10	0.87
16	2017	4.27	2.41	6.67	93.29	1.58	2.22	3.80	102.90	0.91
17	2018	4.27	2.41	6.67	99.96	1.40	2.40	3.80	106.70	0.94
18	2019	4.27	2.41	6.67	106.64	1.21	2.59	3.80	110.50	0.97
19	2020	4.27	2.41	6.67	113.31	1.00	2.80	3.80	114.30	0.99
20	2021	4.27	2.41	6.67	119.98	0.77	3.03	3.80	118.10	1.02
21	2022	4.27	2.41	6.67	126.66	0.53	3.27	3.80	121.90	1.04
22	2023	4.56	1.98	6.54	133.20	0.27	3.37	3.64	125.54	1.06
23	2024	5.93	-	5.93	139.14	-	-	-	125.54	1.11
24	2025	5.93	-	5.93	145.07	-	-	-	125.54	1.16
25	2026	5.93	-	5.93	151.00	-	-	-	125.54	1.20
26	2027	5.93	-	5.93	156.94	-	-	-	125.54	1.25
27	2028	5.93	-	5.93	162.87	-	-	-	125.54	1.30
28	2029	-	-	-	162.87	-	-	-	125.54	1.30
29	2030	-	-	-		-	-	-	-	-
30	2031	-	-	-		-	-	-	-	-
Total		106.24	56.63	162.87	2,330.26	63.03	62.51	125.54		

Project: Amalitan Geothermal, Case 1 Outside
Subject: Repayment Schedule, Case 1-Outside
File Name:
Date:
Rev.: ########

FOR REPAYMENT SCHEDULE

YEAR	Total	Japan 40%	Int'l 60%	TOTAL
	MM$	MM$	MM$	MM$
1	27.80	11.12	16.68	27.80
2	27.50	11.00	16.50	27.50
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
	55.30	22.12	33.18	55.30

LOAN TERM		Japan	Int'l
Interest	%	9.11%	6.00%
Grace P.	Year	2	2
Repayment	Years	12	20
WACC			8.44%

Japan Bank Loan Repayment Schedule (Million US$), Case 1 Outside

UNIT: Million US$

No	Year	2002 Loan					2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
		Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
0	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2002	11.12	-	1.01	-	12.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	12.13
2	2003	11.00	-	1.11	-	13.24	-	1.00	-	12.00	-	-	-	-	-	-	-	-	-	-	-	-	-	2.11	-	-	25.24
3	2004	-	0.65	1.21	1.86	12.59	0.60	1.09	1.69	11.40	-	-	-	-	-	-	-	-	-	-	-	-	1.25	-	2.30	3.55	23.99
4	2005	-	0.71	1.15	1.86	11.88	0.65	1.04	1.69	10.75	-	-	-	-	-	-	-	-	-	-	-	-	1.36	-	2.19	3.55	22.63
5	2006	-	0.78	1.08	1.86	11.10	0.71	0.98	1.69	10.04	-	-	-	-	-	-	-	-	-	-	-	-	1.49	-	2.06	3.55	21.14
6	2007	-	0.85	1.01	1.86	10.25	0.78	0.91	1.69	9.26	-	-	-	-	-	-	-	-	-	-	-	-	1.63	-	1.92	3.55	19.51
7	2008	-	0.93	0.93	1.86	9.32	0.85	0.84	1.69	8.41	-	-	-	-	-	-	-	-	-	-	-	-	1.78	-	1.77	3.55	17.73
8	2009	-	1.01	0.85	1.86	8.31	0.92	0.77	1.69	7.49	-	-	-	-	-	-	-	-	-	-	-	-	1.93	-	1.62	3.55	15.80
9	2010	-	1.10	0.76	1.86	7.21	1.01	0.68	1.69	6.48	-	-	-	-	-	-	-	-	-	-	-	-	2.11	-	1.44	3.55	13.69
10	2011	-	1.20	0.66	1.86	6.01	1.10	0.59	1.69	5.38	-	-	-	-	-	-	-	-	-	-	-	-	2.30	-	1.25	3.55	11.39
11	2012	-	1.31	0.55	1.86	4.70	1.20	0.49	1.69	4.18	-	-	-	-	-	-	-	-	-	-	-	-	2.51	-	1.04	3.55	8.88
12	2013	-	1.43	0.43	1.86	3.27	1.31	0.38	1.69	2.87	-	-	-	-	-	-	-	-	-	-	-	-	2.74	-	0.81	3.55	6.14
13	2014	-	1.56	0.30	1.86	1.71	1.43	0.26	1.69	1.44	-	-	-	-	-	-	-	-	-	-	-	-	2.99	-	0.56	3.55	3.15
14	2015	-	1.71	0.16	1.87	-	1.44	0.13	1.57	-	-	-	-	-	-	-	-	-	-	-	-	-	3.15	-	0.29	3.44	-
15	2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	2024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	2026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	2027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		22.12	13.24	11.21	22.33		12.00	9.16	20.16		-	-	-		-	-	-		-	-	-		25.24	3.12	17.25	42.49	

International Bank Loan Repayment Schedule (Million US$) Case 1 - Outside

UNIT: Million US$

No	Year	2002 Loan					2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
		Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
-	2,001.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.33	-	-	18.01
1.00	2,002.00	16.68	-	1.33	-	18.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.76	-	-	37.27
2.00	2,003.00	16.50	-	1.44	-	19.45	-	1.32	-	17.82	-	-	-	-	-	-	-	-	-	-	-	-	0.81	-	2.99	3.80	35.46
3.00	2,004.00	-	0.42	1.56	1.98	19.03	0.39	1.43	1.82	17.43	-	-	-	-	-	-	-	-	-	-	-	-	0.89	-	2.91	3.80	35.57
4.00	2,005.00	-	0.46	1.52	1.98	18.57	0.43	1.39	1.82	17.00	-	-	-	-	-	-	-	-	-	-	-	-	0.95	-	2.85	3.80	34.62
5.00	2,006.00	-	0.49	1.49	1.98	18.08	0.46	1.36	1.82	16.54	-	-	-	-	-	-	-	-	-	-	-	-	1.03	-	2.77	3.80	33.59
6.00	2,007.00	-	0.53	1.45	1.98	17.55	0.50	1.32	1.82	16.04	-	-	-	-	-	-	-	-	-	-	-	-	1.12	-	2.68	3.80	32.47
7.00	2,008.00	-	0.58	1.40	1.98	16.97	0.54	1.28	1.82	15.50	-	-	-	-	-	-	-	-	-	-	-	-	1.20	-	2.60	3.80	31.27
8.00	2,009.00	-	0.62	1.35	1.98	16.35	0.58	1.24	1.82	14.92	-	-	-	-	-	-	-	-	-	-	-	-	1.30	-	2.50	3.80	29.97
9.00	2,010.00	-	0.67	1.31	1.98	15.68	0.63	1.19	1.82	14.29	-	-	-	-	-	-	-	-	-	-	-	-	1.41	-	2.39	3.80	28.56
10.00	2,011.00	-	0.73	1.25	1.98	14.95	0.68	1.14	1.82	13.61	-	-	-	-	-	-	-	-	-	-	-	-	1.51	-	2.29	3.80	27.05
11.00	2,012.00	-	0.78	1.20	1.98	14.17	0.73	1.09	1.82	12.88	-	-	-	-	-	-	-	-	-	-	-	-	1.64	-	2.16	3.80	25.41
12.00	2,013.00	-	0.85	1.13	1.98	13.32	0.79	1.03	1.82	12.09	-	-	-	-	-	-	-	-	-	-	-	-	1.76	-	2.04	3.80	23.65
13.00	2,014.00	-	0.91	1.07	1.98	12.41	0.85	0.97	1.82	11.24	-	-	-	-	-	-	-	-	-	-	-	-	1.91	-	1.89	3.80	21.74
14.00	2,015.00	-	0.99	0.99	1.98	11.42	0.92	0.90	1.82	10.32	-	-	-	-	-	-	-	-	-	-	-	-	2.06	-	1.74	3.80	19.68
15.00	2,016.00	-	1.07	0.91	1.98	10.35	0.99	0.83	1.82	9.33	-	-	-	-	-	-	-	-	-	-	-	-	2.22	-	1.58	3.80	17.46
16.00	2,017.00	-	1.15	0.83	1.98	9.20	1.07	0.75	1.82	8.26	-	-	-	-	-	-	-	-	-	-	-	-	2.40	-	1.40	3.80	15.06
17.00	2,018.00	-	1.24	0.74	1.98	7.96	1.16	0.66	1.82	7.10	-	-	-	-	-	-	-	-	-	-	-	-	2.59	-	1.21	3.80	12.47
18.00	2,019.00	-	1.34	0.64	1.98	6.62	1.25	0.57	1.82	5.85	-	-	-	-	-	-	-	-	-	-	-	-	2.80	-	1.00	3.80	9.67
19.00	2,020.00	-	1.45	0.53	1.98	5.17	1.35	0.47	1.82	4.50	-	-	-	-	-	-	-	-	-	-	-	-	3.03	-	0.77	3.80	6.64
20.00	2,021.00	-	1.57	0.41	1.98	3.60	1.46	0.36	1.82	3.04	-	-	-	-	-	-	-	-	-	-	-	-	3.27	-	0.53	3.80	3.37
21.00	2,022.00	-	1.69	0.29	1.98	1.91	1.58	0.24	1.82	1.46	-	-	-	-	-	-	-	-	-	-	-	-	3.37	-	0.27	3.64	-
22.00	2,023.00	-	1.91	0.15	2.06	-	1.46	0.12	1.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23.00	2,024.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	2,025.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25.00	2,026.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26.00	2,027.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	2,028.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28.00	2,029.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29.00	2,030.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	2,031.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		33.18	19.45	23.00	39.68		17.82	19.66	36.16		-	-	-		-	-	-		-	-	-		37.27	4.09	38.57	75.84	

FIRR Case 2-O

Project Amatitlan Geothermal
Subject FIRR - Case 2-Outside
File Name
Date 1999/5/21
Rev. 2001/10/12

財務內部收益率(FIRR), Case 2 - Outside
Financial Internal Rate of Return

FIRR = 10.87%

			Project Undertaking									
No	Year	Project Cost	Salable Energy	Supple. Wells	O&M for Steam Prod.	O&M for P. Plant	Steam Cost	Tax	Generat. Cost Ttl	Project Cost Total	Revenue	Balance
		MM$	GWh	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	27.80	-	-	-	-	-	-	-	27.80	-	(27.80)
2	2003	27.50	-	-	-	-	-	-	-	27.50	-	(27.50)
3	2004	-	145.01	-	1.13	0.30	1.70	1.60	4.73	4.73	11.60	6.87
4	2005	23.54	145.01	-	1.13	0.30	1.70	1.60	4.73	28.27	11.60	(16.67)
5	2006	22.47	145.01	-	1.13	0.30	1.70	1.60	4.73	27.20	11.60	(15.60)
6	2007	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
7	2008	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
8	2009	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
9	2010	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
10	2011	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
11	2012	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
12	2013	-	290.01	-	1.35	1.35	3.39	4.28	10.38	10.38	23.20	12.82
13	2014	-	290.01	-	1.35	1.35	3.39	4.69	10.79	10.79	23.20	12.41
14	2015	-	290.01	-	1.35	1.35	3.39	4.69	10.79	10.79	23.20	12.41
15	2016	-	290.01	4.53	1.35	1.35	3.39	3.14	13.77	13.77	23.20	9.43
16	2017	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
17	2018	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
18	2019	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
19	2020	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
20	2021	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
21	2022	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
22	2023	-	290.01	-	1.35	1.35	3.39	4.55	10.65	10.65	23.20	12.55
23	2024	-	290.01	-	1.35	1.35	3.39	5.16	11.26	11.26	23.20	11.94
24	2025	-	290.01	-	1.35	1.35	3.39	5.16	11.26	11.26	23.20	11.94
25	2026	-	290.01	-	1.35	1.35	3.39	5.30	11.40	11.40	23.20	11.80
26	2027	-	290.01	-	1.35	1.35	3.39	5.30	11.40	11.40	23.20	11.80
27	2028	-	290.01	-	1.35	1.35	3.39	5.30	11.40	11.40	23.20	11.80
28	2029	-	145.01	-	1.13	0.30	1.70	2.63	5.76	5.76	11.60	5.84
29	2030	-	145.01	-	1.13	0.30	1.13	2.63	5.18	5.18	11.60	6.42
30	2031	-	145.01	-	1.13	0.30	1.13	2.63	4.06	4.06	11.60	11.60
Total		101.31	7,250.25	4.53	36.56	31.58	83.64	113.24	268.41	369.72	580.00	214.34

Profit And Loss Statement
損益計算書. Case 2 – Outside

		Project Undertaking																
		Sales Revenue			Operating Cost			Steam Cost	Depreciation			Cost	Profit		Profit	Interest Payment			Net
No.	Year	Generated Energy	Salable Energy	Revenue	Supple. Well	O&M Steam	O&M P. Plant		Steam Supply	Power Plant	Total			Tax	After Tax	Japan Bank	Int'l Bank	Total	INCOME
		GWH	GWH	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2002		-	-	-	-	-	-	-	-	-	-	-	-	-	1.01	1.33	2.34	(2.34)
2	2003		-	-	-	-	-	-	-	-	-	-	-	-	-	2.11	2.76	4.87	(4.87)
3	2004	154.18	145.01	11.60	-	1.13	0.30	1.70	1.32	1.98	6.43	5.17	1.60	3.57	2.30	2.99	5.29	(1.72)
4	2005	154.18	145.01	11.60	-	1.13	0.30	1.70	1.32	1.98	6.43	5.17	1.60	3.57	3.05	4.04	7.09	(3.52)
5	2006	154.18	145.01	11.60	-	1.13	0.30	1.70	1.32	1.98	6.43	5.17	1.60	3.57	3.94	5.15	9.09	(5.52)
6	2007	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	4.32	5.25	9.57	(0.05)
7	2008	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	4.05	5.11	9.16	0.36
8	2009	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	3.76	4.97	8.73	0.79
9	2010	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	3.45	4.80	8.25	1.27
10	2011	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	3.11	4.63	7.74	1.78
11	2012	308.35	290.01	23.20	-	1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	2.72	4.46	7.18	2.34
12	2013	308.35	290.01	23.20		1.35	1.35	3.39	1.32	1.98	9.40	13.80	4.28	9.52	2.32	4.25	6.57	2.95
13	2014	308.35	290.01	23.20	-	1.35	1.35	3.39	-	1.98	8.08	15.12	4.69	10.43	1.87	4.04	5.91	4.52
14	2015	308.35	290.01	23.20	-	1.35	1.35	3.39	-	1.98	8.08	15.12	4.69	10.43	1.38	3.80	5.18	5.25
15	2016	308.35	290.01	23.20	4.53	1.35	1.35	3.39	0.45	1.98	13.06	10.14	3.14	7.00	0.84	3.55	4.39	2.61
16	2017	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	0.59	3.28	3.87	6.25
17	2018	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	0.30	2.98	3.28	6.84
18	2019	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	2.67	2.67	7.45
19	2020	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	2.32	2.32	7.80
20	2021	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	1.94	1.94	8.18
21	2022	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	1.54	1.54	8.58
22	2023	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	1.98	8.53	14.67	4.55	10.12	-	1.11	1.11	9.01
23	2024	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	-	6.55	16.65	5.16	11.49	-	0.65	0.65	10.84
24	2025	308.35	290.01	23.20	-	1.35	1.35	3.39	0.45	-	6.55	16.65	5.16	11.49	-	0.46	0.46	11.03
25	2026	308.35	290.01	23.20	-	1.35	1.35	3.39	-	-	6.10	17.10	5.30	11.80	-	0.24	0.24	11.56
26	2027	308.35	290.01	23.20	-	1.35	1.35	3.39	-	-	6.10	17.10	5.30	11.80	-	-	-	11.80
27	2028	308.35	290.01	23.20	-	1.35	1.35	3.39	-	-	6.10	17.10	5.30	11.80	-	-	-	11.80
28	2029	154.18	145.01	11.60	-	1.13	0.30	1.70	-	-	3.13	8.47	2.63	5.84	-	-	-	5.84
29	2030	154.18	145.01	11.60	-	1.13	0.30	1.70	-	-	3.13	8.47	2.63	5.84	-	-	-	5.84
30	2031	154.18	145.01	11.60	-	1.13	0.30	1.70	-	-	3.13	8.47	2.63	5.84	-	-	-	5.84
Total			7,250.25	580.00		36.56	31.58	84.78	17.73	39.60	214.77	365.23	113.24	251.99	41.12	78.32	119.44	132.55

FIRR Case 2-O

Cash Flow Statement
キャッシュフロー ,Case 2 - Outside

			Cash Flow Out				Cash Flow In				Balance	
No	Year	Loan	Net Income	Dep. Steam Facilities	Dep. P. Plant Facilities	Total	Project Cost	Japn Bank Principal Payment	Int'l Bank Principal Payment	Total	Annual Balance	Balance
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	27.80	(2.34)	-	-	25.46	27.80	-	-	27.80	(2.34)	(2.34)
2	2003	27.50	(4.87)	-	-	22.63	27.50	-	-	27.50	(4.87)	(7.21)
3	2004	-	(1.72)	1.32	1.98	1.58	-	1.25	-	1.25	0.34	(6.87)
4	2005	23.54	(3.52)	1.32	1.98	23.32	23.54	1.36	1.43	26.33	(3.00)	(9.87)
5	2006	22.47	(5.52)	1.32	1.98	20.25	22.47	1.49	1.56	25.52	(5.26)	(15.13)
6	2007	-	(0.05)	1.32	1.98	3.25	-	2.91	1.67	4.58	(1.32)	(16.46)
7	2008	-	0.36	1.32	1.98	3.66	-	3.18	1.81	4.99	(1.32)	(17.78)
8	2009	-	0.79	1.32	1.98	4.09	-	3.47	1.95	5.42	(1.32)	(19.11)
9	2010	-	1.27	1.32	1.98	4.57	-	3.78	2.11	5.89	(1.31)	(20.42)
10	2011	-	1.78	1.32	1.98	5.08	-	4.12	2.28	6.40	(1.31)	(21.73)
11	2012	-	2.34	1.32	1.98	5.64	-	4.51	2.46	6.97	(1.32)	(23.06)
12	2013	-	2.95	1.32	1.98	6.25	-	4.91	2.65	7.57	(1.31)	(24.37)
13	2014	-	4.52	-	1.98	6.50	-	5.36	2.86	8.22	(1.71)	(26.09)
14	2015	-	5.25	-	1.98	7.23	-	5.88	3.10	8.98	(1.74)	(27.83)
15	2016	-	2.61	0.45	1.98	5.04	-	2.84	3.35	6.19	(1.15)	(28.98)
16	2017	-	6.25	0.45	1.98	8.68	-	3.09	3.62	6.71	1.97	(27.01)
17	2018	-	6.84	0.45	1.98	9.27	-	3.32	3.91	7.23	2.04	(24.96)
18	2019	-	7.45	0.45	1.98	9.88	-	-	4.21	4.21	5.67	(19.29)
19	2020	-	7.80	0.45	1.98	10.23	-	-	4.55	4.55	5.68	(13.61)
20	2021	-	8.18	0.45	1.98	10.61	-	-	4.92	4.92	5.69	(7.92)
21	2022	-	8.58	0.45	1.98	11.01	-	-	5.32	5.32	5.69	(2.23)
22	2023	-	9.01	0.45	1.98	11.44	-	-	5.74	5.74	5.70	3.48
23	2024	-	10.84	0.45	-	11.29	-	-	5.90	5.90	5.39	8.86
24	2025	-	11.03	0.45	-	11.48	-	-	-	-	11.48	20.35
25	2026	-	11.56	-	-	11.56	-	-	-	-	11.56	31.91
26	2027	-	11.80	-	-	11.80	-	-	-	-	11.80	43.71
27	2028	-	11.80	-	-	11.80	-	-	-	-	11.80	55.51
28	2029	-	5.84	-	-	5.84	-	-	-	-	5.84	61.36
29	2030	-	5.84	-	-	5.84	-	-	-	-	5.84	67.20
30	2031		5.84	-	-	5.84	-	-	-	-	5.84	73.04
Total		101.31	132.55	17.73	39.60	291.19	101.31	51.42	65.41	218.14	73.04	-93.10

Debt Service Ratio, Case 3 - Outside

No	Year	Cash Generation				Loan Payment				
		Operating Revenue	Depreciation	Total	Total	Interest Payment	Principal Payment	Total	Accumu. Total	Dept Service Ratio
		MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	
0	2001	-	-	-	-	-	-	-	-	-
1	2002	-	-	-	-	2.34	-	2.34	2.34	-
2	2003	-	-	-	-	4.87	-	4.87	7.21	-
3	2004	3.57	3.30	6.87	6.87	5.29	1.25	6.54	13.75	0.50
4	2005	3.57	3.30	6.87	13.75	7.09	2.79	9.88	23.62	0.58
5	2006	3.57	3.30	6.87	20.62	9.09	3.05	12.14	35.76	0.58
6	2007	9.52	3.30	12.82	33.44	9.57	4.58	14.15	49.90	0.67
7	2008	9.52	3.30	12.82	46.26	9.16	4.99	14.15	64.05	0.72
8	2009	9.52	3.30	12.82	59.09	8.73	5.42	14.15	78.19	0.76
9	2010	9.52	3.30	12.82	71.91	8.25	5.89	14.14	92.33	0.78
10	2011	9.52	3.30	12.82	84.73	7.74	6.40	14.14	106.47	0.80
11	2012	9.52	3.30	12.82	97.55	7.18	6.97	14.15	120.61	0.81
12	2013	9.52	3.30	12.82	110.38	6.57	7.57	14.14	134.75	0.82
13	2014	10.43	1.98	12.41	122.79	5.91	8.22	14.13	148.87	0.82
14	2015	10.43	1.98	12.41	135.20	5.16	8.98	14.16	163.03	0.83
15	2016	7.00	2.43	9.43	144.63	4.39	6.19	10.58	173.61	0.83
16	2017	10.12	2.43	12.55	157.18	3.87	6.71	10.58	184.19	0.85
17	2018	10.12	2.43	12.55	169.74	3.28	7.23	10.51	194.70	0.87
18	2019	10.12	2.43	12.55	182.29	2.67	4.21	6.88	201.58	0.90
19	2020	10.12	2.43	12.55	194.84	2.32	4.55	6.87	208.45	0.93
20	2021	10.12	2.43	12.55	207.39	1.94	4.92	6.86	215.31	0.96
21	2022	10.12	2.43	12.55	219.94	1.54	5.32	6.86	222.17	0.99
22	2023	10.12	2.43	12.55	232.50	1.11	5.74	6.85	229.02	1.02
23	2024	11.49	0.45	11.94	244.44	0.65	5.90	6.55	235.57	1.04
24	2025	11.49	0.45	11.94	256.38	0.46	-	0.46	236.03	1.09
25	2026	11.80	-	11.80	268.18	0.24	-	0.24	236.27	1.14
26	2027	11.80	-	11.80	279.98	-	-	-	236.27	1.19
27	2028	11.80	-	11.80	291.79	-	-	-	236.27	1.23
28	2029	5.84	-	5.84	297.63	-	-	-	236.27	1.26
29	2030	5.84	-	5.84	303.47	-	-	-	-	-
30	2031	5.84	-	5.84	309.32	-	-	-	-	-
Total		251.99	57.33	309.32	4,562.29	119.44	116.83	236.27		

Project: Amatitlan Geothermal, Case 2 Outside
Subject: Repayment Schedule, Case 2-Outside
File Name:
Date:
Rev.: ########

FOR REPAYMENT SCHEDULE

YEAR	Total	Japan 40%	Intl 60%	TOTAL
	MM$	MM$	MM$	MM$
1	27.80	11.12	16.68	27.80
2	27.50	11.00	16.50	27.50
3	-	-	-	-
4	23.54	9.42	14.12	23.54
5	22.47	8.99	13.48	22.47
6	-	-	-	-
	101.31	40.52	60.79	101.31

LOAN TERM		Japan	Intl
Interest	%	9.11%	8.00%
Grace P.	Year	3	3
Repayment	Years	12	20
WACC			8.44%

Japan Bank Loan Repayment Schedule (Million US$), Case 2 Outside

UNIT: Million US$

		2002 Loan				2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
0	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	12.13
1	2002	11.12	-	1.01	-	12.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.11	-	-	25.24
2	2003	11.00	-	1.11	-	13.24	-	1.00	-	12.00	-	-	-	-	-	-	-	-	-	-	-	-	1.25	-	2.30	3.55	24.00
3	2004	-	0.65	1.21	1.86	12.59	0.60	1.09	1.69	11.41	-	-	-	-	-	-	-	-	-	-	-	-	1.35	0.86	2.19	3.55	34.26
4	2005	9.42	0.71	1.15	1.86	11.88	0.65	1.04	1.69	10.76	-	-	-	-	-	0.86	-	11.62	-	-	-	-	1.49	1.88	2.06	3.55	47.34
5	2006	8.99	0.78	1.08	1.86	11.10	0.71	0.98	1.69	10.06	-	-	-	-	-	1.06	-	12.68	-	0.62	-	13.50	2.91	-	4.32	7.23	44.43
6	2007	-	0.85	1.01	1.86	10.25	0.77	0.92	1.69	9.29	-	-	-	-	0.62	1.16	1.78	12.06	0.67	1.23	1.90	12.83	3.18	-	4.05	7.23	41.25
7	2008	-	0.93	0.93	1.86	9.32	0.84	0.85	1.69	8.46	-	-	-	-	0.68	1.10	1.78	11.38	0.73	1.17	1.90	12.10	3.18	-	3.76	7.23	37.79
8	2009	-	1.01	0.85	1.86	8.31	0.92	0.77	1.69	7.54	-	-	-	-	0.74	1.04	1.78	10.64	0.80	1.10	1.90	11.30	3.47	-	3.45	7.23	34.01
9	2010	-	1.10	0.76	1.86	7.21	1.00	0.68	1.69	6.55	-	-	-	-	0.81	0.97	1.78	9.83	0.87	1.03	1.90	10.43	3.78	-	3.11	7.23	29.90
10	2011	-	1.20	0.66	1.86	6.01	1.09	0.60	1.69	5.46	-	-	-	-	0.88	0.90	1.78	8.95	0.95	0.95	1.90	9.48	4.12	-	2.72	7.23	25.39
11	2012	-	1.31	0.55	1.86	4.70	1.19	0.50	1.69	4.28	-	-	-	-	0.97	0.81	1.78	7.97	1.04	0.86	1.90	8.44	4.51	-	2.32	7.23	20.48
12	2013	-	1.43	0.43	1.86	3.27	1.30	0.39	1.69	2.98	-	-	-	-	1.05	0.73	1.78	6.92	1.13	0.77	1.90	7.31	4.91	-	1.87	7.23	15.13
13	2014	-	1.56	0.30	1.86	1.71	1.42	0.27	1.69	1.57	-	-	-	-	1.15	0.63	1.78	5.77	1.23	0.67	1.90	6.08	5.36	-	1.38	7.26	9.25
14	2015	-	1.71	0.16	1.87	-	1.57	0.14	1.71	-	-	-	-	-	1.25	0.53	1.78	4.52	1.35	0.55	1.90	4.73	5.88	-	0.84	3.68	6.41
15	2016	-	-	-	-	-	-	-	-	-	-	-	-	-	1.37	0.41	1.78	3.15	1.47	0.43	1.90	3.26	2.84	-	0.59	3.68	3.32
16	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	1.49	0.29	1.78	1.66	1.60	0.30	1.90	1.66	3.09	-	0.30	3.62	-
17	2018	-	-	-	-	-	-	-	-	-	-	-	-	-	1.66	0.15	1.81	-	1.66	0.15	1.81	-	3.32	-	-	-	-
18	2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	2024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	2026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	2027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		40.52	13.24	11.21	22.33		12.00	9.24	20.24		-	-	-		12.68	10.64	21.40		13.50	10.03	22.71		51.42	5.86	35.26	86.66	

International Bank Loan Repayment Schedule (Million US$) Case 2 - Outside

UNIT: Million US$

		2002 Loan					2003 Loan				2004 Loan				2005 Loan				2006 Loan				TOTAL				
No	Year	Loan	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest	Repay-ment	Outstand-ing Balance	Principal	Interest in grace period	Interest	Repay-ment	Outstand-ing Balance
-	2,001.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.33	-	-	18.01
1.00	2,002.00	16.68	-	1.33	-	18.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.76	-	-	37.27
2.00	2,003.00	16.50	-	1.44	-	19.45	-	1.32	-	17.82	-	-	-	-	-	-	-	-	-	-	-	-	0.81	-	2.99	3.80	36.46
3.00	2,004.00	-	0.42	1.56	1.98	19.03	0.39	1.43	1.82	17.43	-	-	-	-	-	-	-	-	-	-	-	-	0.89	1.13	2.91	3.80	50.82
4.00	2,005.00	14.12	0.46	1.52	1.98	18.57	0.43	1.39	1.82	17.00	-	-	-	-	-	1.13	-	15.25	-	-	-	-	0.95	2.30	2.85	3.80	65.66
5.00	2,006.00	13.46	0.49	1.49	1.98	18.08	0.46	1.36	1.82	16.54	-	-	-	-	-	1.22	-	16.47	-	1.08	-	14.56	1.71	-	5.25	6.96	63.95
6.00	2,007.00	-	0.53	1.45	1.98	17.55	0.50	1.32	1.82	16.04	-	-	-	-	0.36	1.32	1.68	15.11	0.32	1.16	1.48	14.24	1.85	-	5.11	6.96	62.10
7.00	2,008.00	-	0.58	1.40	1.98	16.97	0.54	1.28	1.82	15.50	-	-	-	-	0.39	1.29	1.68	15.72	0.34	1.14	1.48	13.90	1.99	-	4.97	6.96	60.11
8.00	2,009.00	-	0.62	1.36	1.98	16.35	0.58	1.24	1.82	14.92	-	-	-	-	0.42	1.26	1.68	15.30	0.37	1.11	1.48	13.53	2.16	-	4.80	6.96	57.95
9.00	2,010.00	-	0.67	1.31	1.98	15.68	0.63	1.19	1.82	14.29	-	-	-	-	0.46	1.22	1.68	14.84	0.40	1.08	1.48	13.13	2.33	-	4.63	6.96	55.62
10.00	2,011.00	-	0.73	1.25	1.98	14.95	0.68	1.14	1.82	13.61	-	-	-	-	0.49	1.19	1.68	14.35	0.43	1.05	1.48	12.70	2.50	-	4.46	6.96	53.12
11.00	2,012.00	-	0.78	1.20	1.98	14.17	0.73	1.09	1.82	12.88	-	-	-	-	0.53	1.15	1.68	13.82	0.46	1.02	1.48	12.24	2.71	-	4.25	6.96	50.41
12.00	2,013.00	-	0.85	1.13	1.98	13.32	0.79	1.03	1.82	12.09	-	-	-	-	0.57	1.11	1.68	13.25	0.50	0.98	1.48	11.74	2.92	-	4.04	6.96	47.49
13.00	2,014.00	-	0.91	1.07	1.98	12.41	0.85	0.97	1.82	11.24	-	-	-	-	0.62	1.06	1.68	12.63	0.54	0.94	1.48	11.20	3.16	-	3.80	6.96	44.33
14.00	2,015.00	-	0.99	0.99	1.98	11.42	0.92	0.90	1.82	10.32	-	-	-	-	0.67	1.01	1.68	11.96	0.58	0.90	1.48	10.62	3.41	-	3.55	6.96	40.92
15.00	2,016.00	-	1.07	0.91	1.98	10.35	0.99	0.83	1.82	9.33	-	-	-	-	0.72	0.96	1.68	11.24	0.63	0.85	1.48	9.99	3.68	-	3.28	6.96	37.24
16.00	2,017.00	-	1.15	0.83	1.98	9.20	1.07	0.75	1.82	8.26	-	-	-	-	0.78	0.90	1.68	10.46	0.68	0.80	1.48	9.31	3.98	-	2.98	6.96	33.26
17.00	2,018.00	-	1.24	0.74	1.98	7.96	1.16	0.66	1.82	7.10	-	-	-	-	0.84	0.84	1.68	9.62	0.74	0.74	1.48	8.57	4.29	-	2.67	6.96	28.97
18.00	2,019.00	-	1.34	0.64	1.98	6.62	1.25	0.57	1.82	5.85	-	-	-	-	0.91	0.77	1.68	8.71	0.79	0.69	1.48	7.78	4.64	-	2.32	6.96	24.33
19.00	2,020.00	-	1.45	0.53	1.98	5.17	1.35	0.47	1.82	4.50	-	-	-	-	0.98	0.70	1.68	7.73	0.86	0.62	1.48	6.92	5.02	-	1.94	6.96	19.31
20.00	2,021.00	-	1.57	0.41	1.98	3.60	1.46	0.36	1.82	3.04	-	-	-	-	1.06	0.62	1.68	6.67	0.93	0.55	1.48	5.99	5.42	-	1.54	6.96	13.89
21.00	2,022.00	-	1.69	0.29	1.98	1.91	1.58	0.24	1.82	1.46	-	-	-	-	1.15	0.53	1.68	5.52	1.00	0.48	1.48	4.99	5.89	-	1.11	6.80	8.20
22.00	2,023.00	-	1.91	0.15	2.06	-	1.46	0.12	1.58	-	-	-	-	-	1.24	0.44	1.68	4.28	1.08	0.40	1.48	3.91	2.51	-	0.65	3.16	5.69
23.00	2,024.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.34	0.34	1.68	2.94	1.17	0.31	1.48	2.74	2.70	-	0.46	3.16	2.99
24.00	2,025.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.44	0.24	1.68	1.50	1.26	0.22	1.48	1.48	2.99	-	0.24	3.23	-
25.00	2,026.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.50	0.12	1.62	-	1.48	0.12	1.60	-	-	-	-	-	-
26.00	2,027.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	2,028.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28.00	2,029.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29.00	2,030.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	2,031.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		60.79	19.45	23.00	39.68		17.82	19.56	36.16		-	-	-	-	16.47	19.42	33.54		14.56	16.24	29.72		68.31	7.52	70.80	139.11	

FIRR Case 3-O

Project Amatitlan Geothermal
Subject FIRR - Case 3-Outside
File Name
Date 1999/5/21
Rev. 2001/10/12

財務內部收益率(FIRR), Case 3 - Outside
Financial Internal Rate of Return

FIRR = 13.40%

			Project Undertaking									
No	Year	Project Cost	Salable Energy	Supple. Wells	O&M for Steam Prod.	O&M for P. Plant	Steam Cost	Tax	Generat. Cost Ttl	Project Cost Total	Revenue	Balance
		MM$	GWh	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$	MM$
0	2001	-	-	-	-	-	-	-	-	-	-	-
1	2002	40.65	-	-	-	-	-	-	-	40.65	-	(40.65)
2	2003	43.18	-	-	-	-	-	-	-	43.18	-	(43.18)
3	2004	6.90	217.51	-	1.02	0.45	2.54	2.47	6.47	13.37	17.40	4.03
4	2005	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
5	2006	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
6	2007	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
7	2008	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
8	2009	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
9	2010	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
10	2011	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
11	2012	-	290.01	-	1.35	0.60	3.39	3.85	9.19	9.19	23.20	14.01
12	2013	-	290.01	4.26	1.35	0.60	3.39	2.53	12.13	12.13	23.20	11.07
13	2014	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
14	2015	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
15	2016	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
16	2017	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
17	2018	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
18	2019	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
19	2020	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
20	2021	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
21	2022	-	290.01	-	1.35	0.60	3.39	4.34	9.68	9.68	23.20	13.52
22	2023	-	290.01	-	1.35	0.60	3.39	4.47	9.81	9.81	23.20	13.39
23	2024	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
24	2025	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
25	2026	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
26	2027	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
27	2028	-	290.01	-	1.35	0.60	3.39	5.54	10.88	10.88	23.20	12.32
28	2029	-	72.50	-	0.34	0.15	0.85	1.38	2.72	2.72	5.80	3.08
29	2030	-	-	-	-	-	-	-	-	-	-	-
30	2031	-	-	-	-	-	-	-	-	-	-	-
Total		90.72	7,250.25	4.26	33.85	14.91	84.75	108.41	246.17	336.90	580.00	243.10