Chubu Electric Power Co., Inc. and its Customer Service Offices

I. Overview of Chubu Electric Power Co., Inc.

(1) Introduction to Chubu Region

(2) Organization of the company
- Overview and Organizational chart of the company

(3) Summary of the Facilities
- Comparison of Electric Power Stations, Power Transmission and Power Distribution Facilities among 10 Electric Power Companies
- Company Management's Problems Concerning Supply and Demand, especially the Increase in Demand

(4) Research & Development on New Energy by the Company

II. Offices

(1) Overview of the Offices
- The scope of work organization and work allotment

(2) Topics on each Section

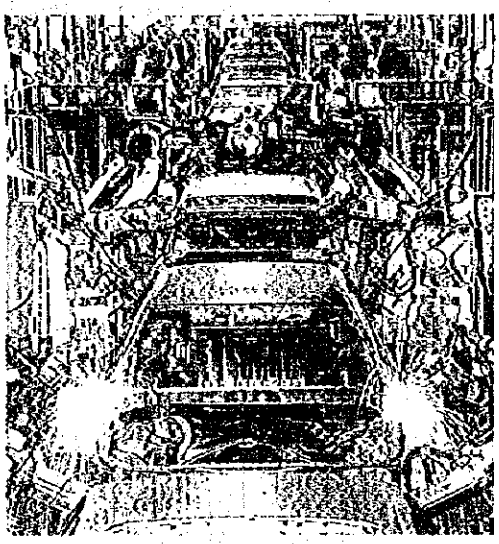
1. Ice Heat Accumulation type Heat Pump System : Sales Section
2. Power Consumption Meter Reading by Handy Terminal : Rate Section
3. Automatic Rerouting System for Electric Power Supply Cable : Consumers' Center
4. Preventive Measures for Power Supply Failure caused by Local Work (An Interruptible power supply method) : Power Distribution Technology Group, Power Distribution Section

Profile

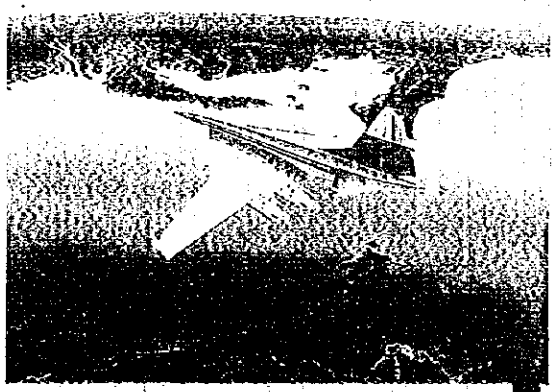
Since its founding in 1951, Chubu Electric Power Company, Incorporated has supplied power to the five prefectures of Japan's centrally-located Chubu region, an area of approximately 39,000 square kilometers serving more than 15 million people. The Company ranks third among Japan's nine principal power companies in terms of generating capacity, energy sales and revenues. Headquartered in the nation's fourth largest metropolis, Nagoya, the Company maintains eight regional offices in Japan, and has established representative offices in Washington, D.C. and London.

The Chubu region plays a crucial role as one of Japan's key transportation, distribution, and manufacturing centers. The region ships 23% of Japan's manufactured goods and accounts for 21% of its exports. With proposed major projects like the 24-hour Chubu New International Airport and the Chuo Linear Express high-speed railway, the Chubu region is rapidly becoming a major gateway between Japan and the world. The region is also in the international spotlight as the site for the 1998 Winter Olympics in Nagano Prefecture, and the planned Aichi World Exposition in 2005.

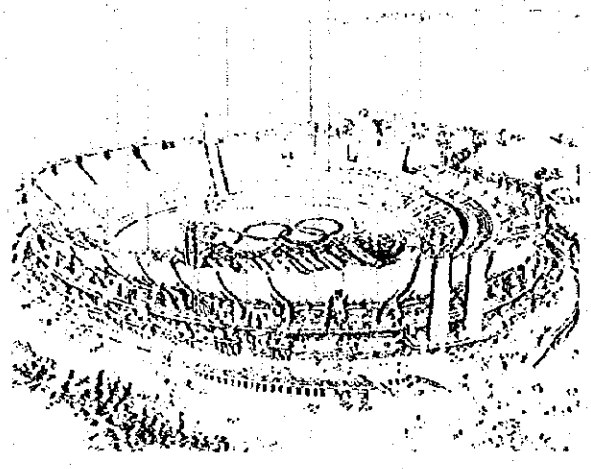
Chubu Electric has been able to contribute to the development of the Chubu region, both in industry and in the community, by providing a stable supply of electrical energy. Since its economic growth is interdependent with that of the region, Chubu Electric strives to positively support various projects and cultural activities in central Japan.



Production line of the world-famous Toyota Motor Corporation



Chubu New International Airport



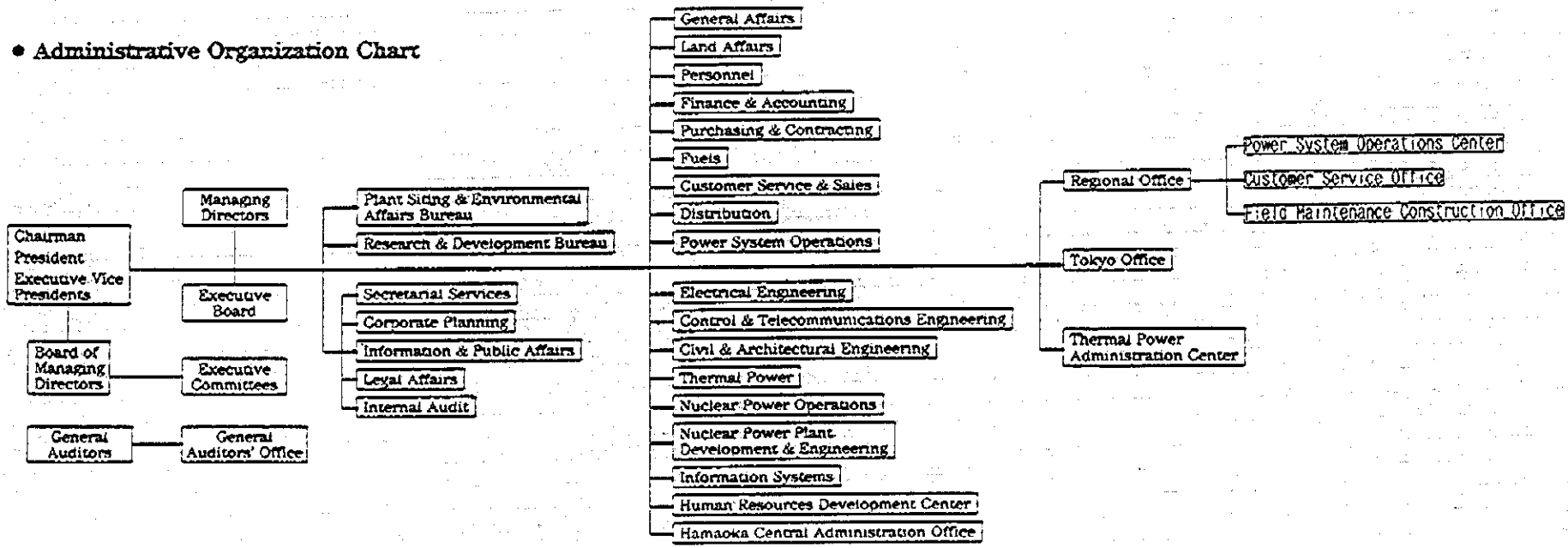
Site of the 1998 Winter Olympic in Nagano
Source: Ministry of Education. Touki Olympic Tokuhon

Company Data (as of March 31, 1995)

Company	Capital Stock (Million yen)	Customers (Thousands)	Energy Sales for the Year (GWh) Residential	Commercial and Industrial	Total	Revenues from Energy Sales for the Year (Million yen)	Installed Generating Capacity (MW)	Service Area (km²)	Employees
Hokkaido EPCo.	114,291	3,441	8,623	14,822	23,445	525,889	5,430	78,414	6,484
Tohoku EPCo.	249,562	6,975	18,474	43,568	62,042	1,263,195	11,488	79,550	14,499
Tokyo EPCo.	670,415	24,391	73,486	175,369	248,855	4,816,264	51,318	39,504	43,104
Chubu EPCo.	369,583	9,181	26,598	83,519	110,117	1,996,035	26,654	39,131	20,891
Hokuriku EPCo.	117,641	1,802	5,431	17,617	23,047	425,792	5,508	12,283	5,634
Kansai EPCo.	484,781	11,674	38,671	93,263	131,934	2,428,721	35,355	28,676	26,702
Chugoku EPCo.	183,126	4,768	13,682	35,122	48,803	945,494	9,956	32,179	11,240
Shikoku EPCo.	145,551	2,600	7,332	14,593	21,925	463,268	6,313	18,445	6,880
Kyushu EPCo.	237,303	7,383	21,050	43,273	64,322	1,339,331	16,195	42,144	14,241
Okinawa EPCo.	7,364	661	2,169	3,437	5,606	119,928	1,452	2,265	1,482
Subtotal	2,579,617	72,877	215,515	524,582	740,097	14,323,922	169,672	372,591	151,158
EPDC	70,600						12,307		3,493
Japan Atomic Power Co.	120,000						2,783		1,510
Total	2,770,217	72,877	215,515	524,582	740,097	14,323,923	184,762	372,591	156,161

Source: The Federation of Electric Power Companies (FEPC)

• Administrative Organization Chart

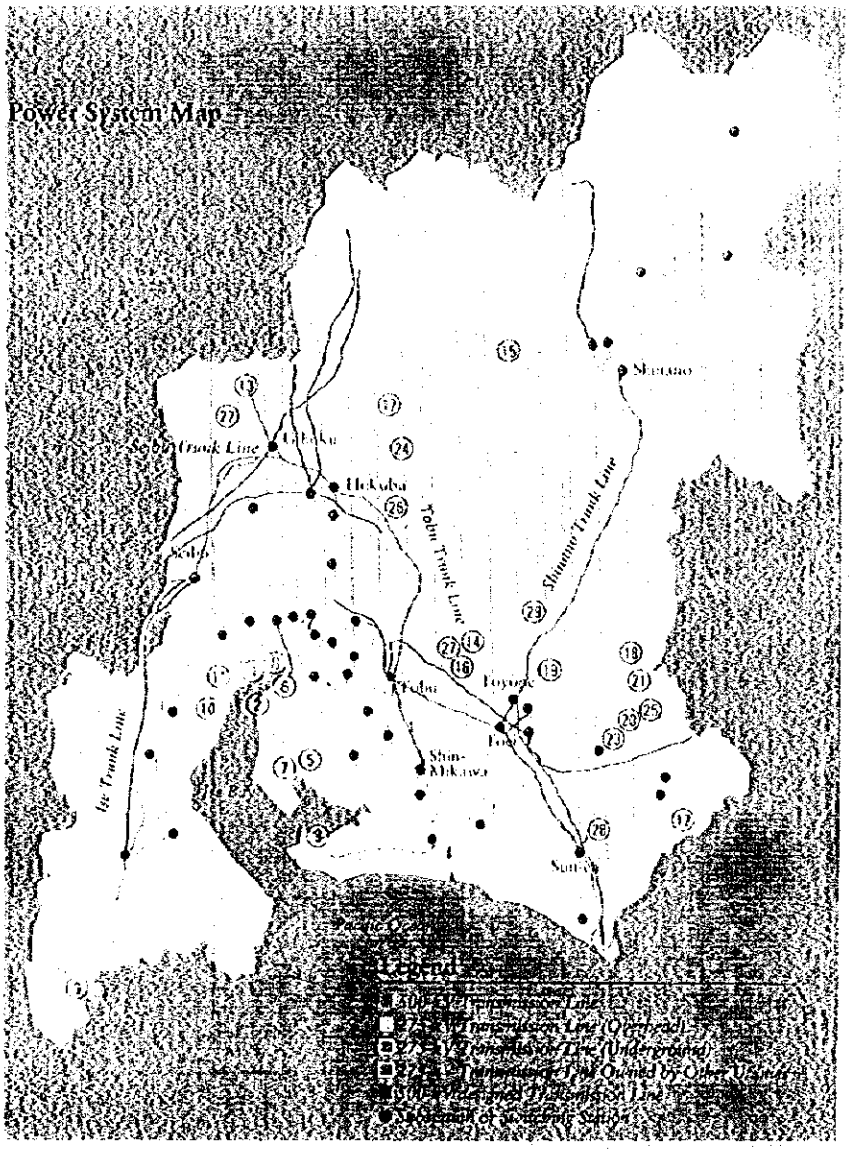


Installed Generating Capacity and Electric Power Generation of Electric Utilities (as of March 31, 1995)

Company	Thermal		Nuclear		Hydroelectric		Total	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Hokkaido EPCo.	3,012	12,430	1,158	9,104	1,211	3,726	5,380	25,260
Tohoku EPCo.	8,400	38,336	524	4,138	2,436	8,056	11,361	50,530
Tokyo EPCo.	29,382	139,653	14,596	97,165	7,340	11,990	51,318	248,808
Chubu EPCo.	18,383	80,224	3,617	24,512	4,655	6,467	26,654	111,204
Hokuriku EPCo.	3,162	10,924	540	3,551	1,806	5,052	5,508	19,527
Kansai EPCo.	18,581	63,064	9,768	60,898	7,006	10,022	35,355	133,984
Chugoku EPCo.	6,406	31,654	1,280	9,269	2,270	2,309	9,956	43,232
Shikoku EPCo.	3,171	12,962	2,022	12,246	1,120	1,802	6,313	27,010
Kyushu EPCo.	9,642	31,853	4,078	27,124	2,323	2,529	16,043	61,506
Okinawa EPCo.	1,452	4,357	—	—	—	—	1,452	4,357
Subtotal	101,591	425,457	37,583	248,008	30,168	51,953	169,342	725,417
EPDC	4,642	28,683	—	—	7,653	9,951	12,295	38,634
Others	10,187	55,200	2,783	20,157	2,738	8,065	15,707	83,421
Total	116,420	509,340	40,366	268,164	40,558	69,969	197,344	847,473

Note: The category "Others" includes Japan Atomic Power Co., municipal power generating enterprises, and joint venture generating companies.
Source: FEPC.

Power System Map



Chubu Electric's Major Generating Facilities

Map No.	MW
Nuclear Power Plant	
(1) Hamaoka	3,617.0
Thermal Power Plant	
(2) Chita	3,404.0
(3) Atsumi	2,400.0
(4) Shin-Nagoya	2,190.0
(5) Hekinan	2,100.0
(6) Others (two plants)	1,554.0
(7) Kawagoe	1,466.0
(8) Yokkaichi	1,343.0
(9) Shin-Toyota	1,256.0
(10) Owase Mita	1,250.0
(11) Kinuura	1,220.0
(12) Shin-Shizuoka	156.0
Others (two plants)	7.5
Total (16 plants)	18,182.5
Hydroelectric Power Plant	
(13) Sunohara	1,000.0
(14) Okuyahagi No.1	780.0
(15) Tenryu No.1	340.0

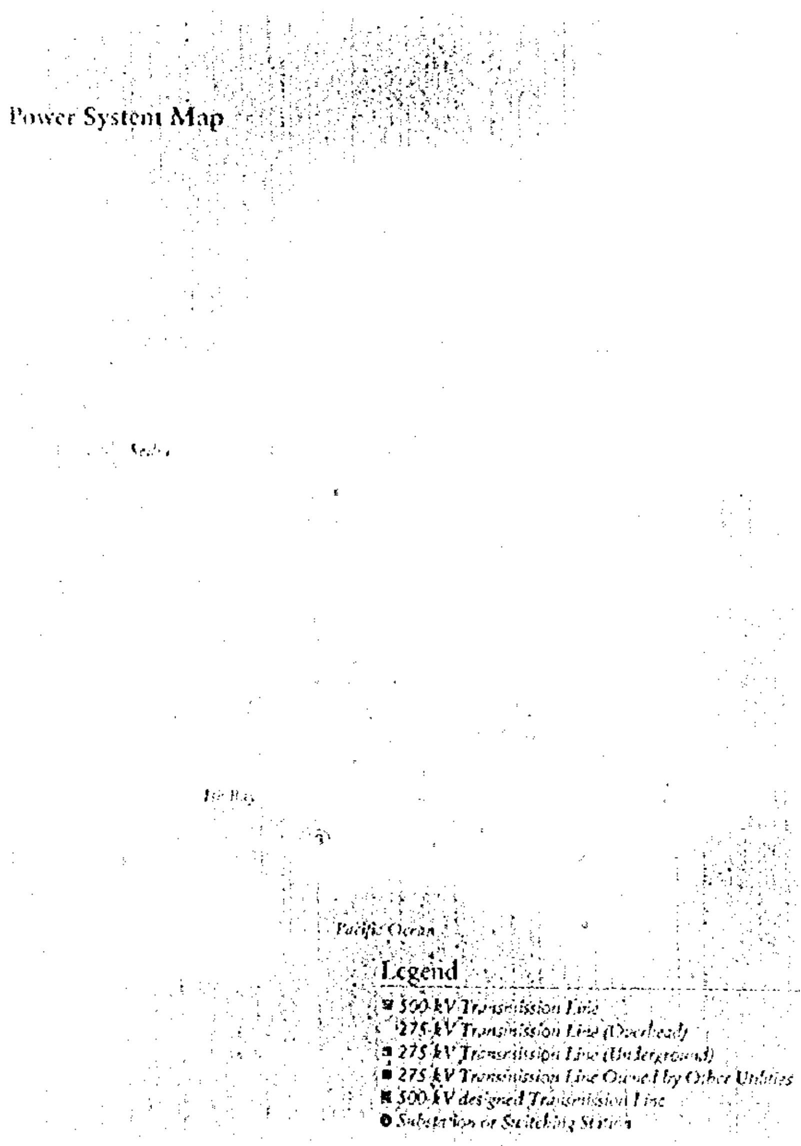
Map No.	MW
(16) Inawashiro No.1	315.0
(17) Miboro No.1	288.0
(18) Hatanagi No.1	137.0
(19) Ikeda	101.0
(20) Okuibuna	87.0
(21) Hatanagi No.2	81.0
(22) Yoshioka	70.0
(23) Otogawa	68.2
(24) Miboro No.2	66.4
(25) Kuzuki	62.0
(26) Shin-Kamiyo	61.4
(27) Yahagi No.1	60.0
(28) Nukabushi	18.0
(29) Yamaoka	12.5
Others (160 plants)	1,023.4
Total	4,558.9
Total Generating Capacity	
(191 plants)	26,654.4

As of March 31 (1995)

Installed Generating Capacity and Electric Power Generation of Electric Utilities

Hokkaido EPCo.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Tohoku EPCo.	[illegible]	[illegible]	[illegible]	[illegible]				
Tokyo EPCo.	[illegible]	[illegible]	[illegible]	[illegible]				
Chubu EPCo.	[illegible]	[illegible]	[illegible]	[illegible]				
Hokuriku EPCo.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Kansai EPCo.	[illegible]	[illegible]	[illegible]	[illegible]				
Chugoku EPCo.	[illegible]	[illegible]	[illegible]	[illegible]				
Shikoku EPCo.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
Kyushu EPCo.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Okinawa EPCo.	[illegible]	[illegible]						
Subtotal	101,531	425,457	[illegible]	248,[illegible]	33,[illegible]	[illegible]	[illegible]	[illegible]
EPDC	4,512	26,[illegible]			[illegible]	[illegible]		
Others	20,157	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
Total	116,120	509,240	10,[illegible]	268,161	40,558	[illegible]	[illegible]	[illegible]

Power System Map



Chubu Electric's Major Generating Facilities

Map No.	MW
Nuclear Power Plant	
① Hamaoka	3,617.0
Thermal Power Plant	
② Chita	3,966.0
③ Atsumi	2,[illegible]
④ Nishi-Nagoya	2,[illegible]
⑤ Hekinan	2,[illegible]
⑥ Chita Daini	1,5[illegible]
⑦ Kawagoe	1,4[illegible]
⑧ Taketoyo	1,1[illegible]
⑨ Shin-Nagoya	1,[illegible]
⑩ Owase Mita	1,[illegible]
⑪ Yokkaichi	1,[illegible]
⑫ Shin-Shimizu	[illegible]
Others (two plants)	[illegible]
Total	18,[illegible]
Hydroelectric Power Plant	
⑬ Okumino	1,[illegible]
⑭ Okuyahagi No.2	[illegible]
⑮ [illegible] No.1	[illegible]

Map No.	MW
⑯ [illegible] No.1	[illegible]
⑰ [illegible] No.1	[illegible]
⑱ [illegible] No.1	[illegible]
⑲ [illegible]	[illegible]
⑳ [illegible]	[illegible]
㉑ [illegible] No.2	[illegible]
㉒ Yokoyama	[illegible]
㉓ [illegible]	[illegible]
㉔ [illegible] No.2	[illegible]
㉕ [illegible]	[illegible]
㉖ [illegible]	[illegible]
㉗ [illegible] No.1	[illegible]
㉘ [illegible]	[illegible]
㉙ [illegible]	[illegible]
Others (190 plants)	1,0[illegible]
Total	4,65[illegible]
Total generating capacity (191 plants)	26,65[illegible]

(As of March 31, 19[illegible])

Transmission & Distribution Facilities (For the year ending March 31, 1995)

	Transmission					Distribution				
	Transmission Lines (km)		Support Facilities (unit)			Distribution Lines (km)		Support Facilities (1,000unit)	Distribution Transformers (1,000kVA)	
	Overhead	Underground	Steel Towers & poles	Ferroconcrete poles	Wooden poles	Overhead	Underground		Overhead	Underground
Hokkaido EPCo.	7,791	236	43,181	4,332	64	77,801	828	1,350	9,786	337
Tohoku EPCo.	13,815	313	51,723	7,036	277	158,424	1,528	2,728	19,407	619
Tokyo EPCo.	14,410	4,635	45,336	986	898	295,778	13,992	5,138	64,146	12,398
Chubu EPCo.	10,375	1,103	31,993	4,520	4	155,070	2,726	2,534	46,515	962
Hokuriku EPCo.	2,968	76	9,580	2,557	-	35,996	539	533	5,462	112
Kansai EPCo.	10,809	1,780	33,821	1,789	1,064	114,609	5,539	2,423	50,192	158
Chugoku EPCo.	6,418	322	20,908	1,943	5	88,106	1,676	1,464	13,442	517
Shikoku EPCo.	3,143	83	9,495	1,341	8	48,130	520	741	6,258	34
Kyusyu EPCo.	7,852	375	26,832	1,780	111	149,923	1,498	2,064	23,366	434
Okinawa EPCo.	428	110	1,029	2,099	4	8,854	184	179	2,551	α
Total	78,009	9,033	273,898	28,383	2,435	1,132,691	29,030	19,154	241,626	15,572

Transformer Facilities (For the year ending March 31, 1995)

		500 kVA	275 kVA	220 kVA	187 KVA	110～154 kVA	66～77kVA	55～ kVA	Total
Hokkaido EPCo.	Number of facilities		2		18	18	222	68	328
	Capacity (kVA)		1.800.000		5.261.000	524.000	5.427.900	383.350	13.396.250
Tohoku EPCo.	Number of facilities	2	14			58	389	52	515
	Capacity (kVA)	4.000.000	10.292.000			15.797.000	14.628.700	553.000	45.270.700
Tokyo EPCo.	Number of facilities	19	41			153	1.104	93	1.410
	Capacity (kVA)	71.790.000	49.980.000			41.837.000	55.019.960	1.173.000	219.799.960
Chubu EPCo.	Number of facilities	7	30			56	695	83	871
	Capacity (kVA)	19.800.000	29.050.000			20.088.000	31.054.100	2.756.710	102.748.810
Hokuriku EPCo.	Number of facilities		4			16	117	20	157
	Capacity (kVA)		3.700.000			6.390.000	5.677.250	121.500	15.888.750
Kansai EPCo.	Number of facilities	12	28		1	40	727	494	1.302
	Capacity (kVA)	33.900.000	30.797.000		380.000	20.560.000	42.989.000	2.472.000	131.098.000
Chugoku EPCo.	Number of facilities	6		12		180	103	41	342
	Capacity (kVA)	11.500.000		8.350.000		13.733.500	2.944.000	517.000	37.044.500
Shikoku EPCo.	Number of facilities	3			15	3	160	7	188
	Capacity (kVA)	3.000.000			6.860.000	122.000	5.719.000	46.500	15.747.500
Kyusyu EPCo.	Number of facilities	6		38		34	342	32	452
	Capacity (kVA)	11.000.000		19.190.000		3.753.000	16.890.000	222.500	51.055.500
Okinawa EPCo.	Number of facilities					8	60	48	116
	Capacity (kVA)					1.826.000	1.918.300	162.050	3.906.850
Total	Number of facilities	55	119	50	34	566	3.919	938	5.681
	Capacity (kVA)	154.990.000	125.619.000	27.540.000	12.501.000	124.630.500	182.268.710	8.407.610	635.956.820

Note: Frequency converter station 600.000kW exclude from Tokyo EPCo.

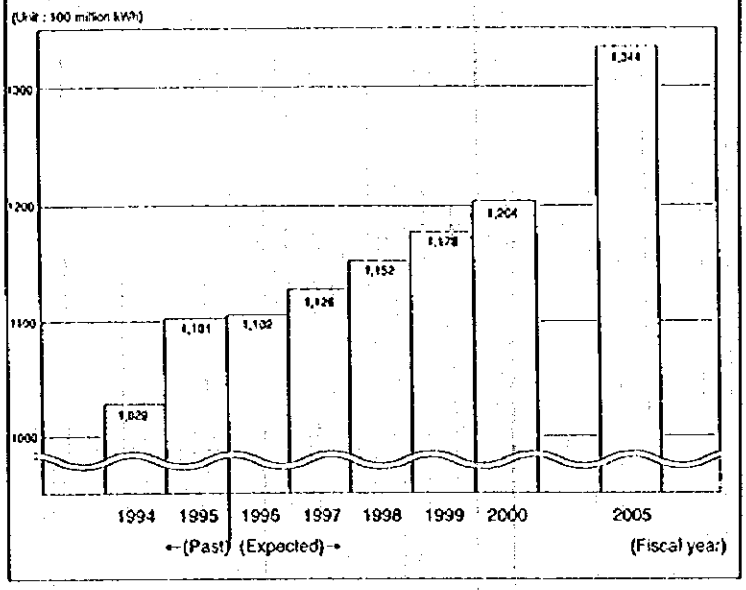
As the demand for electric power increases, the supply and demand balance becomes harder to maintain.

Electric Power:

Reflecting the movement of people towards a more affluent and substantial life, which involves an improvement in the living environment, an increasing demand on the leisure industry, the improvement and multi-functionalization of machinery, equipment and instrumentation, and the demand for air-conditioning, all contribute to a steadily increasing demand for electric power.

The total electric power consumption being 110.1 billions kwh as of 1994 is expected to further increase at an annual average growth rate of 2.4%.

● Electric Power Consumption

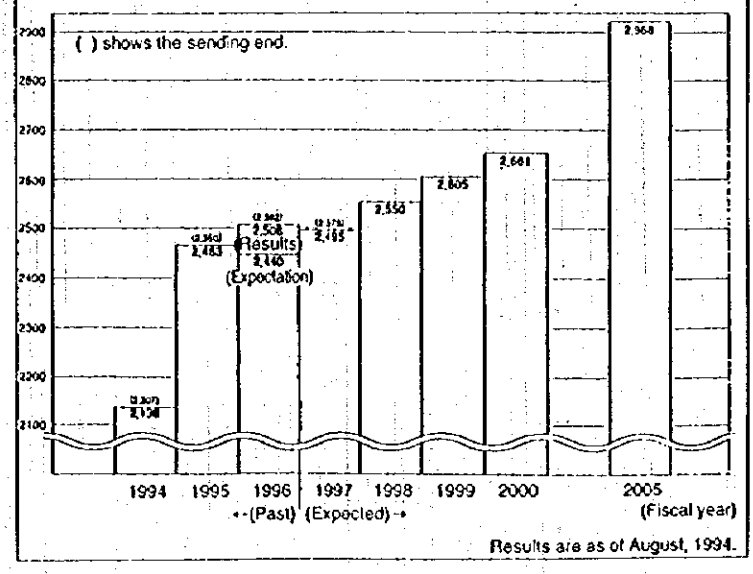


Maximum Electric Power Consumption:

In 1995, due to the fiercely hot weather over the last few years, a maximum electric power, at the sending end of 25.08 kWh was recorded.

Power consumption is affected by medium and long term climatic and economic conditions, this not withstanding an annual increase in power consumption of 2.3 % is expected due to an increased demand for air-conditioning among others. Consumer education measures have been tried by power companies in an effort to flatten peak power consumption and these may have an affect on the market in the future.

● Maximum Electric Power (Sending end)
(Maximum for 3 days)



Results are as of August, 1994.

• Generating End and Sending End

The total electric power generated at the power station is called "Electric Power at the Generating End", from which electric power is taken for use for auxiliary equipment and lighting in the station itself and the remaining power which is actually distributed is called "Electric Power at the Sending End".

As shown above, the increased demand for electric power has more and more narrowed the gap between supply and demand. Chubu Electric Power Co. now receives electric power from other electric power companies, through which a spare supply capacity of 8%, regarded as the proper amount for the near future, is maintained. Also, Chubu Electric Power Co. is trying to maintain a stable power supply in relation to demand increases by requesting that customers be more energy concision and reduce power consumption during summer afternoon.

In the future, it will inevitably become necessary to maintain an on going dialogue with consumers to promote the development of power resources. Also, positive measures to reduce power consumption peaks on the consumers' side, will be performed such as modification of the rate system.

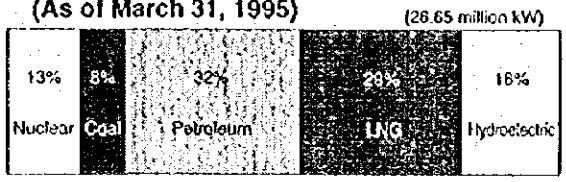
Aiming at a Good Balance among Power Generating Sources, which is extremely important.

Electric Power Generating Sources

Japan's energy dependency upon foreign countries is approximately 84%, of which oil dependency is 99.6%. Petroleum, for which a price rise is expected over the medium- or long-term, can be regarded, from a stable power source point of view, as having highly unstable factors such as fluctuations in the oil supply volume which can be affected by the international situation.

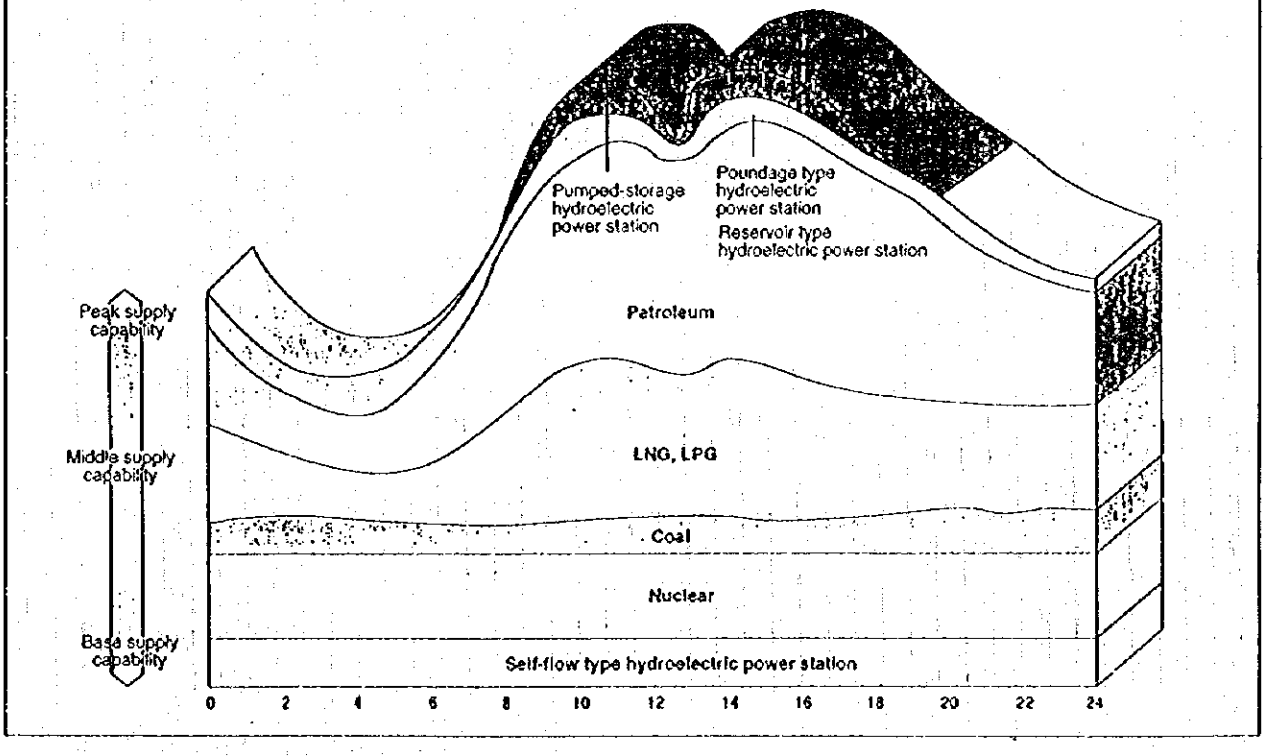
Development of electrical power sources, which needs 10 to 20 years, should be promoted for diversification, from a long-term view point. When comprehensively evaluating the stability of power source, economicalness, its operational characteristics and affect on the environment, it is important to achieve a balance among electric power generating sources centering on nuclear power.

● **Power Facility Composition (As of March 31, 1995)**



(Owned facilities only)

● **Relationship between Daily Demand-Supply Curve and Supply**



Pumped-storage Hydroelectric Power Station:
This type of hydroelectric power station can easily be started so as to cope with fluctuations in the power demand. It is utilized for a demand heading for or at the peak consumption and for quick fluctuations.

Pumped-storage Hydroelectric Power Station:
Both have high initial costs but are economically superior considering the average durable service life. Their quick-start operation is used to cope with the demand fluctuations at peak supply capacity.

Petroleum Power:
This type of power station has a high operating cost and is utilized for peak capacity supplying of electricity based on its cheaper capital costs and its superiority in coping with demand fluctuations.

LNG & LPG Power:
Both of these power stations are utilized for the middle capacity supplying of electricity because they have a lower operating cost than petroleum power, also they are cheaper than the coal power in capital costs and are superior in coping with the demand fluctuations.

Coal Power:
This power station is utilized for medium capacity supplying of electricity between the basic and the middle supply capacities, based upon it cheaper operating costs, expensive capital costs and superiority to nuclear power in easily coping with demand fluctuations.

Nuclear Power:
Nuclear power has a low operating cost but a high capital cost and is utilized aiming at a highly efficient operation for the basic capacity supplying of electricity.

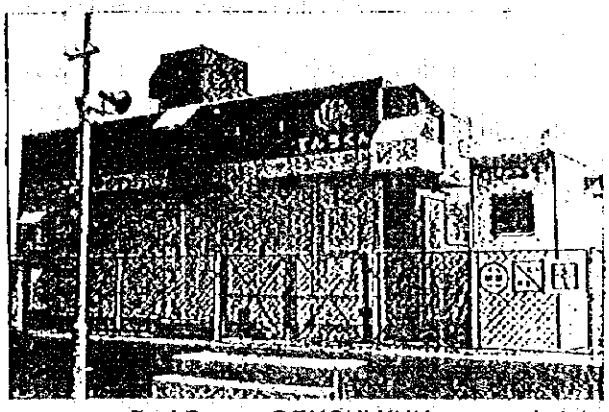
Self-flow type Hydroelectric Power Station:
This type of hydroelectric power station which is high in initial cost but is economically superior considering the average durable service life is utilized for the basic capacity supplying of electricity.

Research and Development on Fuel Batteries, Solar Power and Wind Generated Electric Power has been undertaken by Chubu Electric Power Co.

Fuel Battery:

The fuel battery, small & phosphoric type, is currently undergoing development for practical applications and now is actually operated for demonstrations. As for the large-sized fuel battery (5MW), Chubu Electric Power Co. has participated in a demonstrative study and technological evaluation, and at the same time, in research and development on the next generation fuel batteries as well as high temperature type fuel batteries.

Fuel Battery	
Small Phosphoric Battery (50 to 200kW)	• 4 units (Total 350 KW) were installed at the KAWAGOE Power Station at the end of 1994. • 1 unit (50 KW) was installed at the KAMISHIRO Transformer Station in 1995.
Fused Carbonate Type:	The pilot plant (1,000 KW class) constructed at the KAWAGOE Power Station and for which the research and development was done as part of the National Solar Power Project has actually been operating for further study since 1996.
Solid Electrolyte Type:	This battery, highly promising as a commercial electric power source in the future, is currently be researched and developed at the Technological Center.

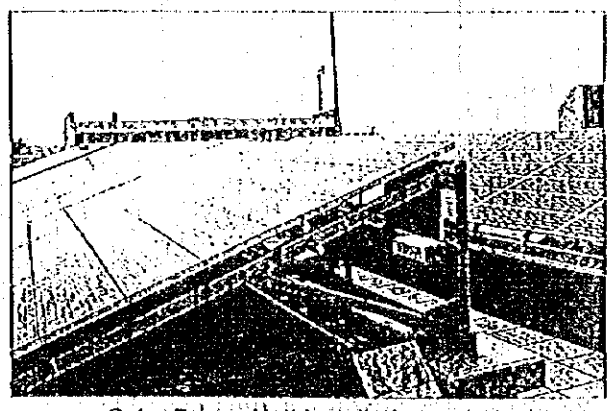


Fuel Battery DENCHI KUN operated at the KAWAGOE Power Station

Solar Power:

The solar power units (total : 372 KW) already installed at site in the company's plants since 1995 are undergoing further study and research in such areas as durability, reliability, lowering costs and integration into existing systems. Additionally, installation in a private house, its installing methods and the optimum integration system, combining a battery & commercial electric power source has been tested.

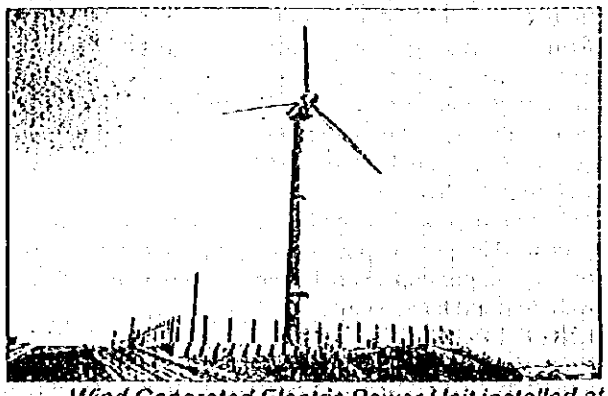
	1994	1995
Introduced Electric Power Capacity	222 kW	150 kW
Installed Site	18 sites at the technical center	Several sites at the Human Resources Development Center



Solar Power Unit installed at technical center

Wind Generated Electric Power (Windpower):

One wind electric power unit has been installed at the HEKINAN Thermal Station and is currently in operation.



Wind Generated Electric Power Unit installed at HEKINAN Thermal Station

Organization and Duties

1. Structure

(1) Company structure

Company business is conducted according to a certain order, and that foundation forms the structure. Unlike small private stores, businesses like ours with tremendous facilities over vast area for a large number of customers need many offices and employees. Therefore, the allocation of employees and the operation of facilities must be particulary rational to effectively promote unified operation throughout the company.

The outline of our company is shown in , "Organization Chart." Offices and departments that constitute the organization have their own jurisdictions and duties, as well as the required number of employees and the staff in managerial positions to manage and supervise the employees.

(2) Duties of headquarters, regional offices, and customer service offices

Our organization for operations is roughly divided into three areas: headquarters, regional offices, and customer service offices.

a. Headquarters

For long-term stable power supply, which is an obligation of public utilities, the headquarters makes future plans for the whole company concerning the power source development, environmental measures, and improvement of service reliability, by offering guidance and advice so that respective offices, including regional officies, can function effectively to reach their targets.

b. Regional offices

Based on plans made by the headquarters for the whole company, regional offices make specific plans for operations in their respective jurisdictions. They supervise and give guidance to customer service offices and other attached offices.

They take partial charge of customer service for respective areas in collaboration with customer service offices.

Tokyo Office is engaged in business which needs to be processed in Tokyo related to government offices and various organizations, .

c. Customer service offices

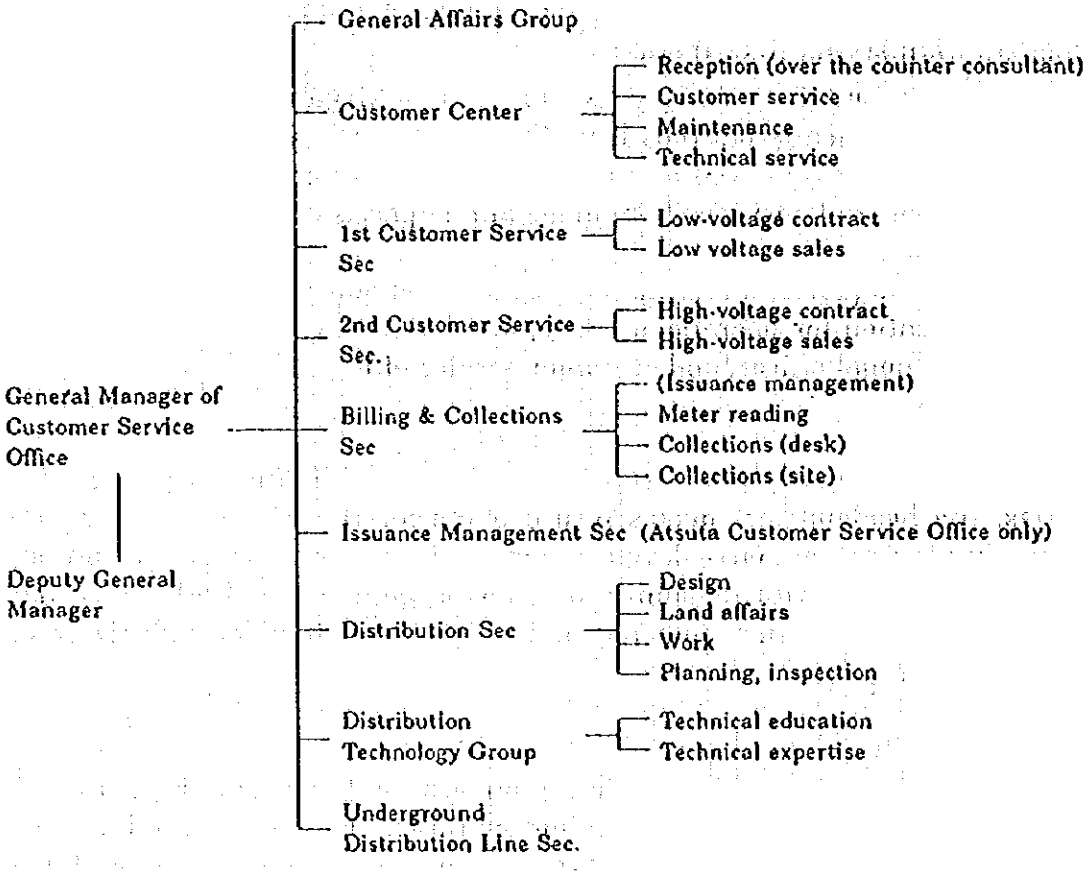
Based on the plans made by the headquarters and regional offices, customer service offices are engaged in utility contract service and billing/charge-collection service for customers in the service area, offering wide-ranging services such as notification of outages, dealing with customers' requests and consulting services for the safe and efficient use of electricity. They are also engaged in construction of distribution facilities, public safety, and facility maintenance to supply high-quality electricity safely and economically.

2. Outline of the Structure and Duties of Customer Service Offices

Customer service offices comprise of large-scale offices, medium-scale offices, small-scale offices, and service stations (SS) that operate under the customer service offices.

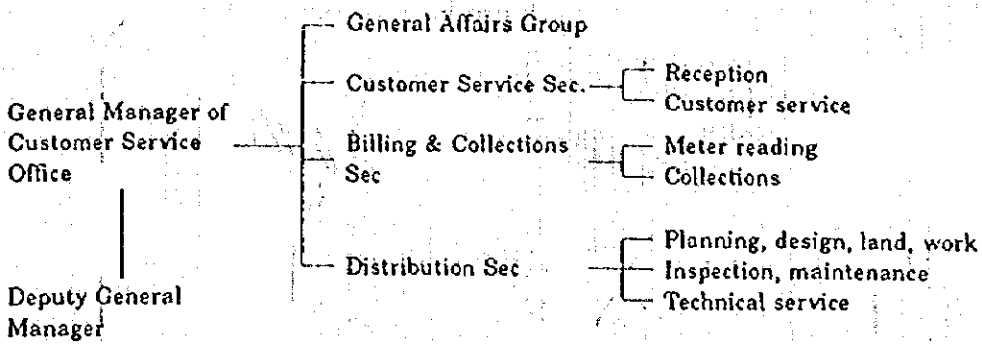
(1) Structure of customer service offices

[Large offices]

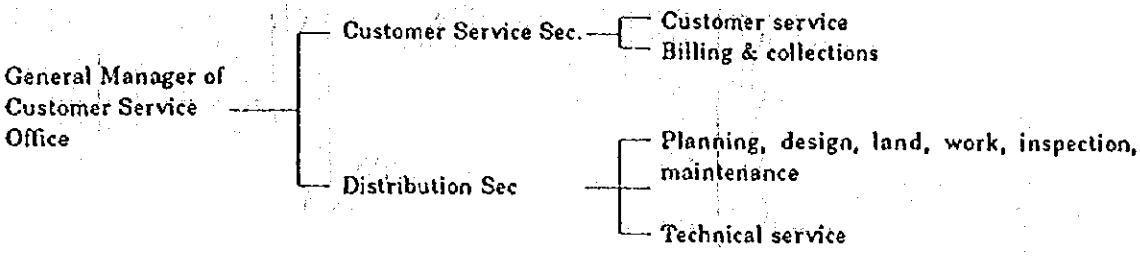


* 2nd Customer Service Sec. may be omitted in terms of the scale of personnel.
* Distribution Technology Group is established in strategic offices.

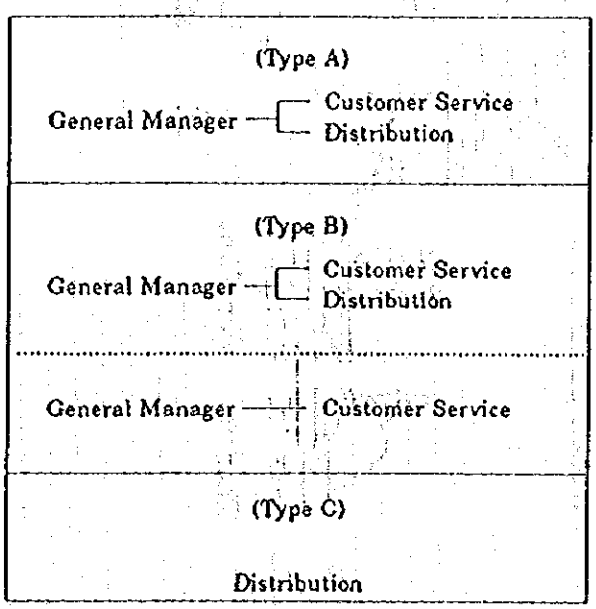
[Medium-offices]



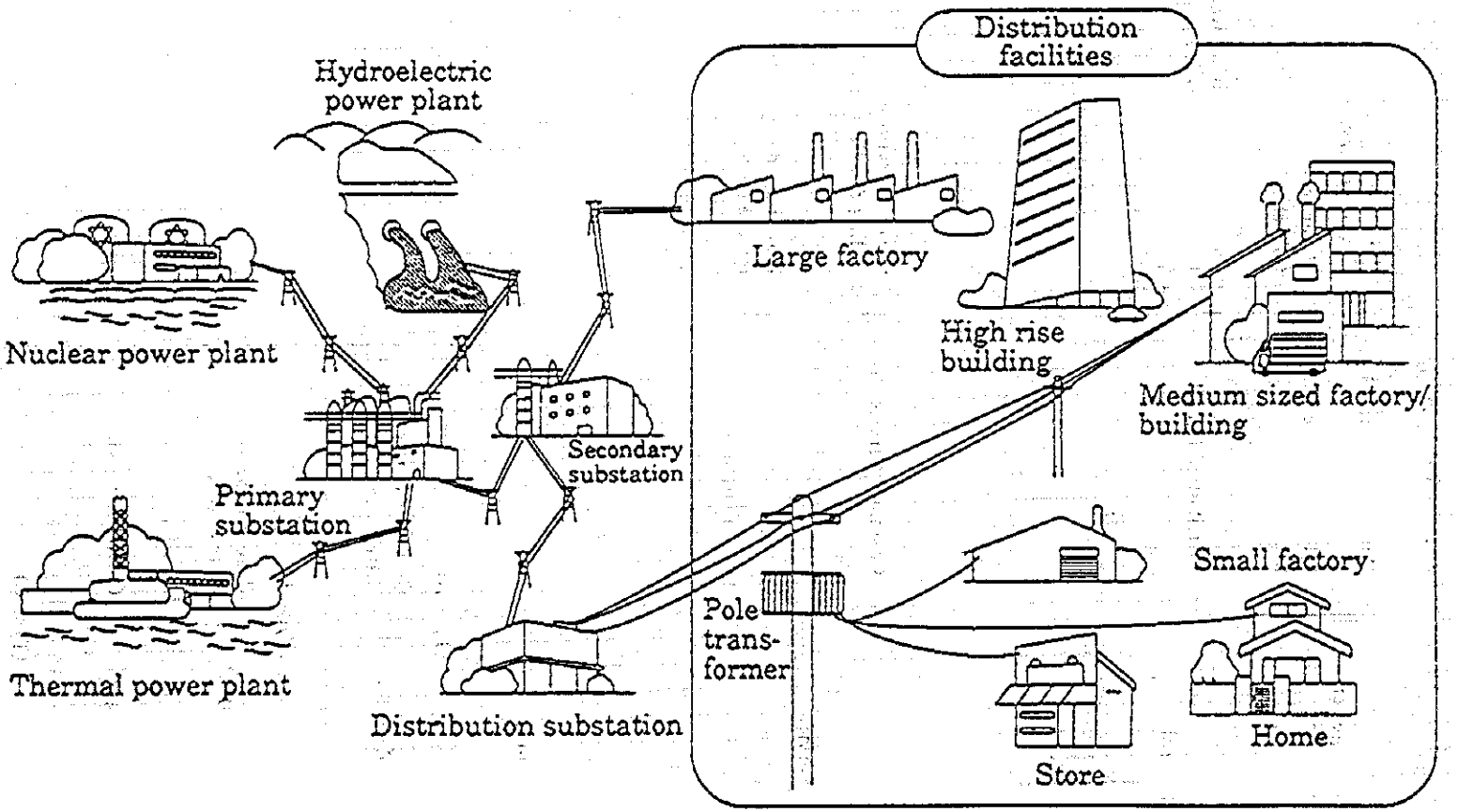
[Small-scale office]



[Service station]



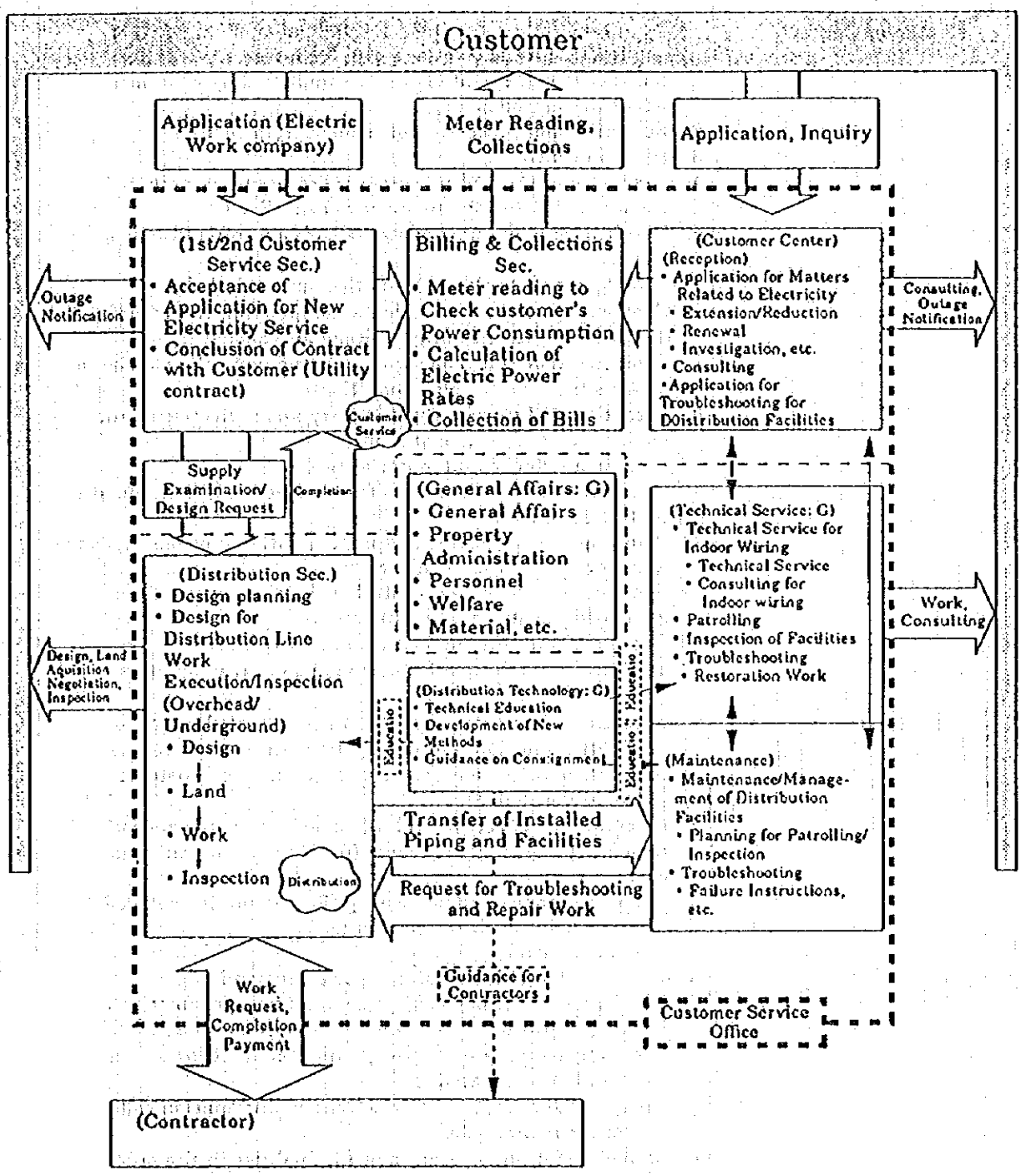
Outline of Power System and Distribution Facilities



(2) Outline of activities of customer service office

The task allotted to a customer service office differs according to the scale of each office and regional characteristics. The following is a representative flow and division of duties in a large-scale customer service office.

a. Flow of work



b. Division of duties

Office or Department	Division of duties
Customer service office a. Standard	
General Affairs Group	General affairs, property administrationr building, labor, personnel, welfare, accounting, and materials
Customer Center	1. Reception and processing (incl. reflection of changes) of applications for low-voltage utility contracts, as well as contract management (Those accompanied by customer works are excluded) 2. Reception and processing of request from customer 3. Demand control 4. Cash acceptance and processing (Processing is excluded when it is left to 1st Customer Service Sec.) 5. Notification of outage (below 500kW) and related management (Matters left to Distribution Sec. are excluded.) 6. Compensation and reparation accompanying the transfer of distribution facilities (high-voltage and below) 7. Compensation and reparation accompanying the change in power supply and supply conditions. 8. Reception and processing of inquiry about electricity and management of service station 9. Electric appliance and material test 10. Management of instruments for transaction and automatic control equipment 11. Planning, management, and implementation of maintenance work for distribution facilities 12. Remote monitoring and control of distribution facilities of generating facilities and substations 13. Outage repair and miscellaneous service works 14. Technical consultation for customer's electric facilities
1st Customer Service Sec.	1. Reception and processing (incl reflection of changes) of applications for low-voltage utility contracts, as well as contract management (Those accompanied by customer works are excluded) 2. Calculation, collection, and management of charges for temporary lighting and power (for short-term utilization contracts) 3. Cash acceptance and processing (Processing is excluded when it is left to Customer Center.) 4. Demand control 5. Investigation of low--voltage power demand 6. Reinforcement of low-voltage demand base, promotion of load leveling, diffusion of machinery and systems that contribute to effective energy utilization, enlightenment for said diffusion, and other related job 7. Customer service, publicity activities, information collection, and other related jobs 8. Management and operation of PR facilities in the office

Office or Department	Division of duties
2nd Customer Service Sec.	1. Reception and processing (incl. reflection of changes) of applications for high-voltage utility contracts, as well as contract management 2. Notification oL outage (above 500kW) and related management (Matters left to the Distribution Sec. are excluded.) 3. High-voltage demand control 4. Investigation of high-voltage power demand 5. Reinforcement of high-voltage demand base, promotion of load leveling/ diffusion of machinery and systems that contribute to effective energy utilization, education for said diffusion, and other related work 6. Industrial development related work
Billing & Collections Sec.	1. Work related to meter reading 2. Collection and custody of electric and incidenta~. charges 3. Work concerning account transfer and direct transfer 4. Management concerning consigned charge collections
Distribution Sec.	1. Planning for distribution facilities 2. Preparation of distribution related budget plans and budget control 3. Management of distribution office automation 4. Design, execution, and inspection of distribution line work 5. Acquisition of various rights, compensation, and reparation concerning sites for distribution 6. Study of which customers suffered outages and are entitled to outage discount
Distribution Technology Group	1. Planning and implementation of technical education 2. Research, development, and guidance regarding new engineering method and technology

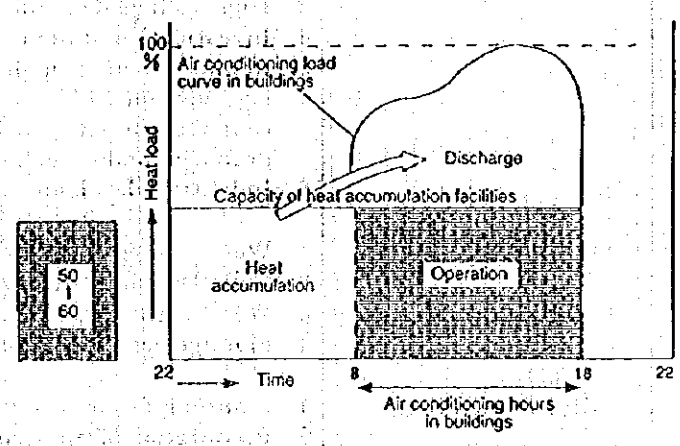
The Heat Accumulation Type Heat Pump System has been recommended for the air-conditioning of buildings.

The requirement for amenities and development of a highly information-oriented society has brought about recently a rapid increase in the demand for air-conditioning. This has been one cause of the narrowing of the gap between electric power supply and demand.

On the other hand, environmental problems such as limited resources and the green-house effect has required more effective utilization of energy.

Because of this, Chubu Electric Power Co. has proposed, incorporation of electric power air-conditioning systems using mainly Heat Accumulation Type Heat Pumps capable of utilizing relatively cheap night-time electric power as a means of contributing to energy-saving & the evenness of the electric power load.

● Operation with heat accumulation type heat pump system



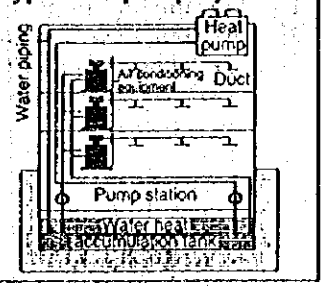
(During the peak season, the same heat source is operated for 24 hours.)

Kinds of Heat Accumulation Type Air-conditioning System:

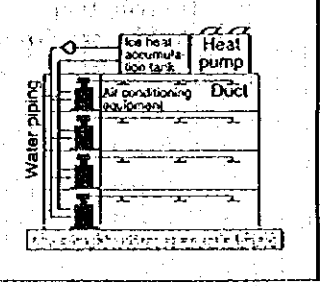
(1) Water or Ice Heat Accumulation Heat Pump System (Concentrated System)

The heat accumulation type heat pump system operates the heat pump during the night time and stores ice, water or hot water in accumulation tanks. During daytime temperature control, the system sends out cold or hot air into each room through the temperature control equipment into which cold or hot water is fed in each room.

● Water heat accumulation type heat pump system



● Ice heat accumulation type heat pump system

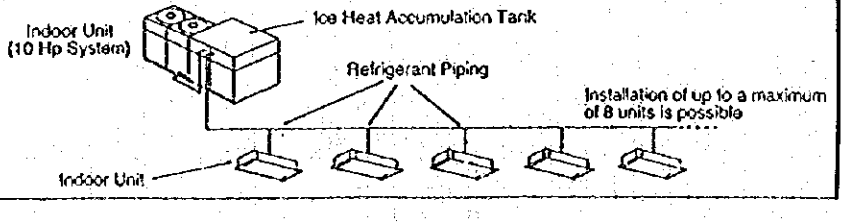


(2) Ice Heat Accumulation Type Individual Air-conditioning System:

In accordance with the development of a highly information-oriented society, there has appeared building with intelligent or office-automated functions. These have mainly adopted individual dispersion type air-conditioning systems such as multiple air-conditioning units (for building) or package type which controls the temperature for each floor or office space. This type of air-conditioning is expected to increase in the future based on its cheaper installation cost, its case of design and installation, and its convenience for controlling the air temperature in areas.

Ice Heat Accumulation Type Individual Air Conditioning System, which is a new heat accumulation type air-conditioning system has, in addition to this individual dispersion system, an additional outstanding feature. It has a an ice heat accumulation tank mounted on it, which has been already sold on the market, and plans are currently being made for future promotion by Chubu Electric Power Co., Inc.

● Example of Multiple Air Conditioning Units (12.5 Hp) in Buildings

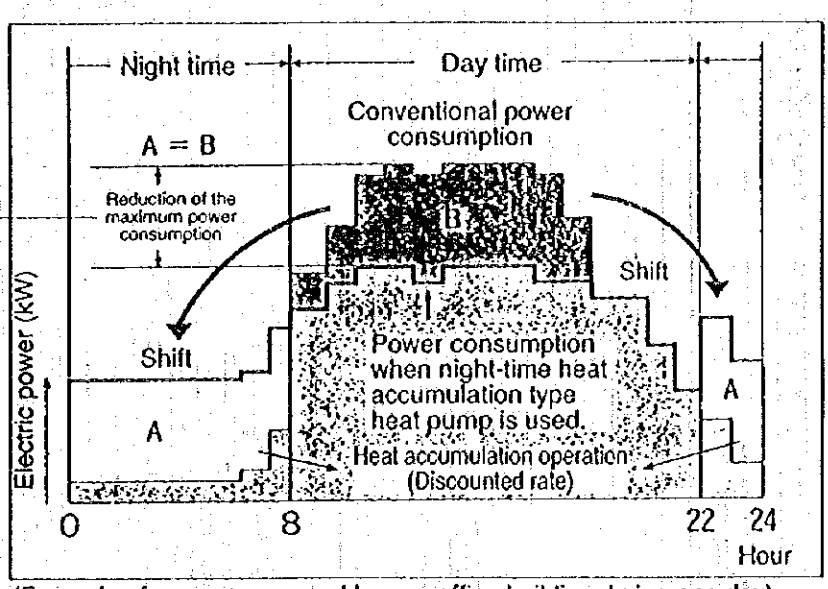


By Utilization of Heat Accumulation, Expense Can Be Reduced.

By storing the coolness or heat used for temperature control during the night through a highly efficient heat pump, and using the stored heat/coolness during the day the following advantages can be achieved;

1. The reduction of operating costs by using discounted night-time rate electricity
2. A down-sizing or reduction of the heat source equipment such as the air-conditioning unit or the transformer.
3. A reduction in the basic rate through a reduction in the contracted amount of power consumption

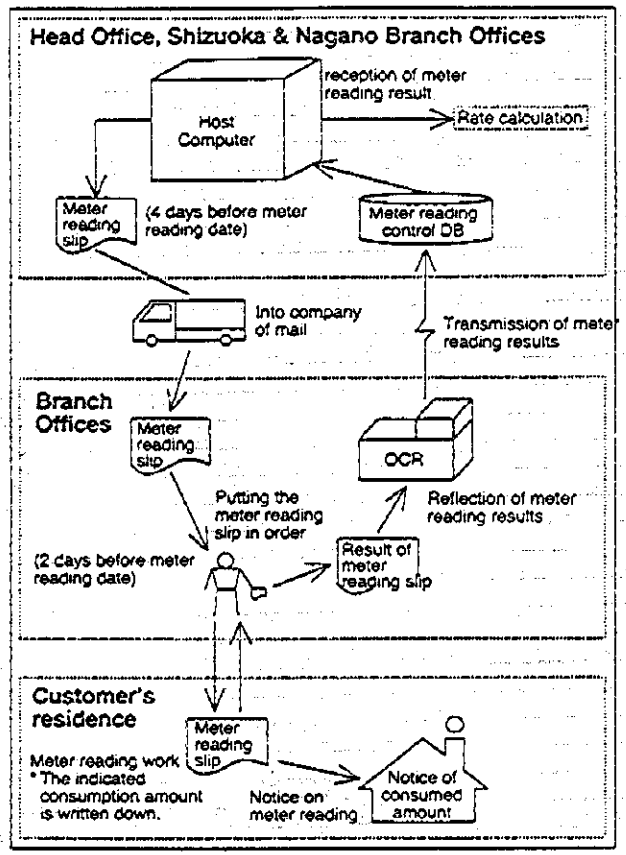
Reduction of the equipment — Capacity or contracted Power consumption

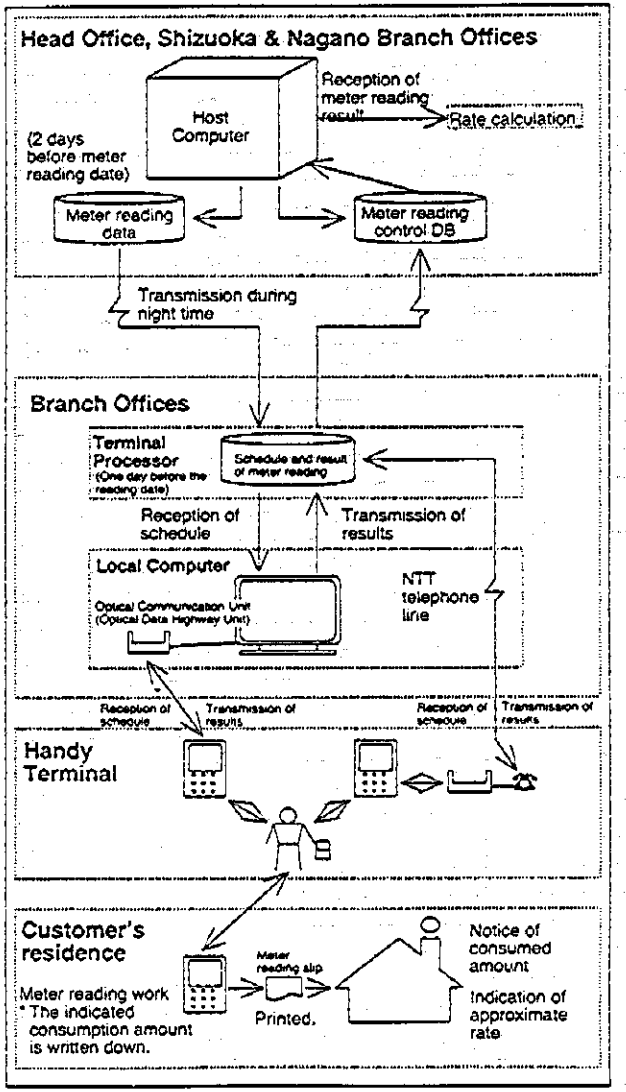


(Example of power consumed by one office building during one day)

Electric power itself is unstorable, therefore, supply facilities must always be ready to meet maximum power consumption demand. As shown above, if the day-time demand can be shifted to the night, this will bring about a reduction in equipment investment and an improvement in the utilization of existing facilities. This will also bring about a decrease in the cost of power.

Introduction of the Handy Terminal (Portable Terminal) has made it possible to quickly and accurately perform meter reading.

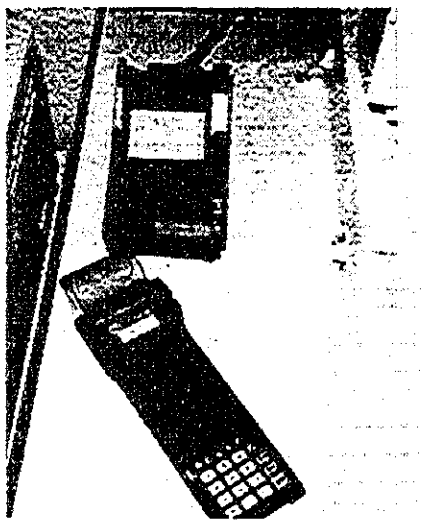




	Former meter reading work	Present meter reading work
Reception of Individual Data Necessary for Meter reading	Sending of Meter reading slip's to each Branch office	Transmission of Meter reading Data to each Branch office via communication line
Meter Reading Work	Manually writing the indicating figures on the meter reading slip, calculating the consumed amount by means of a portable calculator	Automatic Calculation of the consume amount inputting the indicated figures into the Handy Terminal's Ten-key.
Indication of Approximate Rate	Not indicated	Indicated
Transmission Method	Transmission after meter reading through the Optical Character Reader (OCR)	Transmission through the Communicate line from the Handy Terminal

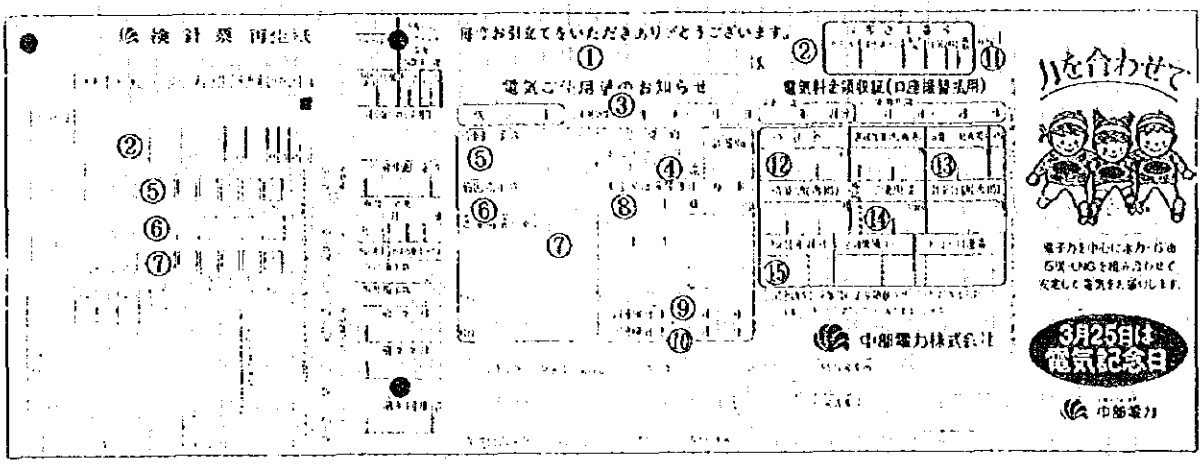
Effects of Introduction of the Handy Terminal System:

1. Increased Service to Customers:
   - The approximate rate can be informed at meter reading.
2. Higher Efficiency in Meter Reading Work and Improvement in Accuracy:
   - The mutual transmission of data between Host & Local Computer is performed, without the formerly necessary printing of meter reading slip and mailing.
   - By only inputting the indicating figures on the kilowatt-hour meter into the handy terminal, the consumed amount is automatically calculated and additionally abnormal consumption is investigated by the handy terminal itself, on-site, so as to prevent meter reading errors.
3. Contribution to Resource-Savings:
   - Less use of meter reading slips has reduced the paper volume by half compared with the former amount.

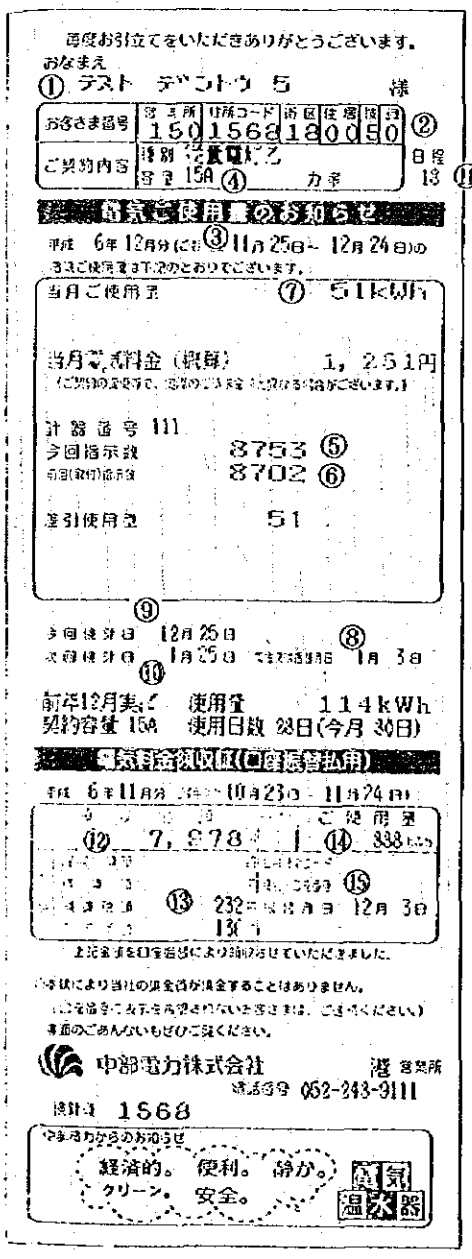


Meter Reading Card

Old Meter Reading Card



New Meter Reading Card



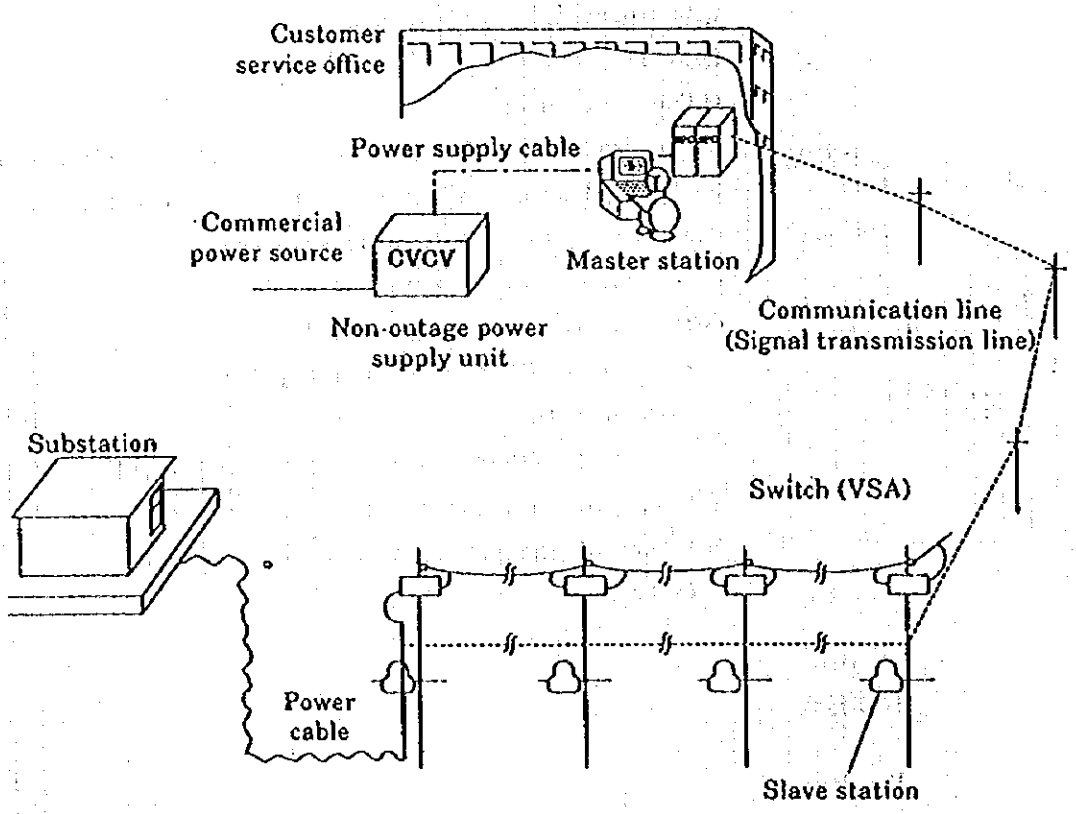
①Customer name
②Customer I.D.
③Billing period
④Contract Power
⑤The reading of the meter on this meter reading day
⑥The reading of the meter on the previous meter reading day
⑦Amount of this month's consumption
⑧Collection day or withdrawing day
⑨This month's meter reading day
⑩The next month's meter reading day
⑪Data of withdrawing
⑫Amount of withdrawing in the previous month
⑬Amount of consumption tax
⑭Amount of the previous month's consumption
⑮Withdrawing day

Automation of distribution lines

A. First stage automation (Manual control system, 1987 ~ 1990)
When trouble occurs in a distribution line, we send maintenance staff to the site in order to minimize the outage range and times. However, we started the first stage of distribution line automation in isolation of the fault section by remote control from the pertinent customer service office, thereby substantially reducing the outage range and time.

(a) Outline
The distribution line automation system means that the master station installed in a customer service office monitors and controls the slave stations through signal transmission line. Monitoring and control are carried out by operators who make the judgement while watching the screen of the master station.

Fig. 1 Outline of Distribution Line Automation



B. Future distribution line automation plan (1991 ~ 2000)

Although we started the distribution line automation with the manual control system, we also continued with development of a computerized automatic control system and have reached levels of pratical application actually.

Since we can expect great result from this system in terms of labor saving in operation, improvements in the distribution line control, efficiency in the equipment investment and solutions to the future problem of difficulty in securing enough personnel, we established the "Long-Term Distribution Line Automation Plan (1991 ~ 2000)", centerring mainly on the computerized automatic control system.

We will be executing this plan on a specific annual plan, but will include the latest technologies and methods of the time and operate flexibly by construction plants on expenses boring our overall judgement on expenses construction plans of customer service office and replacement of the control office systems. The following outlines this "Long-Term Distribution Line Automation Plan".

Fig. 2 Outline of Computerized Automatic Control System

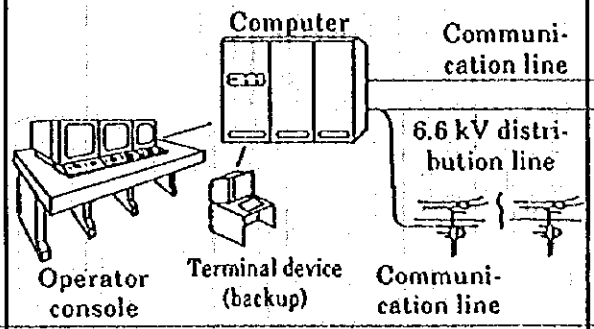
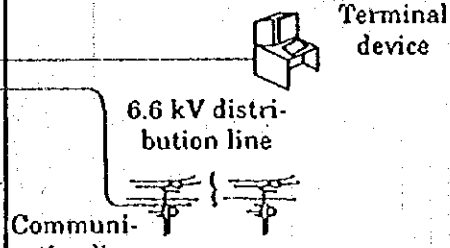
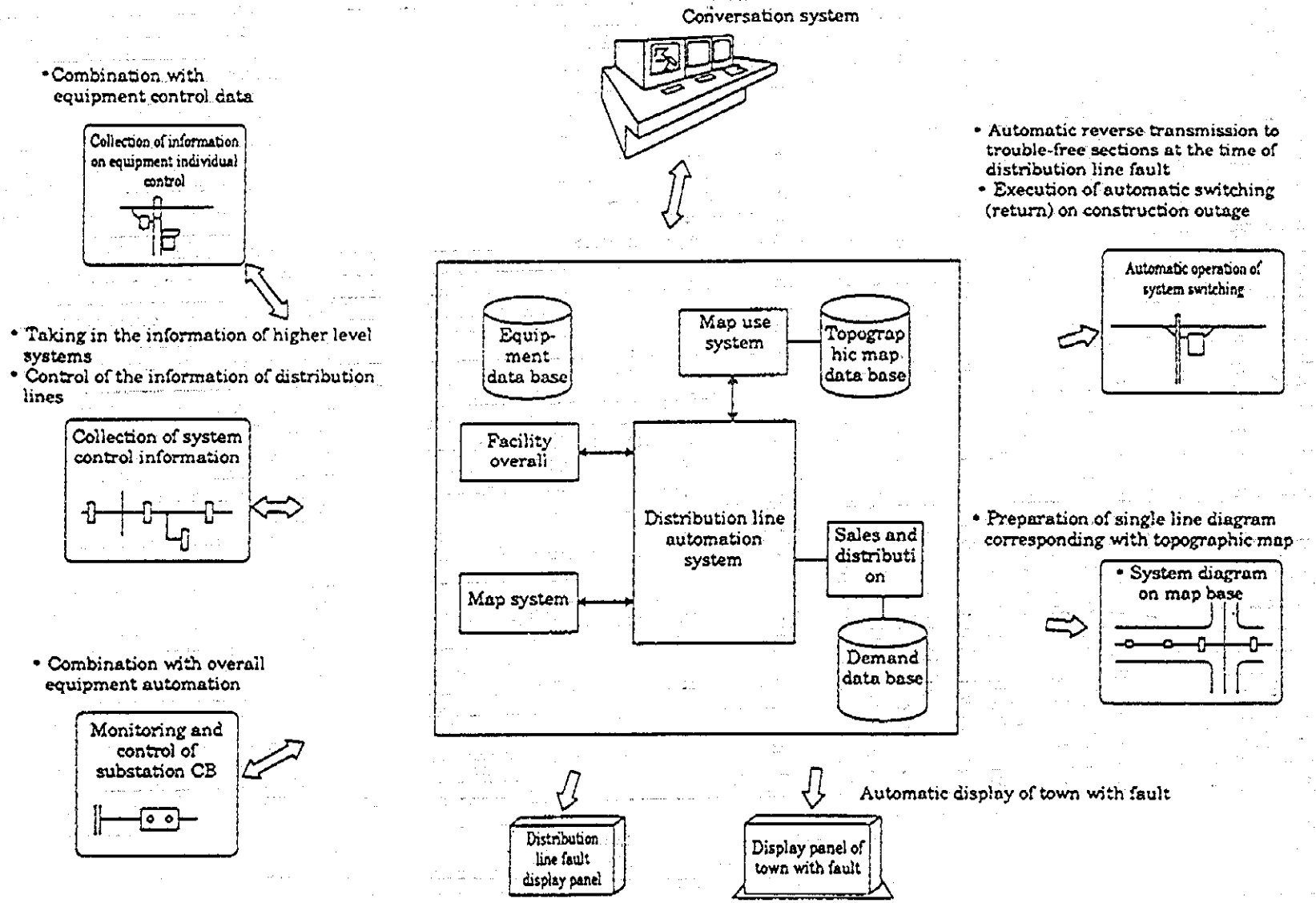
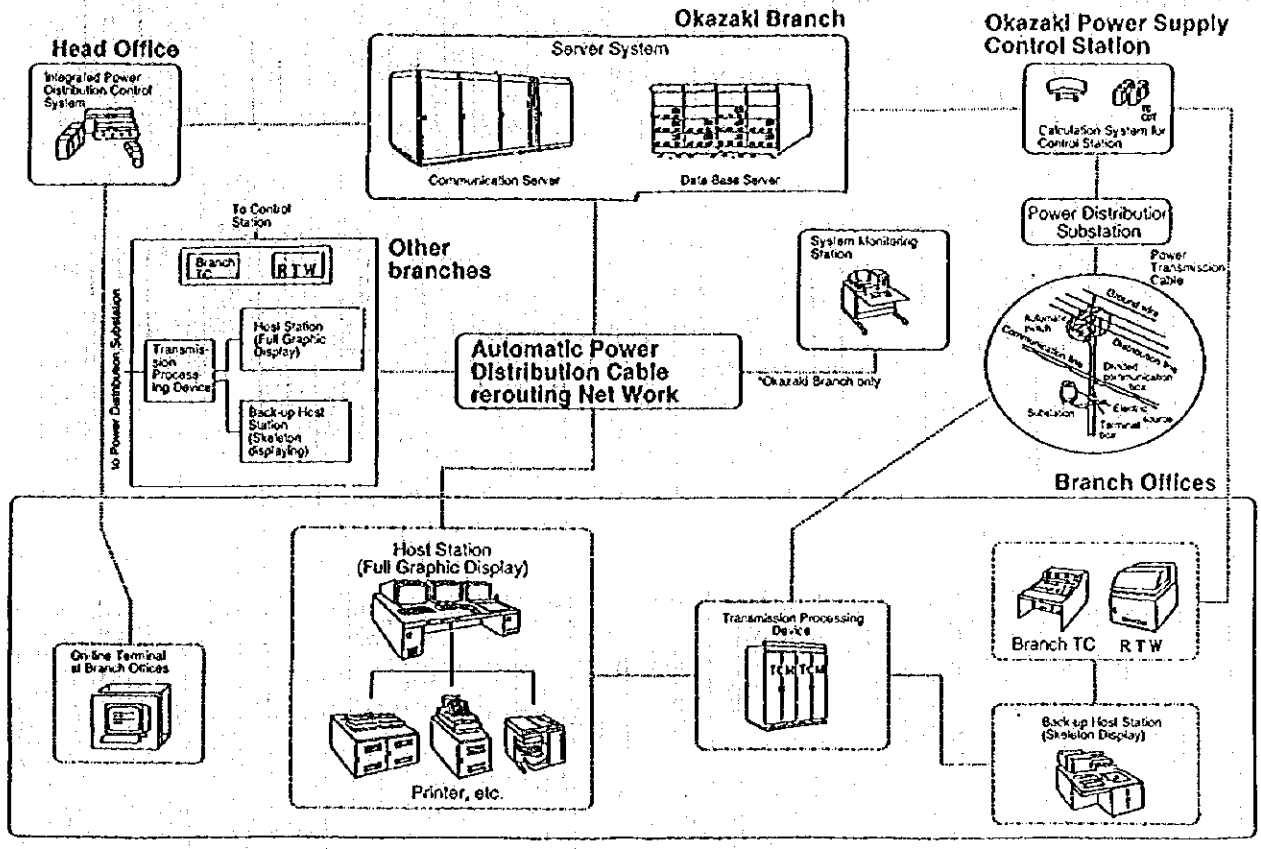
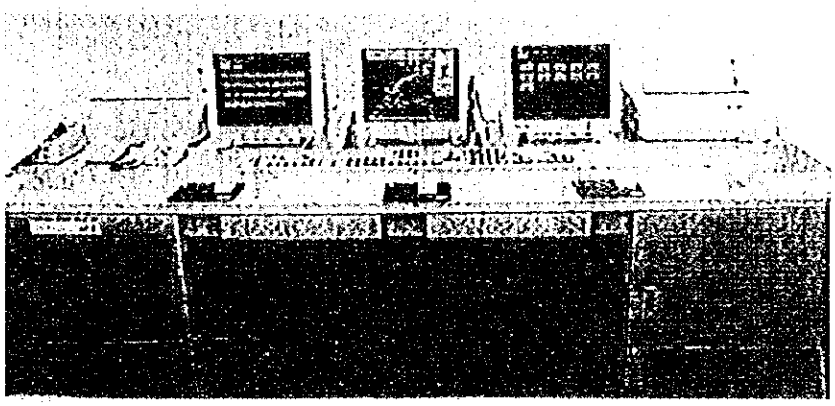
	Base point operation office	Satelite operation office
System configuration		
processing	The automatic control master station automatically monitors and controls all distribution line systems including the sattelite operation office and the result is displayed on the CRT screen of three units.	The monitoring and control results at the basic point operation office are displayed on the CRT screen of terminal device.

Fig. 3 Conceptual Diagram of Distribution Line Automation System



System Composition:





Interconnected System:

- Electric Power Distribution Control System:

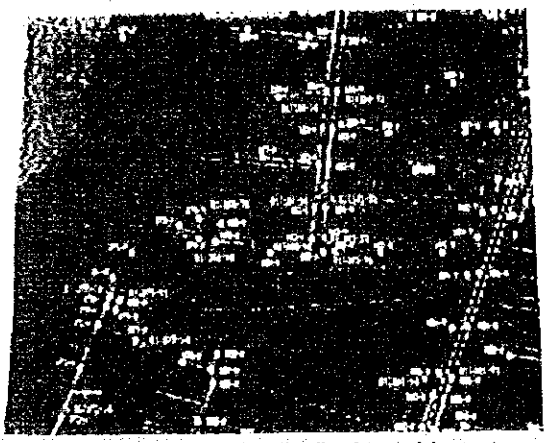
  Through system-wide information provided by the network, troubles in power transmission cables or overloading of substations for power distribution, can be monitored.

- Integrated Power Distribution Control System:

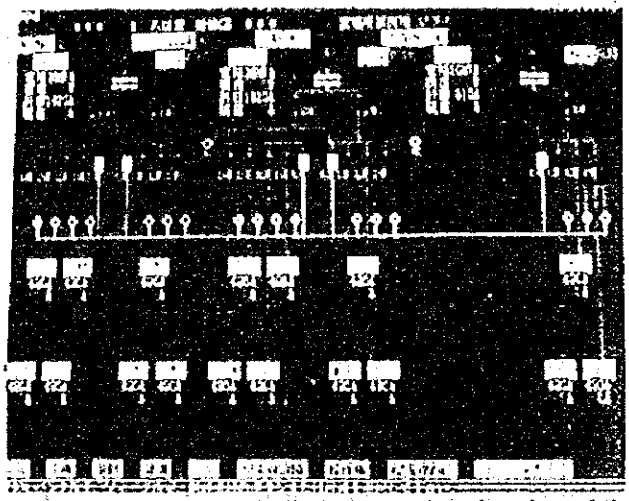
  Through facility-wide information provided by the system, prediction of loads on the cables is possible. Also, simplification of data input work has been brought about by equipment changes.

Examples on display

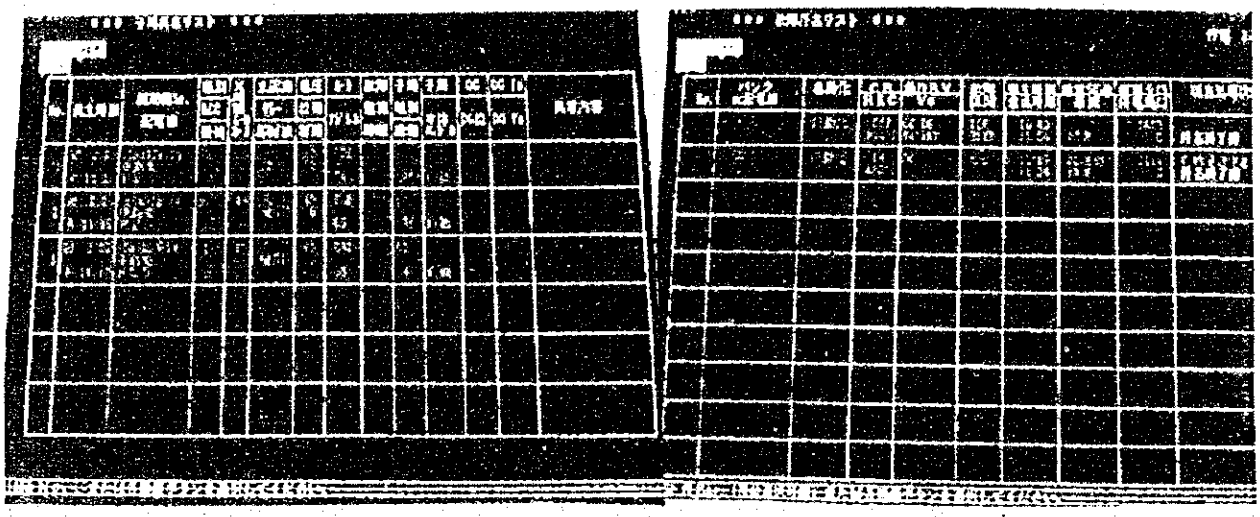
Host Station (Full Graphic display):



1. Display of the power distribution cable routes drawn on a road map

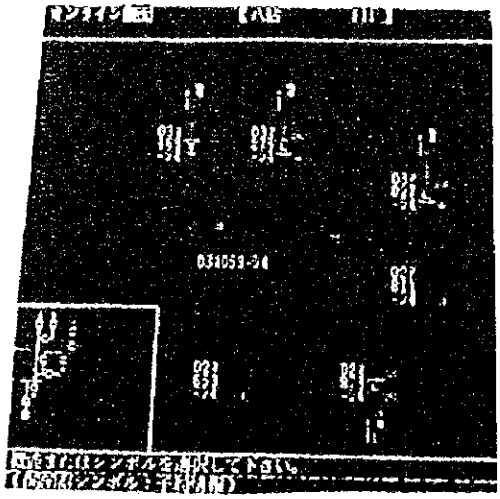


2. Display of a single line connection drawing of the transformer stations



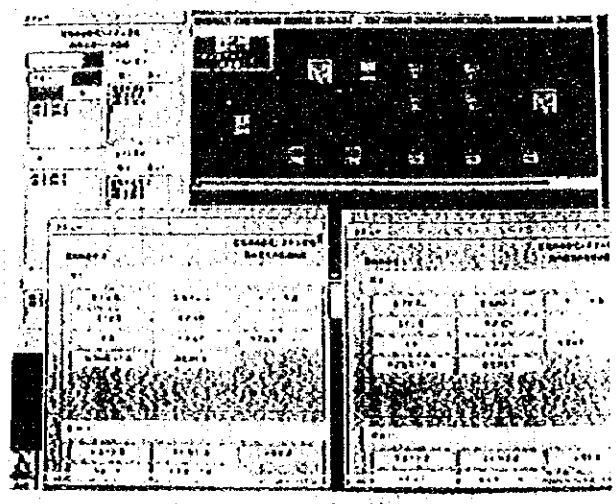
3. Display of various lists

Back-up Host Station (Skeleton display):



Display of the power cable circuit diagram

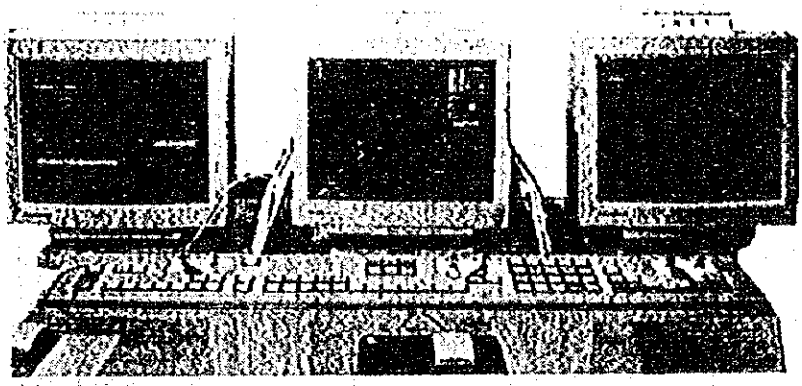
System Monitoring Station:



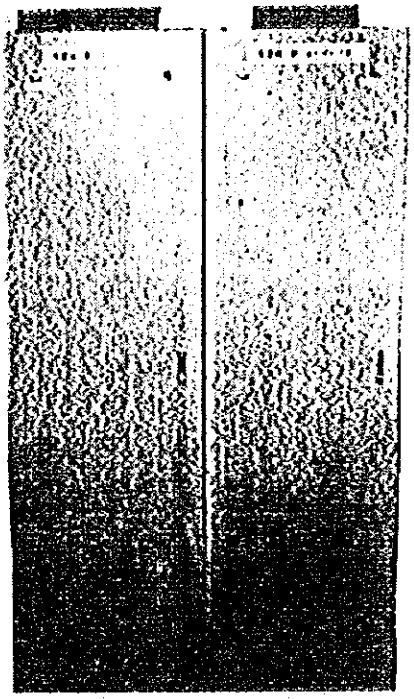
Display of the system operational status

System Composition

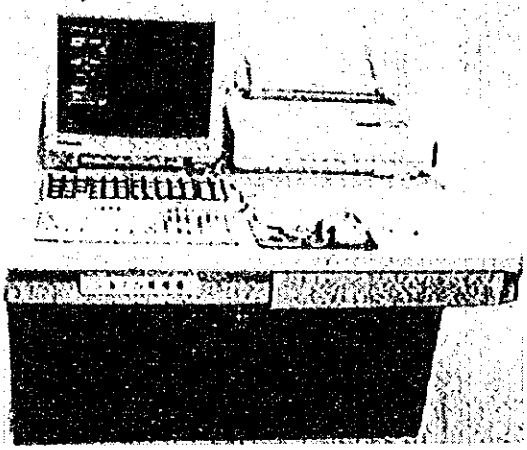
Headquarters Station:



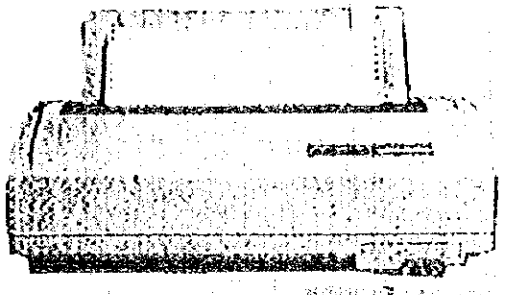
1. Desk-top type CRT displays the current status of daily operations and the content of the operation.



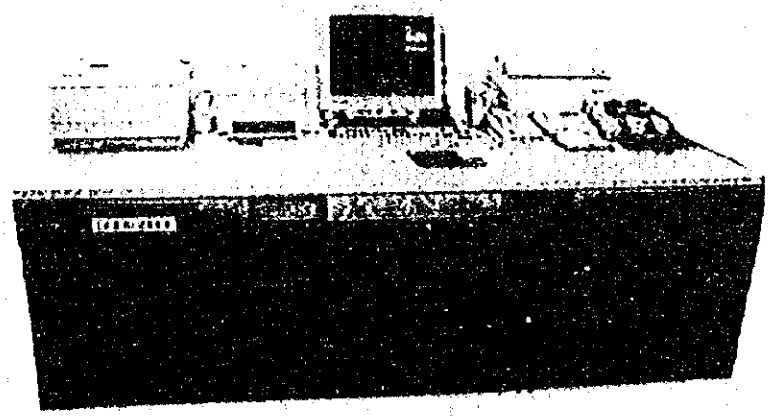
4. The Signal transmission device performs mutual data transmission/receipt between Host & Substations.



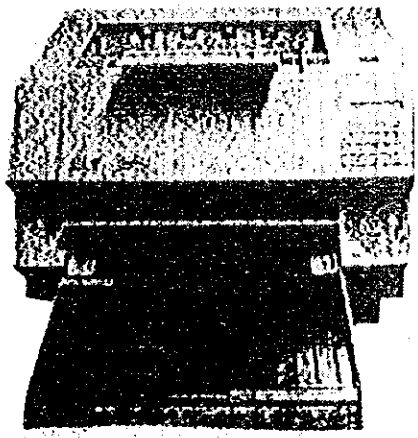
2. The System Watch Table (Okazaki Branch only) monitoring the operational status of the overall system and quickly informing the operator of any problems.



5. SF data printer makes data records, for power failures, operation of results and for equipment.

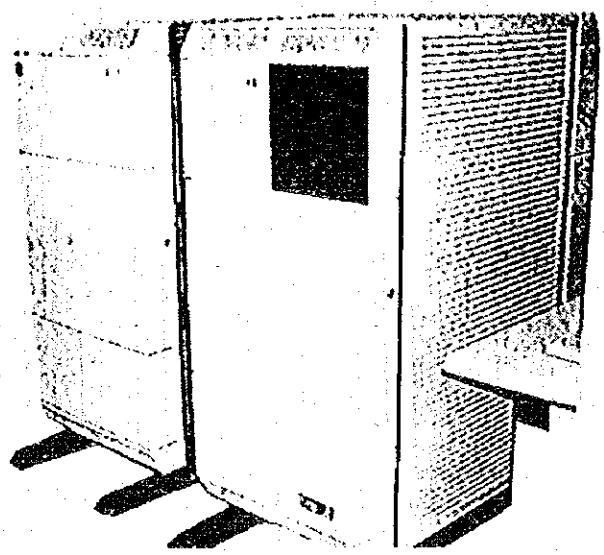


3. The back-up host station can continue distribution line rerouting work during maintenance and inspection of the program control system.

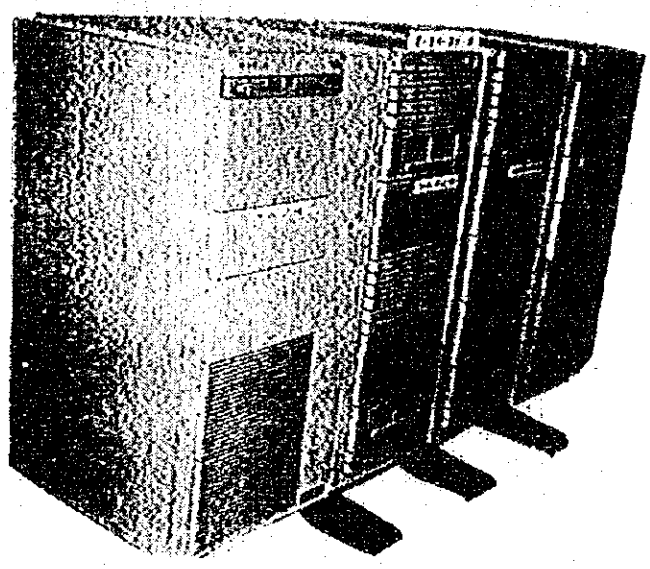


6. The color hard copy machine can print the content of the CRT screen.

Server Room:

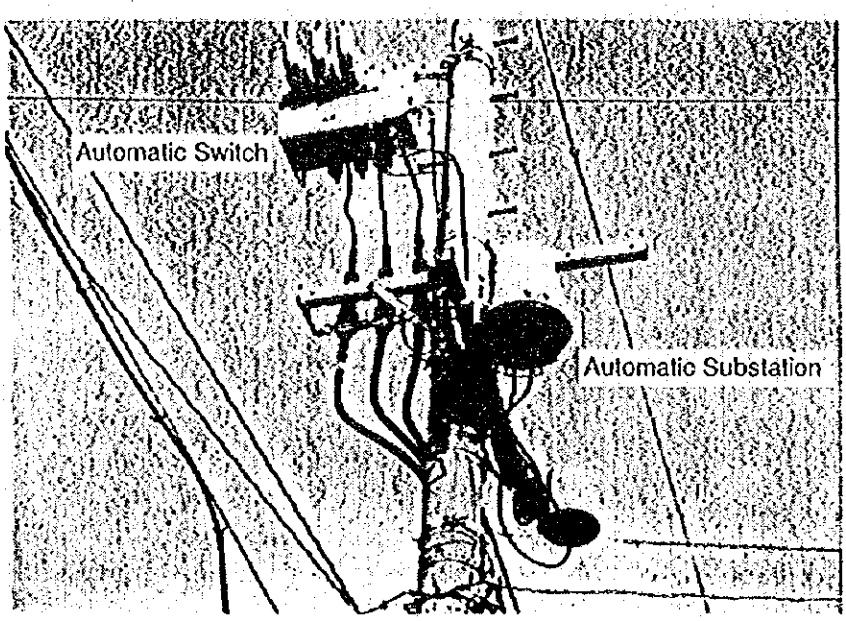


1. Communication Server makes data exchange possible between the control stations and the integrated power distribution control system.



2. Data Base Server stores software and information on the power distribution equipment of each branch offices in the network.

Site:



Automatic Switch and Substation, are automated a signals is sent to the substation from the host station to operate the switch on the pole and also, switch information is sent to the host station by the substation.

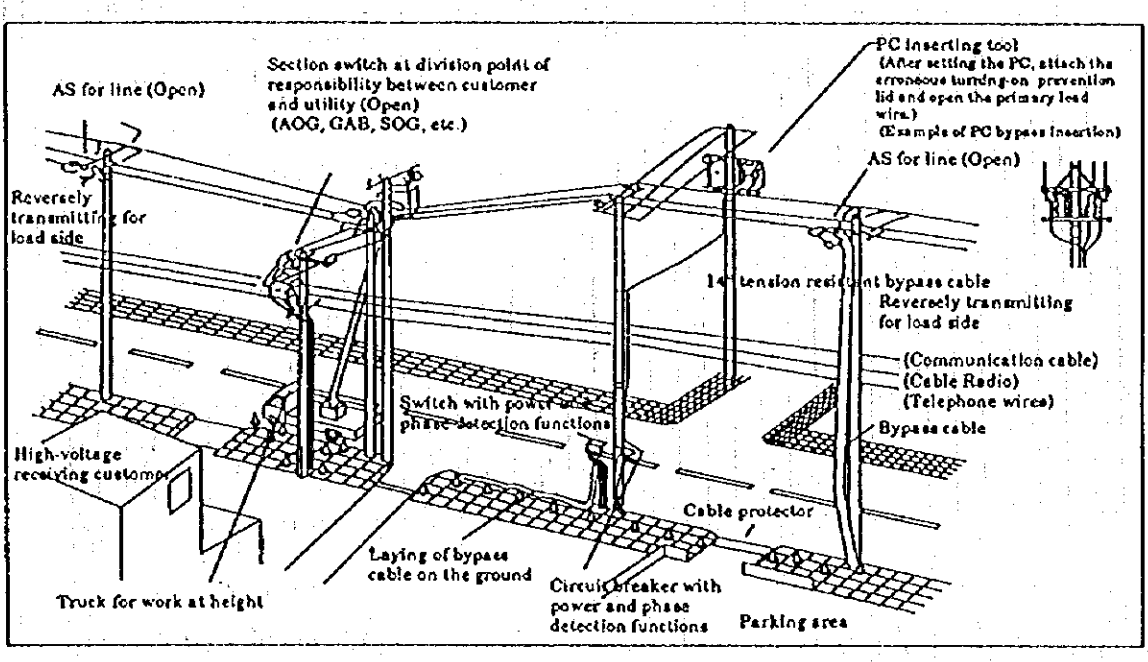
Measures to reduce on Construction Outages

Non-outage construction method

We are promoting the development and introduction of the non-outage construction method (refer to Table 1) to respond to customers' demands for an outage free supply, to increase the construction work efficiency and to realize safe and comfortable distribution line work.

A. Tentative transmission method
In this method, the power is transmitted by bypass cable for the customers in the construction section so that customers do not experience outages and the workers work at no voltage. (Refer to Fig. 1)
We started this method on construction work in Nagoya City and in the central parts of major cities in 1990 and we plan to enlarge the areas of application.

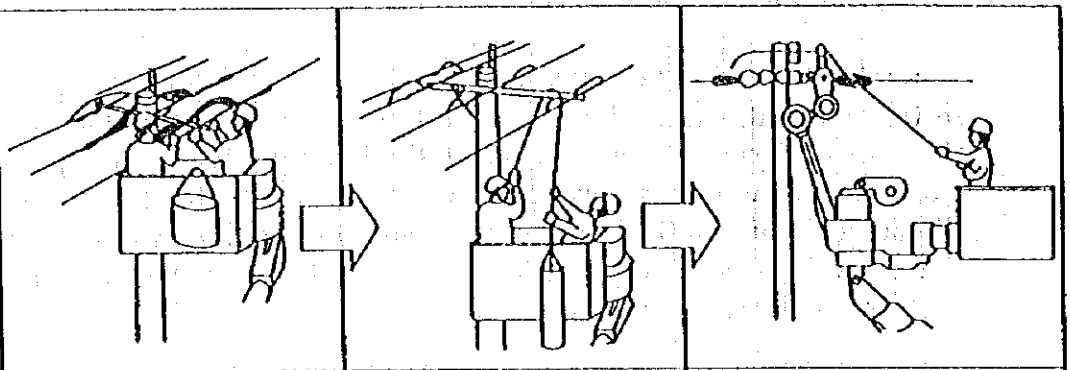
Fig. 1 Conceptual Diagram of Bypass Cable



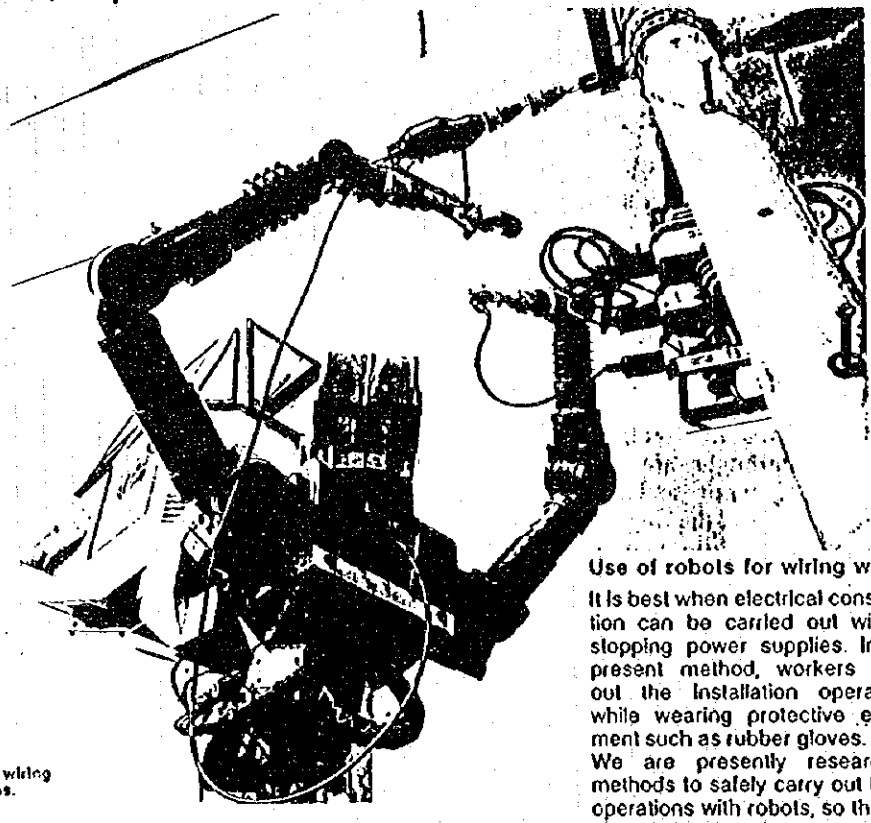
B. Indirect live line method

In this method, the workers work while the high-voltage is maintained. This method has two types, hot-stick method for simple work and mobile indirect live line method using vehicles for sophisticated work. We are also studying the manipulator method for use of a robot in the future.

Fig. 18 Conceptual Drawings of Indirect Live Line Method

Conceptual drawing			
Explanation	Workers who wear protectors such as high-voltage rubber gloves and high-voltage rubber boots work touching the charged parts.	Workers work using an insulative operation rod without touching the charged parts (applied to simple work).	Workers work using a sub-arm holder which holds utensils and super-arm which is operable with tools attached to its edge.
Construction method	Direct live line method	Hot stick method	Mobile indirect live line method (super-arm method)
		Indirect live line method	

(Manipulator method under research)

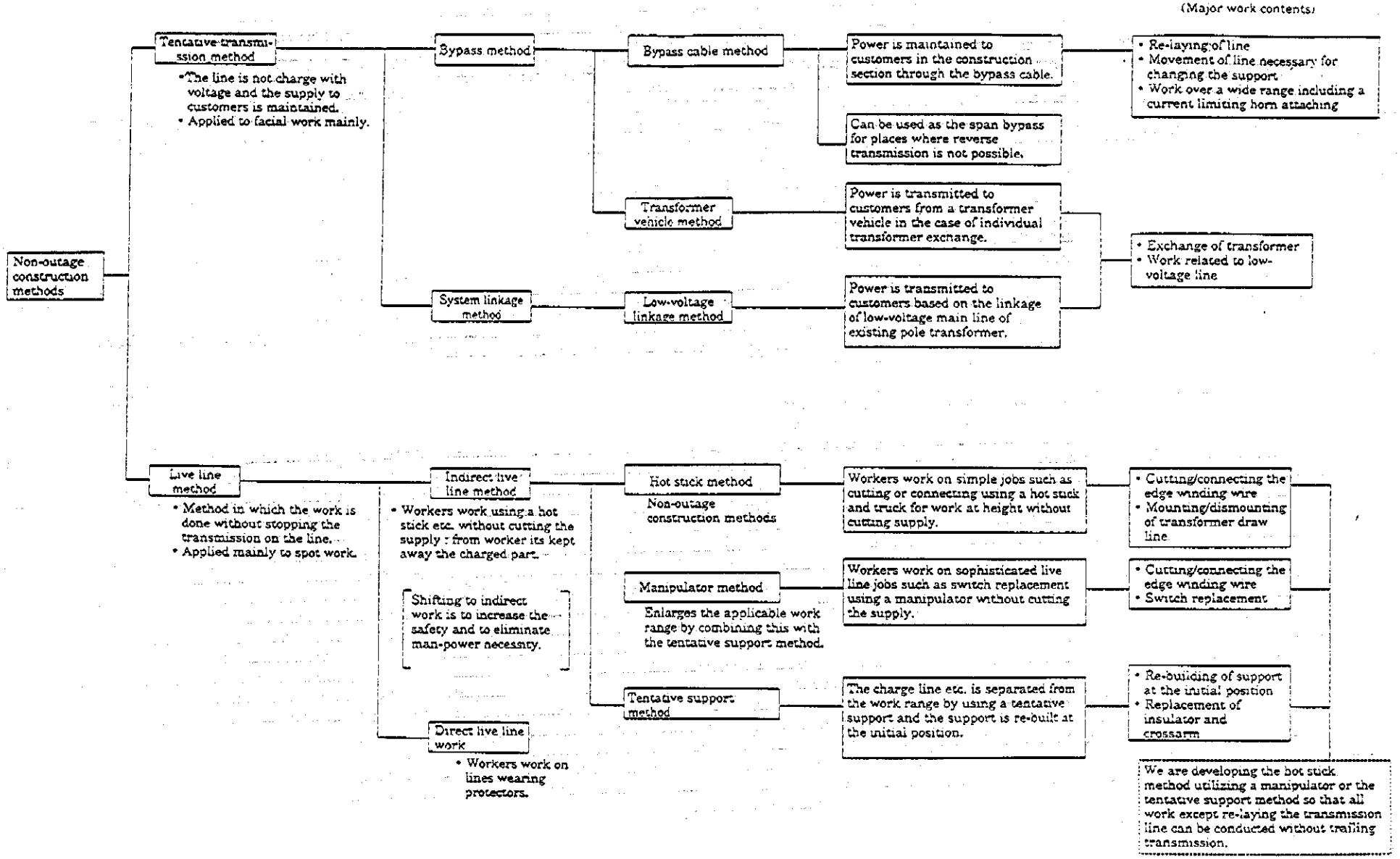


Manipulator for high wiring installation operations.

Use of robots for wiring work

It is best when electrical construction can be carried out without stopping power supplies. In the present method, workers carry out the installation operations while wearing protective equipment such as rubber gloves.
We are presently researching methods to safely carry out these operations with robots, so that we will not inconvenience our users with power stoppages.

Table 6 System of Non-Outage Construction Methods



AGENCIA DE COOPERACION
INTERNACIONAL DEL JAPON
(J I C A)

ADMINISTRACION NACIONAL
DE ELECTRICIDAD
(A N D E)

C E R T I F I C A D O

Conste que: _____

ha participado del Seminario de **ELECTRIC POWER MANAGEMENT**, desarrollado por Expertos Japoneses enviados por la Sede Central de Tokio, realizado en la Ciudad de Asunción, durante el día 10 de julio de 1.996.

Asunción, 10 de julio de 1.996

YOKO MOCHIZUKI
Jefe de la Misión y Director
del Seminario

KOJI TOMIZU
Representante Residente
JICA - Paraguay

MIGUEL F. RODRIGUEZ
Pdte. de la Administ. Nac. de
Electricidad (ANDE)

La Agencia de Cooperación Internacional del Japón
(JICA)

tiene el honor de otorgar este certificado a

---

en reconocimiento a su participación en el

SEMINARIO SOBRE ADMINISTRACION DE ENERGIA ELECTRICA

llevado a cabo por la Misión de Seguimiento Técnico de Ex-Becarios

realizado en El Pardo Hotel, Ciudad de Lima el 15 de Julio de 1996

Lima. 15 de julio de 1996

Srta. Yoko MOCHIZUKI
Jefa de la Misión
de Seguimiento Técnico del
Curso de Administración de Energía Eléctrica

Sr. Masashi AOKI
Representante Residente
JICA-Perú

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

takes pleasure in presenting this certificate to

_____

_____

in recognition of his/her participation to the

Seminar in Electric Power Management
by JICA Follow-up Team
for the Ex-Participants

held at 101 PARK HOUSE - Bogotá, on July 19, 1996
given this July 19, 1996

Ms. Yoko Mochizuki Team Leader, JICA Follow-up Team for GTC in Electric Power Management II	Mr. Bunkichi Kuramoto Resident Representative of JICA in Colombia

QUESTIONNAIRE TO THE PARTICIPANTS NOMINATING GOVERNMENT (技協窓口機関用)

1. Please tell us the processes of nominating the participants after you received the *Information* on Group Training Course in Electric Power Management II sent from the Embassy of Japan or the JICA Office in your country, and also the time required until a nomination is made.

2. Do you finalize the nomination (1)on the basis of *Information* or (2)on the related organization's criteria ?

   (1) _____ (2) _____

3. Do you think the *Information* of this course is clearly described about the objectives, contents and level ?

   YES _____ NO _____

4. How long does it take till a participant to finish all the procedures needed for departure after he/she received the notification of his/her acceptance ?

   (1)More than 1 month ___ (2)More than 2 weeks ___

   (3)Less than 2 weeks ___

5. Does the participant present his/her report to your office on his/her return from the training in Japan ?

   Usually yes _____ Usually no _____

   Is it compulsory ?

   YES _____ NO _____

6. Concerning on the field of Electric Power Management, do you have a chance to get an assistance from donors other than JICA (Japan International Cooperation Agency) ?

   YES _____ NO _____

   If yes, what kind of assistance are they ?

   _____

   _____

   _____

7. If you have any opinion about this training course in comparison with other similar trainings inside or outside of your country, please state below ;

   _____

   _____

   _____

Thank you very much for your cooperation.

QUESTIONNAIRE TO THE ORGANIZATION OF THE EX-PARTICIPANTS

(帰国研修員所属機関)

The group training course (Electric Power Management II) has been conducted annually by JICA. Recent Training curriculum is attached as reference.(Annex 1,2)

Name of the organization:_____

Address:_____

_____

The team would appreciate it if the following questions could be answered.

I . Nomination Procedure :

1. Please let us know the necessary processes to nominate candidates, after you receive the *Information* of the Group Training Course in Electric Power Management II sent from the Emabassy of Japan or the JICA Office in your country, and the time required for each process.

2. Is it difficult to select applicants for participating in this Group Training in your country ?
   1) _____ Difficult to select, due to the large number of applicants
   2) _____ Difficult to select, due to the limited time allowance
   3) _____ Easy to select, due to the small number of applicants
   4) _____ Others (list other reasons)

   _____

   _____

   _____

3. What is your policy of selecting the candidates ?

   _____

   _____

   _____

4. Please explain the procedures from the time your organization receives the notice of participant's acceptance until his/her departure for Japan, and the time required for each process.

5. Do you have sufficient time allowance for completing the procedures described in Item 4?

Yes_____ No_____

If No, state the time required.

_____

II. Effect of Training :

6. Is there a kind of duty for participants to present a report to your organization when he/she returns to your country after the training in Japan ?

Yes_____ No_____

If Yes, what kind of report are they ? (If No, skip to the question 7)

_____

_____

7. What else methods have you used to transfer the acquired skills into your organization ? Please explain in detail on each categories below. (Content, duration, the number of people trained, e.t.c.)

1) On the job training

2) Formal training sessions

3) Written materials of technology learnt

4) Others (Please explain them.)

8. In what specific area has your organization gotten the most beneficial effects from the training in Japan ?

9. Among the techniques and knowledge obtained from the training in Japan, what has been practically applied to the work in your organization ?

III. Present Situation :

10. Please indicate the most serious problems which impede the improvement of Electric Power Management in your country ?

11. Please describe the training programs and staff development systems inside your organization as the countermeasures against the above mentioned problems. (place, equipments, number of instructors and students, kinds of class, duration of training, e.t.c.)

Ⅳ. Others :

12. Please attach the pamphlet, or an organization chart which shows the activities of your organization.

13. Please write down any requests or suggestions to Japan International Cooperation Agency (JICA)

Thank you very much for your cooperation.!

Questionnaire for Ex-participants（帰国研修員用）

NAGOYA INTERNATIONAL TRAINING CENTRE (NITC)
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

No.73, 2-chome Kamenoi, Meito-ku, Nagoya 465 Japan

Q U E S T I O N N A I R E

I . Personal Data :

1. Name in Full : _____ , Date of Birth _____
(Please underline family name)

2. Name of institution where currently employed :

_____

Address : _____
(Street and Number) (City) (State/Country)

_____ Tel. _____
(Zip code) (Cable/Telex) (Telephone)

3. Your position at present:

_____

4. Current home address :

_____
(Street and Number) (City) (State/Country)

_____ Tel. _____
(Zip code) (Telephone)

II. Present Work and Effect of Training :

5. Current position : _____

Your responsibility :

_____

_____

6. Which part of your training held by JICA was most useful to you in relation to your subsequent position and responsibility ?

_____

_____

_____

III. Skills Transfer:

7. Have you presented a report to your organization after you returned to your country from the training in Japan ?

Yes_____ No_____

8. What else methods have you used to transfer the acquired skills within your organization ? Please explain in detail on each categories below. (content, the number of people trained, duration e.t.c.)

a) On the job training

b) Formal training sessions

c)Written materials of technology learnt

d) Others (Please explain them.)

9. Which part of the training by JICA was the most applied in your workplace ?

_____

_____

_____

10. What are the main obstacles to be overcome in transferring the techniques and knowledge to others within your organization ?

_____

_____

_____

_____

IV. Problems :

11. What do you consider to be the biggest problems in the performance of your present job? (Check 4 or less in each row below ;)

Lack of

_____ trained personnel
_____ equipment
_____ funds
_____ foreign experts
_____ research facilities
_____ other, specify ;

_____ support of supervisor
_____ technical literature
_____ national training institutes
_____ transport facilities
_____ career perspective

Please explain them briefly.

_____

_____

_____

_____

12. In terms of training or technical improvement, do your have any idea of renewing the course curriculum drastically or creating a new course ?

_____

_____

_____

V. Post-training Services Programmes :

13. JICA provides the following post-training services in order to keep in contact with alumni(ex-participants), enhance friendly relations, and provide the latest technical information.
    1) Dispatch of Follow-up Team
    2) Support for Alumni Associations
    3) Provision of 'KENSHU-IN' and Technical Literatures

    Do you think that the Alumni Association in your country is actively functioning ?
    Yes_____ No_____

    Are you participating in the Alumni Association activities ?
    Yes_____ No_____

    Do you think that your involvement in Alumni Association is helpful for yourself ?
    Yes_____ No_____

    Does the Alumni Association have a specific program of activity in future ?
    Yes_____ No_____

    _____

    _____

    _____

14. Please make a comment if any on the JICA's post-training services ?

    _____

    _____

    _____

    _____

Thank you very much for your cooperation.

Japan International Cooperation Agency

Questionnaire on the Seminar in Electric Power Management II

The Follow-up Team would appreciate it if you could kindly answer the following questions.

1. Name of attendant : _____

2. Name of organization : _____

_____

3. Your position : _____

4. Have you ever attended any JICA training course ?

Yes ____ No ____

If yes, please write down the name of the course and the year.

Name of the course _____

Year _____

5 Was the seminar useful to you ?

Yes ____ Not much ____

Please explain more about your answer.

_____

_____

_____

_____

6. Please write down the name of subject you would like to have a training in Japan if you have such a chance.

_____

_____

_____

_____

_____

Thank you very much for your cooperation.

4．持ち帰り資料一覧表

【パラグァイ】

・Resumen Estadistico 1995	ANDE
・MEMORIA ANUAL	ANDE
・COMPLILACION ESTADISTICA 1982 - 92	ANDE
・Manual de Autogestion	ANDE
・研修員募集過程説明図	S.T.P.
・TRAINING PROGRAMMES	SIDA
ENERGY CONSERVATION IN INDUSTRY	
MANAGEMENT OF HYDRO POWER DEVELOPMENT	
POWER SYSTEM CONTROL AND OPERATION	
MANAGEMENT OF ELECTRIC POWER UTILITIES	
ELECTRICITY DISTRIBUTION MANAGEMENT	

【ペルー】

・PERU'S CHALLENGE: THE ELECTRICITY BUSINESS	Ministry of Energy and Mines of Peru
・PLAN REFERECIAL DE ELECTRICIDAD	MINSTERIO DE ENERGIA Y MINAS
・MEMORIA 1995 EDEGEL S. A.	EDEGEL S. A.
・THE ELECTRICITY BUSINESS IN PERU	---
・MERCADOS PARA UNA EMPRESA GENERADORA	---
・DISTRITOS COMPRENDIDOS DENTRO DEL AREA DE CONCESION DE LUZ DEL SUR	LUZ DEL SUR S.A.
・LUZ DEL SUR S.A. 組織図	LUZ DEL SUR S.A.
・EDELNOR S.A. 組織図 1995	EDELNOR S.A.

【コロンビア】

・INSTITUTO COLOMBIANO DE ENERGIA ELECTICA - ICEL	ENFOQUE GENERAL DEL ICEL
・PORTA FOLIO DE PROYECTOS DE GENERACION ELECTRICA	ICEL
・ISA 事業紹介	ISA
・SISTEMA INTERCONECTADO COLOMBIANO	ISA