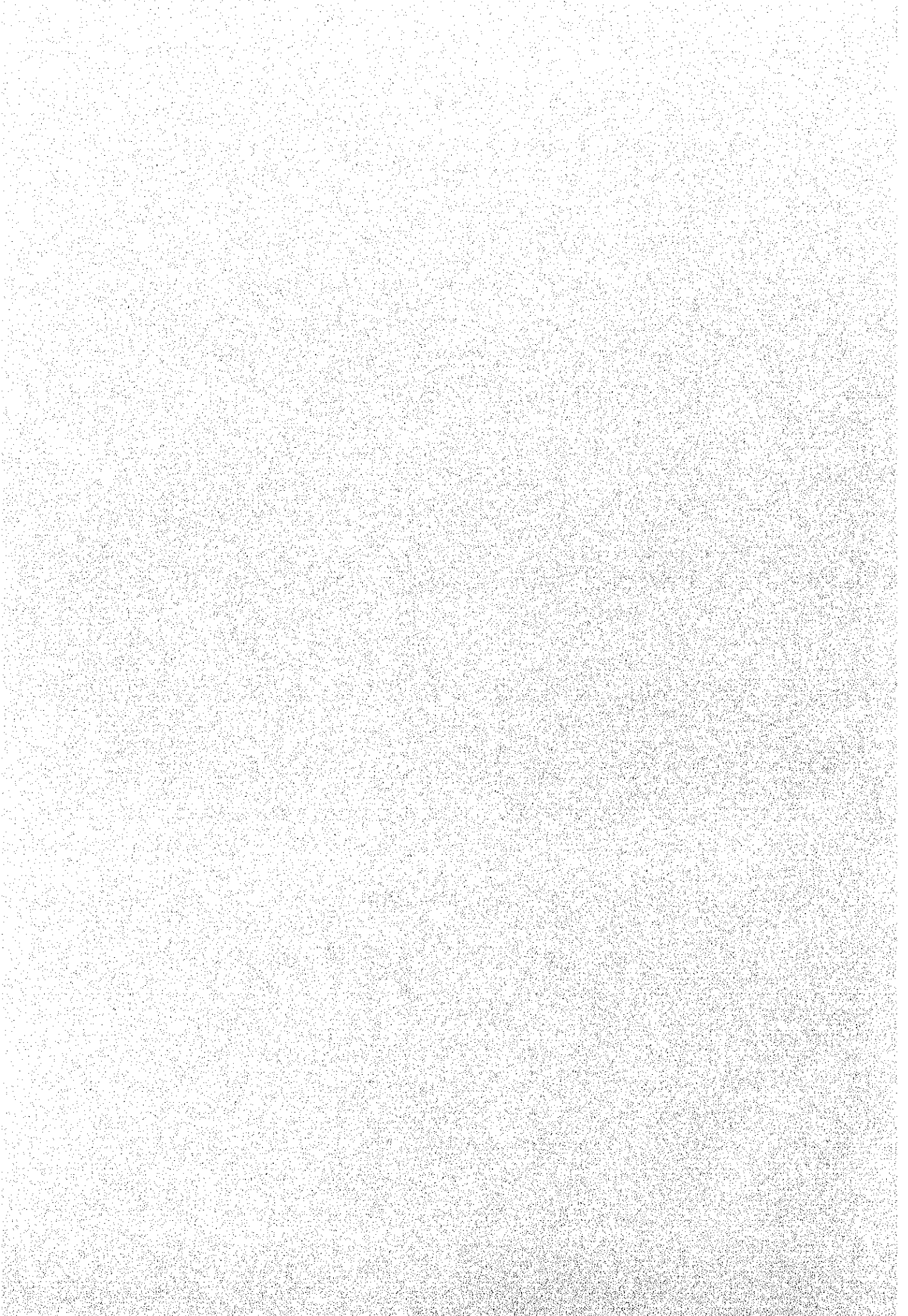


付 録



APPLICATION FOR THE TECHNICAL COOPERATION
(DEVELOPMENT STUDY)
BY THE GOVERNMENT OF JORDAN

*(THE PROJECT TO COMPLEMENT THE PREVIOUS TECHNICAL
COOPERATION PROJECT "THE STUDY OF ELECTRIC POWER LOSS
REDUCTION")*

1. Project digest

- (1) **Project Title :** Feasibility Study of the first period of the feasibility recommended by Electric Power loss Reduction Study
- (2) **Location :** Jordan/National Electric Power Company (NEPCO)
- (3) -1 **Responsible Agency :** Ministry of Planning

-2 **Executing Agency :** NEPCO (JEPCO and IDECO will cooperate)
- (4) **Justification of the Project :** Implementation of RECOMMENDATIONS (Chapter 8) of Final Report of the Study on Electric Power Loss Reduction of Transmission and Distribution Networks in the Hashemite Kingdom of Jordan is the purpose of the project. This Final Report was prepared by Tokyo Electric Power Service Co., LTD.(TEPSCO) and presented to Jordan in June 1997 through JICA. In face of the high electric power loss rate in the transmission and distribution networks and increasing trend of it, the Government of Jordan requested to the Government of Japan to study it and to propose a useful countermeasures for it. The Government of Japan decided to conduct the Master Plan Study on electric power loss reduction of transmission and distribution networks and entrusted the study to Japan International Corporation Agency (JICA). JICA sent a study team consists of TEPSCO to Jordan four times from February 1996 to 1997. The team studied the situations in Jordan and made the Final Report. In the Final Report, TEPSCO proposed five alternative plans all of which are useful, and recommended that in order to implement the best plan, the feasibility study should be done in three periods during coming 10 years and the feasibility study for first period should be done by cooperation work with consultant of foreign countries and Jordan engineers. Therefore the Government of Jordan is going to request in this application the technical cooperation on this project.
- (5) **Desirable or schedule time of commencement of the Project :** April, 1998. The Government of Jordan is executing a preparation work for the feasibility study with Japanese expert who is dispatched by JICA

- (6) **Prospective funding source and/or assistance** : JICA/Government of Japan
(7) **Other relevant project , if any** : No.

2. Terms of Reference of the proposed Study

- (1) **Necessity/Justification of the Study** : A feasibility study is essential for implementation of RECOMMENDATIONS of Final Report of "The Study on Loss Reduction of Transmission and Distribution Networks in the Hashemite Kingdom of Jordan" carried out by TEPSCO. Without feasibility study, it may be difficult to execute the project from the engineering and financial reasons
- (2) **Objectives of the Study** : Preparing feasibility study for the first period (750 feeders) of Master Plan. The second (for 2,150 feeders) and third period (for 3,500 feeders) will be carried out by Jordan engineers in due course.
- (3) **Study Area** : Transmission and Distribution Networks in all Jordan country.
- (4) **Scope of Study** : Preparing Feasibility Study for the first period.
- A) The roles of the Consultant from Japan are as follows:
- Preparing of a feasibility study for improvement of power factor
 - Studying of establishment of execution organization in the above
 - Promoting training of local engineers of regional offices
 - Establishing of study team
 - Load forecast
 - Setting of guidelines for the amount of investment by the respective companies
 - Estimation of unit construction cost
 - Optimizing calculation with needed software
 - Training on calculation methods
 - Feasibility design
 - Preparation of work schedule
 - Arranging final plan
 - Economic evaluation
- B) The roles of power utilities in Jordan are as follows:
- Collection of necessary data and site survey
 - Assistance in calculation
 - Check of the adaptability of planning and designing
- Feasibility studies of the second and third period, and construction works will be carried out by Jordanian power utilities.
- (5) **Study Schedules** : Around 6 months for 7persons (40-45 M/M)
- (6) **Other relevant information** : Available FINAL REPORT from JICA.

QUESTIONNAIRE

December, 1998

JAPAN INTERNATIONAL COOPERATION AGENCY

CONTENTS OF QUESTIONNAIRE

1. General Information
2. Electric Power Situation
3. Activities based on the Recommendation of the Master Plan Study (M/P) and Preparation of the Feasibility Study (F/S)
4. Required Data for Planning in the F/S
5. Topographic Map
6. Geological Data
7. Meteorological Data
8. Environment and Compensation
9. Inland Transportation Data
10. Cost Data

Notes:

1. This questionnaire is prepared to confirm availability of the latest data and information for the above subjects. It is kindly requested to indicate whether the data are available or not, in the column of Availability with the following legend.

[Legend] A: Available ... To be provided this time

B: Available ... To be prepared at the stage of Feasibility Study

C: Not available

2. The questionnaire includes the items already obtained by the previous mission. If any revised or updated information is available, it is kindly requested to provide the latest one. Technical information is also necessary to identify or reconfirm for up-grating or replacing the power distribution equipment especially for the project area.

3. The Project area means the area supplied from the candidate site or route for the first stage feeders construction.

1. General Information

Item	Description	Availability	Remarks
1. Information of Relevant Power Utility Companies	<ul style="list-style-type: none"> a) Annual reports of NEPCO, JEPCO and IDECO b) Power development plans for the power sector as well as each company 	A	5 years plan available
2. Statistics	<ul style="list-style-type: none"> a) GNP, population, economics indices, etc. 		Available
3. Economic Development Plan	<ul style="list-style-type: none"> a) National economic development plan 		Drafting stage
4. Privatization Situation	<ul style="list-style-type: none"> a) Privatization policy of NEPCO b) Present situation of NEPCO privatization and its prospect c) Functions after privatization 	A	
5. Status or Priority of the Power Loss Reduction Plan	<ul style="list-style-type: none"> a) Status or priority of the plan in the national economic development plan and power development plan in each company 	A	

2. Electric Power Situation	Item	Description	Availability	Remarks
1. Existing Power Supply Systems for each Power Utility Company	<ul style="list-style-type: none"> a) Power plants b) Substations (installed capacities and number of stations for HV/MV systems) c) Transmission lines d) Telecommunication systems including SCADA e) Single line diagrams for HV and MV systems f) Service area maps 			Available
2. Existing Power Distribution Facilities	<ul style="list-style-type: none"> a) Substations (installed capacities, etc.) b) Distribution lines (including cables) c) Schematic and single line diagrams 			Available
3. Power Supply Records	<ul style="list-style-type: none"> a) Power/energy generated, sent-out and sold b) Load curve 		A (see Annual report)	
4. Power Demand and Consumption Records	<ul style="list-style-type: none"> a) Power/energy demand/consumption by categories b) Number of consumers 		A (see Annual report)	

<p>5. Power and Energy Losses</p>	<ul style="list-style-type: none"> a) Consumption in each power plant b) Transmission loss c) Substation loss d) Distribution loss e) Non-technical losses 	<p>A (see Annual report)</p>	
<p>6. Demand Forecast</p>	<ul style="list-style-type: none"> a) Long term power/energy demand forecast b) Load density forecast 	<p>A C</p>	
<p>7. Power Development Plan by 2010</p>	<ul style="list-style-type: none"> a) Power plants b) Substations c) Transmission lines and distribution lines 	<p>A</p>	
<p>8. Reliability</p>	<ul style="list-style-type: none"> a) Number of power failure and stoppage per annum b) Time duration of power failure per annum c) Major reasons of the stoppage d) Improvement plans 		<p>Partly available (to be checked)</p>
<p>9. Impedance maps</p>	<ul style="list-style-type: none"> a) Impedance map for HV and MV network and impedance map for distribution networks 		<p>Available</p>

3. Activities based on the Recommendation of the Master Plan Study (M/P) and Preparation of the Feasibility Study (F/S)

Item	Description	Availability	Remarks
1. Improvement of Unbalanced Current	<ul style="list-style-type: none"> a) Activities conducted after the completion of the M/P b) Areas and number of 415 V feeders improved and method of the feeders selection c) Results of the improvement (current, voltage drop, power loss before and after the implementation) 		Improvement work being continued
2. Improvement of Power Factor	<ul style="list-style-type: none"> a) Present situation of the improvement work b) Budget and work force allocated to the work c) Progress of planning (number of feeders to be installed, places and required number of capacitors, availability of purchasing small size capacitors) d) Method of the feeders selection e) Results of the improvement 		Improvement work being continued
3. Selection of the MV and LV Feeders for the F/S (for the enhancement of power systems)	<ul style="list-style-type: none"> a) Areas and Number of the feeders selected for each company b) Method of approximately 750 feeders selection 	A	

4. Data Collection for the Feeders	<ul style="list-style-type: none"> a) Type of data being collected (current, voltage, kW, kWh, power factor, etc.) b) Progress of the data being collected c) Details of feeders (line size, current, physical conditions, pole strength, etc.) d) Route maps e) Installation method 		予備調査報告書参照
5. Working Group	<ul style="list-style-type: none"> a) Establishment of the working group for conducting the F/S together with Japanese members 		

4. Required Data for Planning in the F/S

Item	Description	Availability	Remarks
1. Transmission and distribution Line	<ul style="list-style-type: none"> a) Topographic map at scale 1:50,000 showing future transmission and distribution lines 		Available
2. Substation	<ul style="list-style-type: none"> a) Typical layout of existing substation b) Single line diagram of existing substation c) Manufacturers 		Available
3. Regulation, code and guide line	<ul style="list-style-type: none"> a) Electrical installation work b) Civil work c) Building, equipment and material d) Telecommunication 		Available

<p>4. Design Standards and Planning Method</p> <p>5. Data Collection for the Plan</p>	<p>Basic system configuration</p> <ul style="list-style-type: none"> (a) Reliability-frequency/duration of power outage (b) Standard substation configuration (c) Number of transformers(bank configuration) (d) Number of distribution lines and its allowable capacity (e) Short circuit capability (f) Protection relay and instrumentation system (g) Other standards for planning <ul style="list-style-type: none"> a) Allowable voltage drop and fluctuation (in transmission lines, substations and distribution lines) b) MV/LV distribution lines (sizes, ampacity, lengths, number of service wires, voltage drop, power loss, etc.) <ul style="list-style-type: none"> a) Estimation of the power demand and load curve in each LV distribution transformer area b) Demand growth for each area c) Load density d) Distribution expansion plan around the areas of selected feeders 	<p style="text-align: center;">A</p>	<p style="text-align: right;">予備調査報告書参照</p>
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5. Topographic Map		
Item	Description	Remarks
1. Aerial photograph	a) Scale 1:15,000 (any scale is available)	C
2. Topographic map covering Project area	b) Scale 1:50,000	

6. Geological Data		
Item	Description	Remarks
1. Geological Data	a) Geological map	C
2. Load Data	a) Strength, obstacles, etc.	
3. Published report on earthquake, if any		

7. Meteorological Data		
Item	Description	Remarks
1. Weather	Temperature, humidity, rainfall, monsoon, IKL, wind direction, wind speed, etc., for recent 10 years	C

8. Environment and Compensation		
Item	Description	Remarks
1. Environmental and ecological conservation regulation	a) Noise standard b) Vibration standard c) Others, if any	Available

2. Compensation	a) Compensation cost data Transmission line/m ² - some examples by unit area Substation load/m ² - some examples by unit area	C	
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9. Inland Transportation Data

Item	Description	Availability	Remarks
1. Road conditions	a) Road map on transportation route(to scale) b) Highway map c) Limited loading weight (ton) d) Limited loading dimension (height x width x length in meters)		Some available
2. Cost of inland transportation	a) Cost of inland transportation /ton-km, /ton, /km or other unit prices b) Hire charge of truck, car, barge, etc.	C	

10. Cost Data

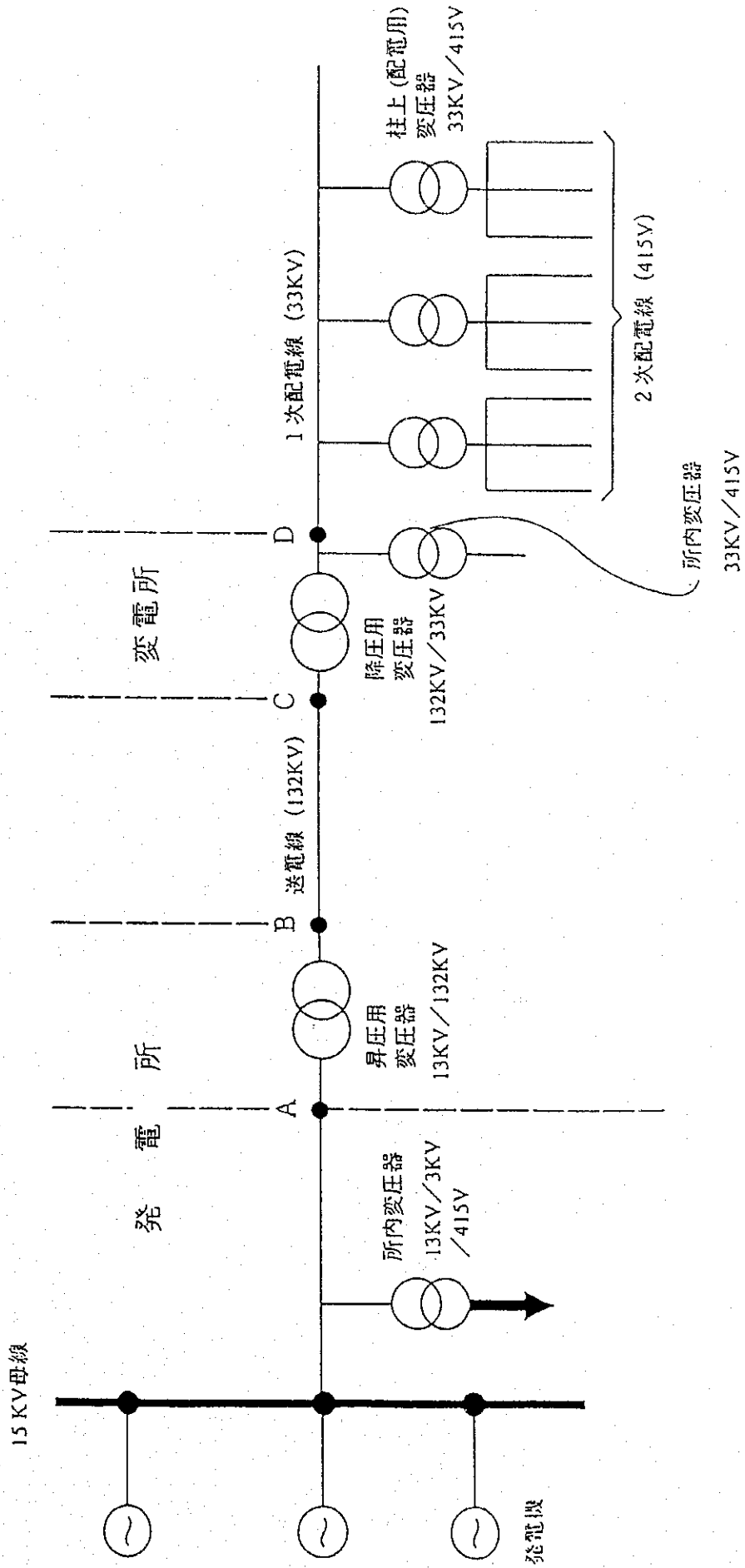
Item	Description	Availability	Remarks
1. Construction costs for civil and electrical works	a) Labor costs and manhours b) Materials and machines(available domestic portion) c) Unit cost of transmission line and substations per km, per kW (available domestic portion)		Available

<p>2. Annual operation and maintenance cost</p> <p>3. Administration and engineering cost</p> <p>4. Interest rate</p> <p>5. Escalation rate</p> <p>6. Import duties</p> <p>7. Exchange rate</p> <p>8. Marginal Cost</p> <p>9. Tariff</p> <p>10. Energy Prices for Power Plant Fuel</p>	<p>b) Transmission line</p> <p>(a) Overhead line</p> <p>(b) Underground cable line</p> <p>c) Substation</p> <p>d) Transmission substation</p> <p>(b) Distribution substation</p> <p>e) Distribution line</p> <p>(a) Overhead line</p> <p>(b) Underground cable line</p> <p>a) Machinery and material for construction</p> <p>a) Between US\$ and/or yen and J\$</p> <p>a) Annual marginal costs and long run marginal costs</p> <p>b) Marginal costs for each of power generation, transmission and distribution</p> <p>a) Current tariff</p> <p>a) Crude oil, diesel oil and natural gas</p>	<p>B</p> <p>A</p>	<p>Available</p> <p>Available</p> <p>Available</p>
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収集資料リスト

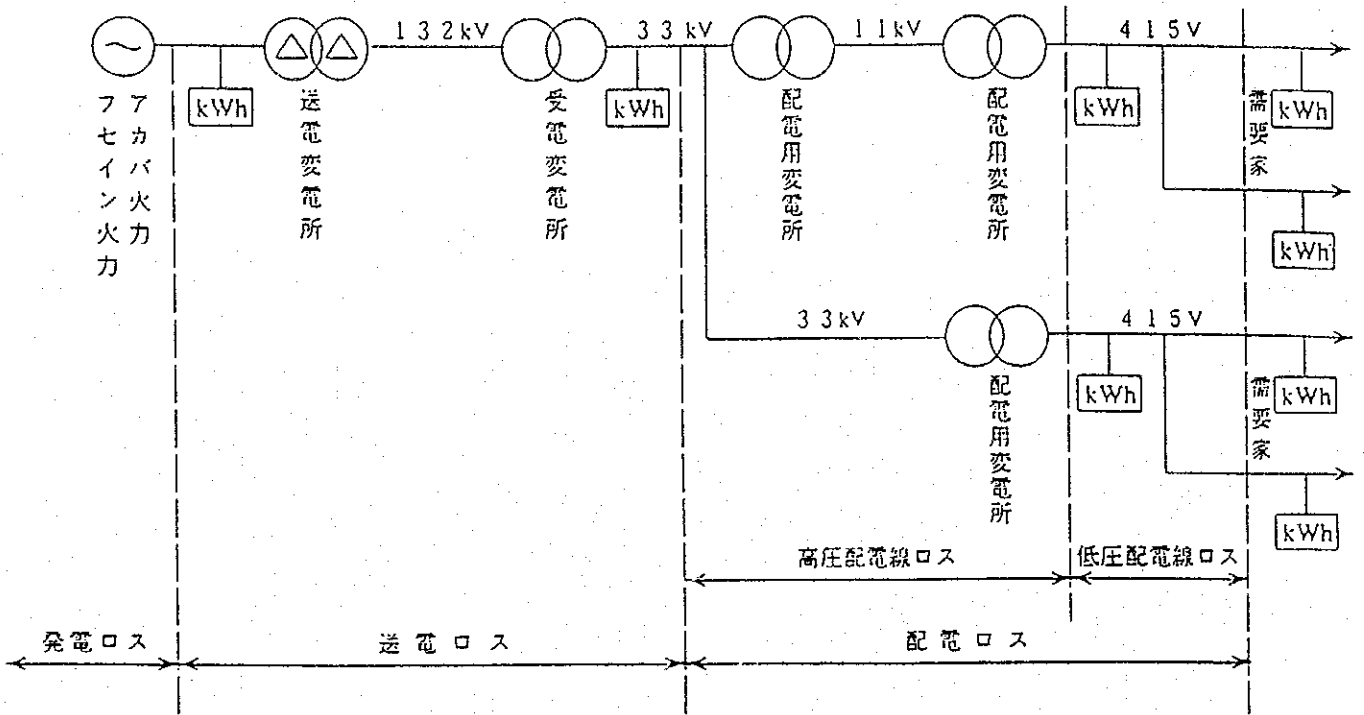
番号	資料名	発行機関	サイズ	頁数	注記
1	ANNUAL REPORT 1997	NEPCO	A-4	52	
2	ANNUAL REPORT 1997	JEPCO	A-4	60	
3	ANNUAL REPORT 1996	JEPCO	A-4	56	
4	ANNUAL REPORT 1995	JEA	A-4	52	
5	ANNUAL REPORT 1987	JEA	A-4	56	
6	JORDAN ELECTRIC POWER COMPANY SCHEMATIC OF 33KV SYSTEM IN ZERKA AREA	JEPCO	>A-1	1	
7	LV SCHEMATIC (アラビア語 - 英訳)	JEPCO	>A-1	1	
8	HSEN THERMAL POWER STATION ZERKA(JULY 1989)	JEA	A-4	18	
9	ELECTRIC TRAINING CENTER	JEA	A-4	27	
10	ELECTRIC TRAINING CENTER (GEA)	NEPCO	A-4	8	

電力システム図

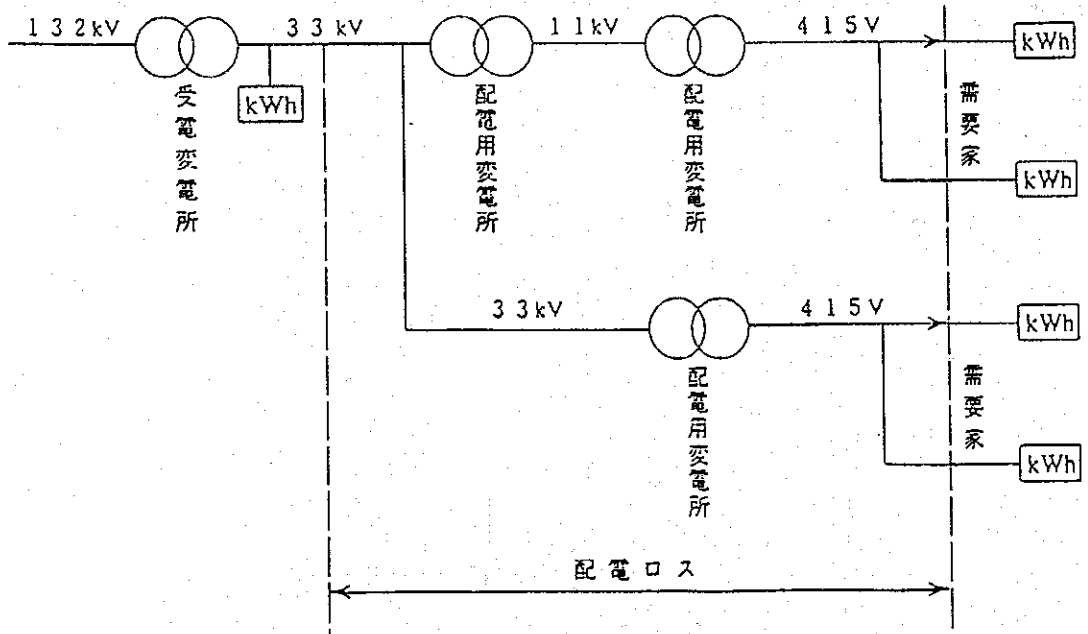


注：電圧は NIEPCの典型的なものを採用

ロス区分図



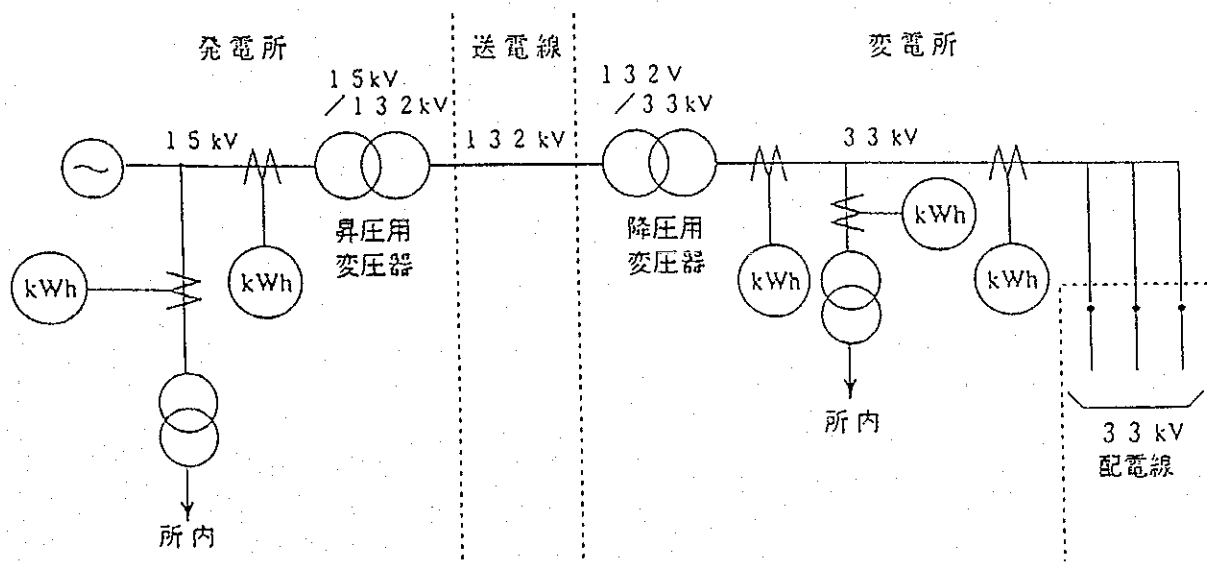
(NEPCO)



(JEPSCO, IDECO)

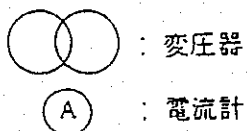
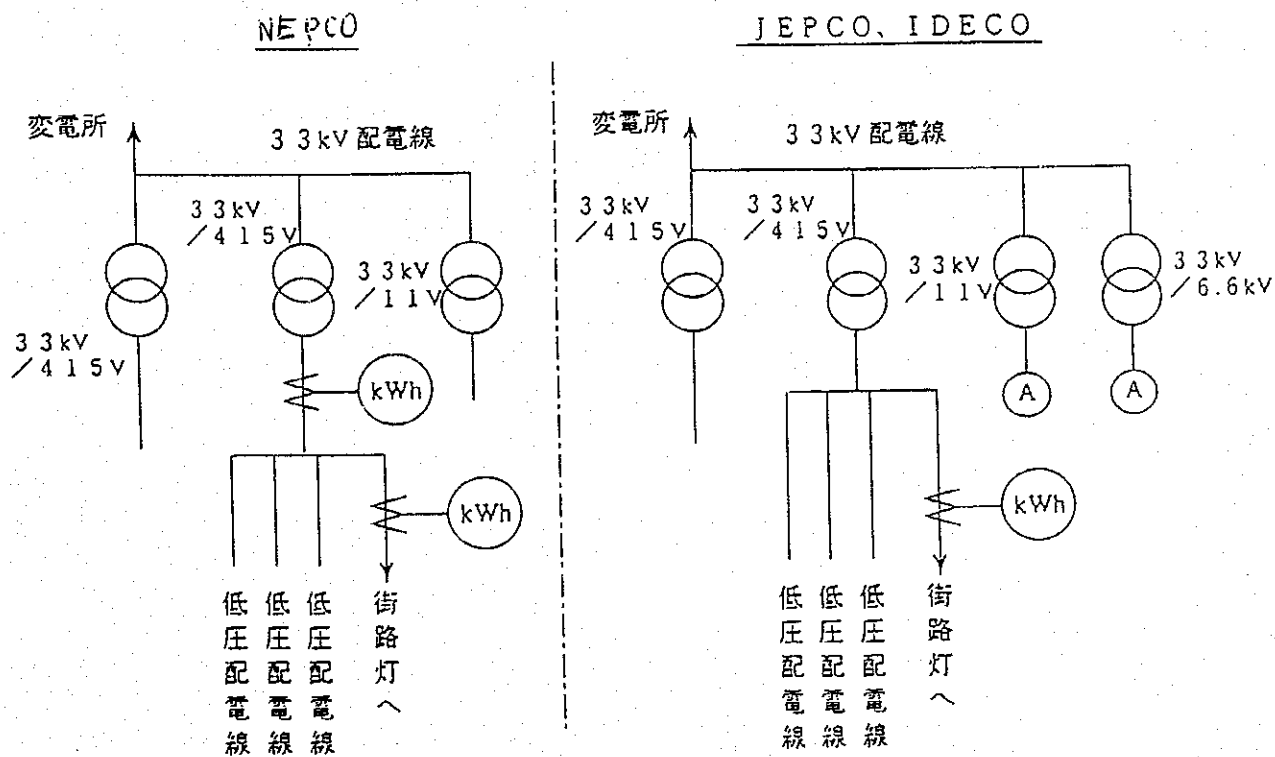
積算電力計設置位置図

a. 発電所、送電線、変電所

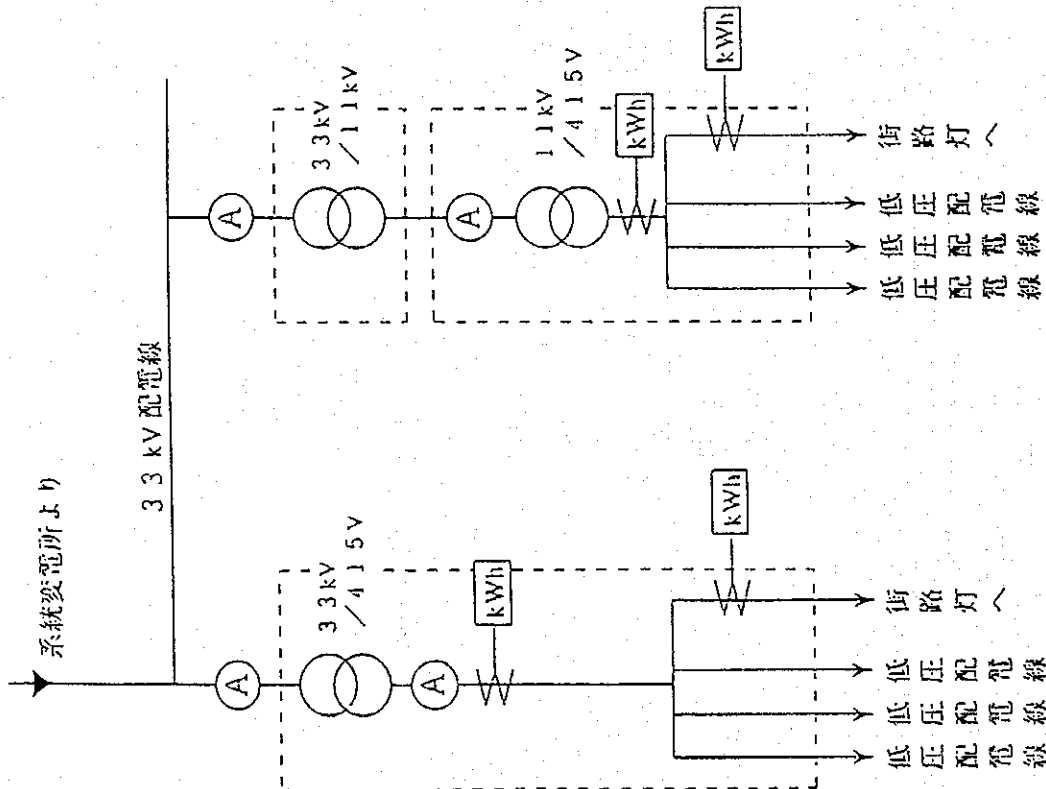


• : NEPCOとJEPSCO、IDECO、大口需要家との責任分界点

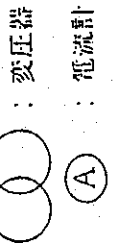
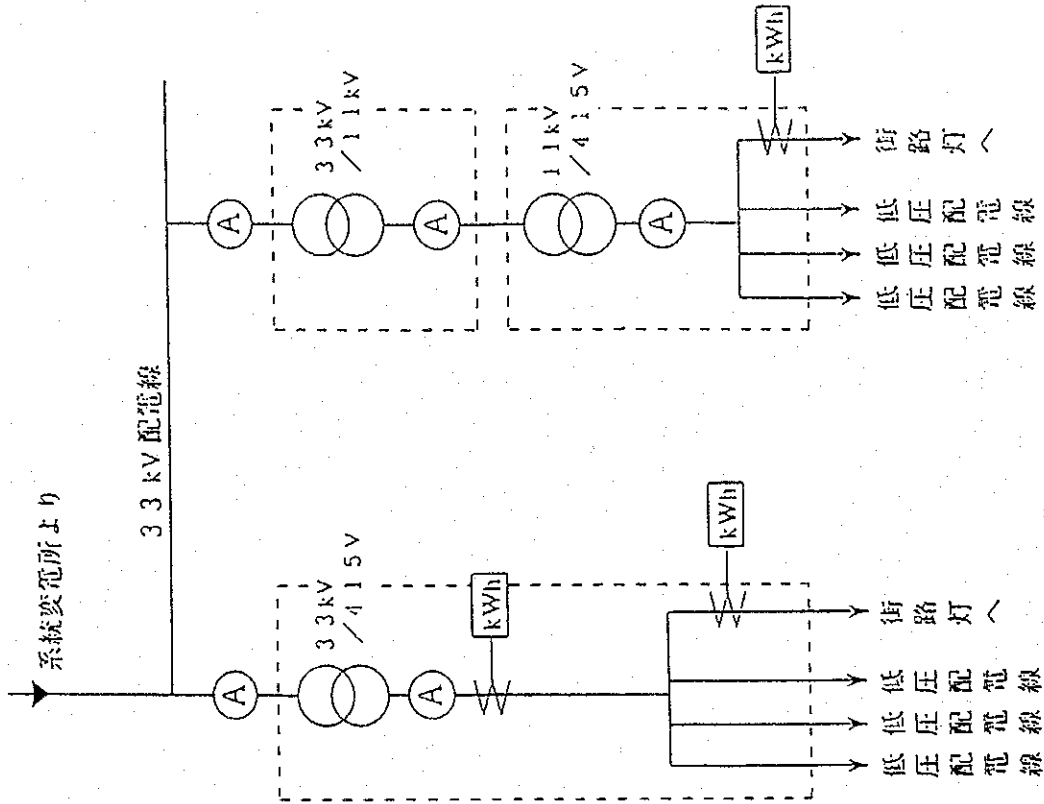
b. 配電用、変圧器



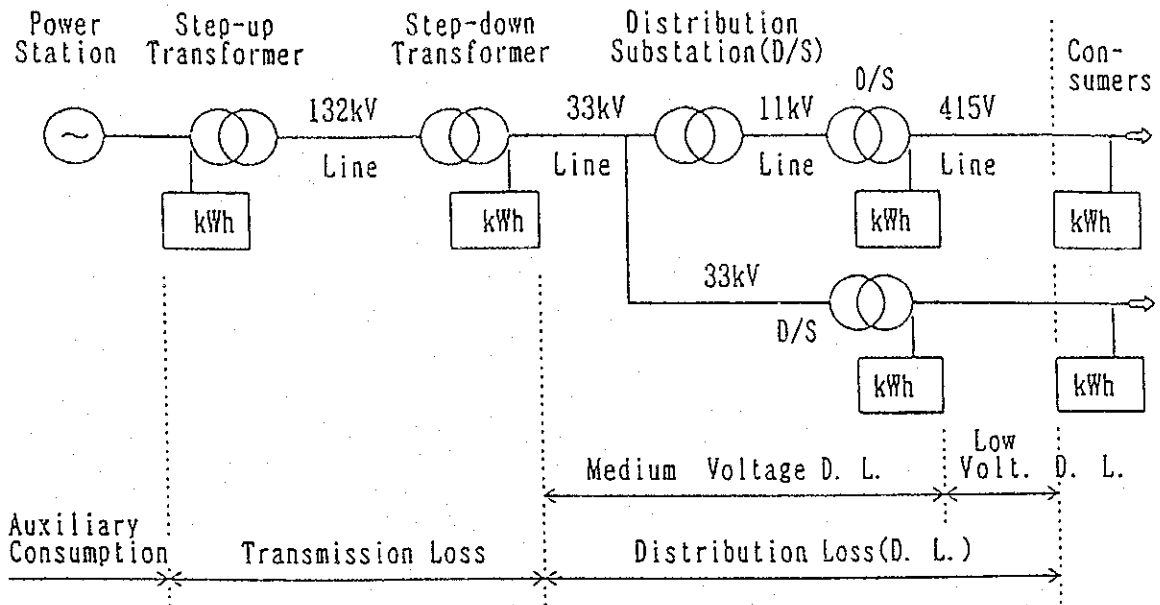
NEPCO



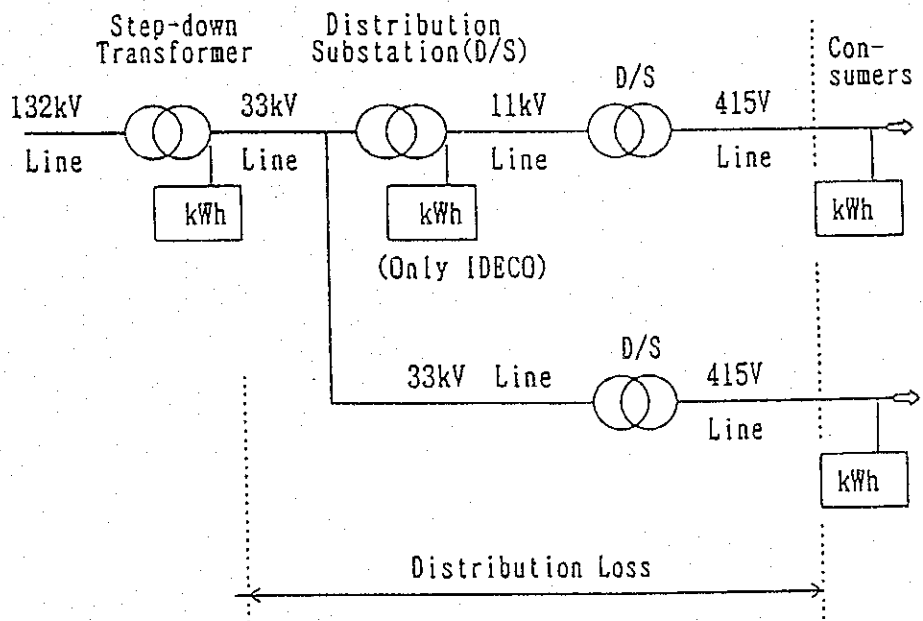
JEPSCO, IDECO



配電川変電所



(NEPCO)



(JEPCO & IDECO)

Measurement Point of Energy and Loss Classification



JICA