

Figure 10.3-2 Power Flow in Year 2005 (132 kV)

10.3.3 Power Flow in 2010

Power demand at consumers end in 2010 is estimated at approximately 9,000 MW. Power transmission line network in northern governorates are integrated with Iraq main power transmission system.

Transmission line expansion was referred to the power generation development. It is expected that the large scale power plants ranging from 600 MW to 1,200 MW up to 2010 would be constructed for satisfying rapid power demand growth. The power

plants are to be connected to the 400 kV system from the installed capacity so as to send the generated energy effectively. Transmission lines routes and its conductor size was selected referred to the MoE expansion plan so that the new line satisfies the generating energy to the demand centre in the system.

The power flow calculation result in 2010 is shown in the Figure 10.3-3 and 10.3-4, respectively.

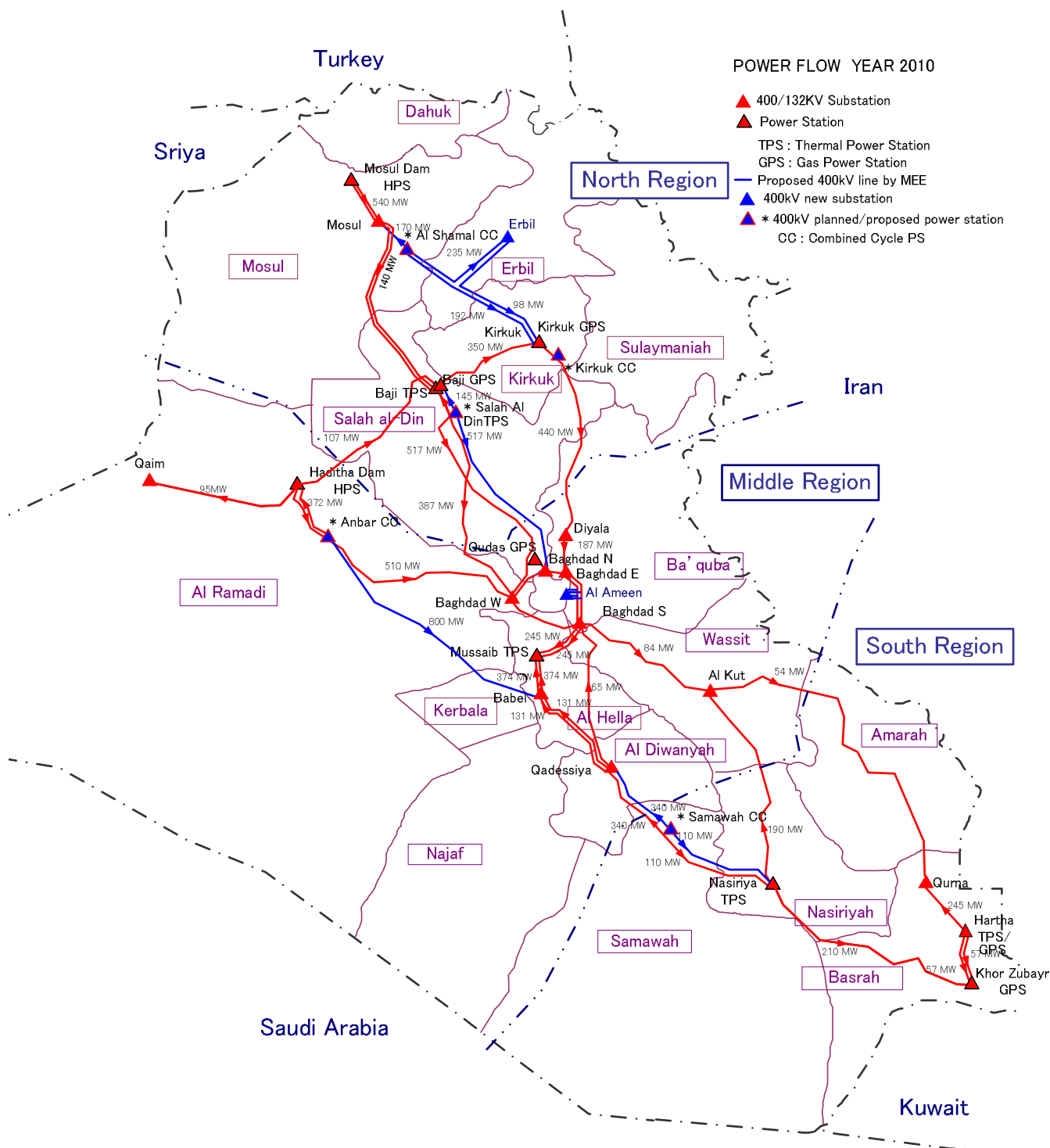


Figure 10.3-3 Power Flow in Year 2010 (400 kV)

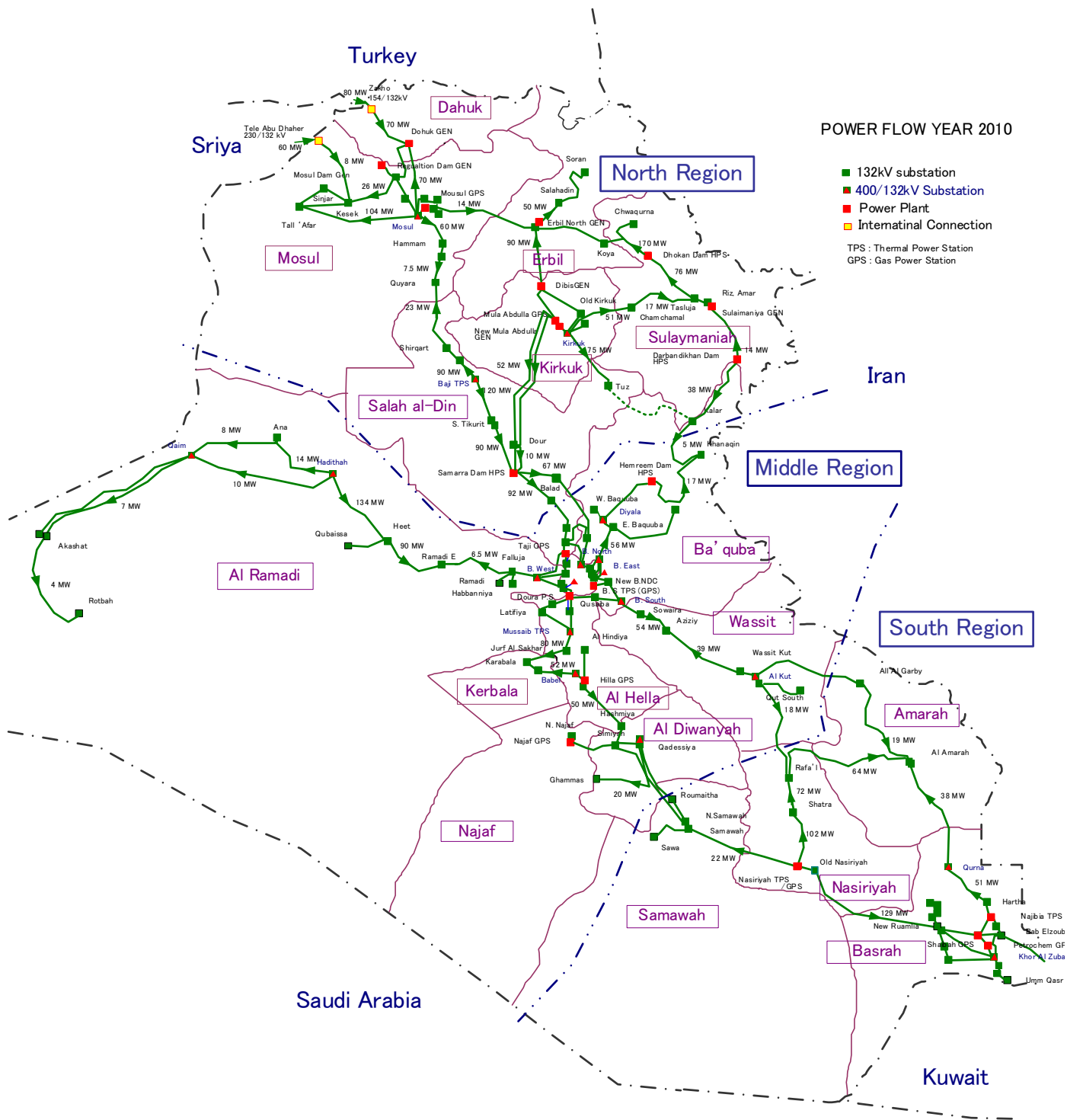


Figure 10.4-4 Power Flow in Year 2010 (132 kV)

CHAPTER 11 CONCLUSION AND RECOMMENDATIONS

11.1 Shortage of Electricity and Urgent Needs for Restoration of Electricity Sector

The electricity sector in Iraq has long experienced shortage of supply capacity to the demand due to lack of maintenance and repair of the facilities and delay in addition of new facilities. This situation was triggered by the Gulf War which occurred in 1990 and has continued to date, being further influenced by the recent conflict in 2003. Load shedding is usually made throughout the country and people are supplied with electricity only for less than a half of 24 hours in a day. Various efforts for the rehabilitation works are being made for the electric facilities by MoE and CPA and power is imported from Turkey and Syria. The actual load of the national grid in May 2004 was only 4,200 MW, although the potential power demand of the country is estimated at more than 6,000 MW.

It is quite apparent that restoration of the electricity sector be given a high priority among the various efforts for rebuilding of Iraq since it is essential to meet the humanitarian needs and enhance development of various industries.

11.2 Continuation of Rehabilitation Works and Technologies for Rehabilitation Works

The on-going and under-planned rehabilitation works of the generating facilities should be continued in order to maintain or upgrade the present supply capacities as long as possible. In parallel with the rehabilitation works of generating plant, the rehabilitation works for transmission lines, substations, distribution lines and load dispatching centers should be carried out to realize a more stable supply system of electricity. It is highly recommended to prepare comprehensive and updated data sheets for the transmission lines, distribution lines and substations for discussion on priority for fund allocation and implementation timing.

Under the economic sanction and various difficult situations, maintenance and repair works for the power facilities have been obliged to be done improperly or with limitation. Technologies used for the rehabilitation works are probably different from the ones used for original installation and might be more sophisticated. In some cases, it is essentially required to use spare parts same as used in the original design. Even in the rehabilitation works, qualified experts should be assigned prior to establishment of the rehabilitation plan and commencement of the works.

11.3 Load Forecasting

In this study, a load forecast was made with a time horizon in 2020 although it should be reviewed and updated based on more reliable and sufficient data. In particular energy requirements for the industrial sector, which shared about 39% of the total

demand, should be analyzed in line with the national master plan for industrial development. It is recommended to review the energy demand for government use, commercial use and agricultural use.

There are a considerable number of captive powers (private owned generating plant operated independently from the national grid). The total installed capacity is reportedly 1,000MW or so. Small generators are used for residential use to cope with load shedding. There is an idea to keep the captive powers independently from the national grid in order to suppress the load of the national grid for the time being, though more analysis should be made.

11.4 Committed Plants

MoE considers commissioning several power generating plants of steam power or gas turbine, which are presented in the CoE's 10 Year Plan prepared in 2002. It is keenly required to complete installation of these power plants as early as possible to cope with the serious shortage of power supply capacity for the increasing power demand. These plants are nominated in the generation expansion plan in the study, though any detail for preparedness or information of the work progress of each the project is not known. It is recommended to review the fund requirements and implementation schedule. For the new installation of thermal plants, the basic items such as land clearance and acquisition, availability of water, availability of fuel, route of transmission line, etc. should be reviewed and confirmed.

11.5 Rehabilitation and Development of Distribution Lines

During the study period, no detail information on the distribution line is available. Even if a master plan study of the electricity sector is conducted in due time, the first focus will be given to the generation and transmission lines for convenience. However, it is recommended to conduct a master plan study for the distribution lines separately at the same time or soon. This study for the distribution lines can be called "Bottom-Up Approach", while the former can be called "Top-Down Approach". The study on the distribution lines will be made in region-wise and step-wise since it takes a considerable time for completion. For this study, experiences gained in the ENRP (Electricity Network Rehabilitation Programme) in the northern governorates by UNDP would be helpful.

11.6 National Policy and Strategy on Energy Production and Use

The electricity generation in Iraq depends much on thermal plants for which fuel supply is prerequisite and is properly arranged. Fuel supply to the power plants should be carefully planned in line with the national policy and strategy on energy production and use. Needless to say, export of oil and use of oil and gas for the domestic use including use for the power plants should be well harmonized. On this point, close and

continued communication and coordination with Ministry of Oil and Ministry of Industry are indispensable. The subjects to be considered are use of natural gas, effective use of flared associated gas, effective use of residual oil in the refineries, route of pipelines and location of relevant facilities and various measures for environmental protection. Share of cost for the infrastructures such as pipelines and relevant facilities would be subject to discussion.

11.7 Environmental Protection

In Iraq, several environmental protection laws were established. However, various environmental issues remain unsolved, such as air pollution caused by oil-fired plants, deterioration of water quality in the rivers and contamination of subsoil by waste. A more appropriate monitoring system for the environment issues should be established at the earliest time in order to grasp the real situation.

11.8 Fuel Price and Electricity Tariff System

Fuel price for the power generation has been set very low and accordingly the tariff was also set low in comparison with the international price level. Under the situation no incentive may occur for more effective use of fuel and for saving energy.

It is necessary to review the tariff structure which was applied in the past. On the other hand, billing and collecting of the electricity tariff has been suspended after the recent conflict in 2003. Resumption of collection of the tariff is essentially needed, if new projects are implemented with international assistance for fund and privatization policy is introduced in the electricity sector.

11.9 Renewable Energies

Iraq is blessed with renewable energies such as hydropower, solar power and wind power, while they have not been tapped fully. It is recommended to investigate potentials of those renewable energies and identify the projects for implementation which are proved feasible. Especially those projects should be implemented from the environmental viewpoints and in case they would contribute electricity supply to remote areas.

11.10 Conventional Thermal Plants and Combined Cycle Plant

Steam power plants have contributed much to electricity production in Iraq and this role would remain unchanged for the time being. For the steam plants, fuel oil, crude oil or natural gas are used. However, combustion of the liquid fuels, if used without proper treatment in the course of refinery or power generation, might be a major

source of air pollution. On the other hand, use of natural gas would be freer from air pollution since it contains less sulfur content.

As explained in the fuel balance, a considerable amount of natural gas, which is mainly associated gas, is not used effectively and the flared gas would be 40 to 80 % of the total production. Use of more natural gas for power generation might be one of the energy policies of the country, but is subject to discussion among the parties concerned, including cost sharing for the gas related structures.

On the other hand, the present power generation may use fuel oil effectively, which can not be used for other purposes. Therefore, the fuel supply system for power generation would be subject to review from the viewpoint of effective use of fuel oil.

In the mid and long perspective, however, use of more natural gas would be a promising option from the viewpoint of environment protection and saving of crude oil. In this regard, introduction of combined cycle plants would be recommended, which energy efficiency is much higher than other types of plant. If this option is accepted by MoE, preparatory works should be started for the introduction, including capacity building for new and advanced technologies.

11.11 Communication System

The power system needs a proper communication system in order to operate and maintain the system in a stable and reliable manner. For upgrading the present communication system, introduction of OPGW (Composite Fiber Optic Overhead Ground Wire) is recommendable.

11.12 Diagnostic Technology

The diagnostic technology has gained ground, which is a current advanced technology to make assessment of any plant and equipment in a more systematic manner aiming at elongation of useful time of the plant and equipment. It is recommended to introduce this technology to assess the residual life of any plant.

APPENDICES

- Appendix A : Generating Plants
- Appendix B : Demand Forecast
- Appendix C : Generation Expansion Plan
- Appendix D : Standards related to the Electricity Sector
- Appendix E : Specific Features of Thermal Plant
- Appendix F : Items to be Considered for Selection of New Generating Plant
- Appendix G : Power Network Diagram for the Power Flow Calculation

Appendix A : Generating Plants

PLANT DATA SHEET

Sheet No.

Type: THS		Ref.No. : T-1		Source of Information: ENAR/CPA			
Name of Power Plant		Dibs TPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Tameem	Kirkuk	N:	E:		
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	1	1959	15	5	44	①Due to the circulating water system pumps. ②The lack of spare parts for routine maintenance, choked condenser tubes, and the over-age for all the units. ③ only two generator transformers, 25 MVA each, in lieu of the original four.	
	2	1959	15	10	44		
	3	1959	15	10	44		
	4	1959	15	10	44		
Total of plant	4		60	35			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		40	156,057,000	12,255,000	At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
		(17.Jambour South Gas)					
Boiler		Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)	Steam capacity (t/h)	Boiler Type	Manufact-urer	
					MAN		
Steam Turbine		Type (tandem or cross comp.)	Revolution (rpm)	Manufacturer	Cooling water	Steam Extract.	
				MAN			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		(ENAR) :It is unlikely that partial rehabilitation of this power station will be technically and economically justified. However, renovation and modernization or complete rehabilitation, which can extend the life of the plant by another fifteen to twenty years and reduce the operation and maintenance cost, will be beneficial.					

Note:

PLANT DATA SHEET

Sheet No.

Type: TPS		Ref. No. T-2		Source of Information: ENAR/CPA				
Name of Power Plant		Baji TPS		Power Station ID:				
Items		Descriptions						
Location		Governorate		City		Coordinates		
		Salah al-Din		Baji		N:	E:	
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity Peak (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.		
	1	1983	220	110	20	(ENAR): Deteriorated turbine rotors, chimney firebricks (water leakage), lack of sufficient water treatment chemicals, especially hydrazine, and circumscribed output from the water treatment plant.		
	2	1983	220	110	20			
	3	1984	220	110	19			
	4	1984	220	110	19			
	5	1984	220	0	19			
6	1984	220	110	19				
Total of plant	6		1,320	550				
Production Record in 2002		Maximum power output (MW)		Annual energy production (kWh)		Station use energy (kWh)		
		765		4,644,673,000		383,247,020		
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	Fuel storage	
				Fuel Oil			Gas	
		Gas Content & Calory(Lower) (12.Salah Al-Den Refinery)				Oil Characteristics & Calory (Lower)		
Boiler		Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)	Steam capacity (t/h)	Boiler Type	Manufact-urer	Feed water treatment	
						Ansaldo		
Steam Turbine		Type (tandem or cross comp.)	Revolution (rpm)	Manufacturer		Cooling water	Steam Extract.	
				Ansaldo				
Electrical & Control		Generator				Electrical & Control		
		Capacity(MVA)		Power factor	Manufacturer		Electrical Manufacturer	Control System
		Main Transformer				Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)		
Main Problems, Action Plans for Restorations & Improvement		(ENAR) An explosion in Unit 5 boiler has put this unit out service since Mar. 2003.						
		CPA : under rehabilitation on Unit 1,2,3,4,&6: Realized additional power: 100MW: by USAID/Bechtel ,complete 01-Jun-04						

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: TPS		Ref. No. T-3		Source of Information: ENAR/CPA				
Name of Power Plant		Doura TPS		Power Station ID:				
Items		Descriptions						
Location		Governorate	City	Coordinates				
		Baghdad		N:	E:			
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc. (ENAR) the lack of spare parts for routine maintenance, defective boiler tubes and control and instrument system		
	3	1988	160	102	15			
	4	1988	160	102	15			
	5	1978	160	131	25			
	6	1983	160	131	20			
Total of plant	4		640	466				
Production Record in 2002	Maximum power output (MW)		Annual energy production (kWh)		Station use energy (kWh)	Station total efficiency (%)		
	528		2,060,656,000			At Gen.Term.	At Trans.Term.	
Fuel	Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	Fuel storage		
		Fuel Oil	HFO	Gas				
	Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)				
(7.Fuel Oil/Middle Refinery Project)								
Boiler	Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)	Steam capacity (t/h)	Boiler Type	Manufact-urer	Feed water treatment		
	13.3	535/535			Ansaldo			
Steam Turbine	Type (tandem or cross comp.)	Revolution (rpm)	Manufacturer		Cooling water	Steam Extract.		
			Toshiba/Siemens					
Electrical & Control	Generator				Electrical & Control			
	Capacity(MVA)	Power factor	Manufacturer		Electrical Manufacturer	Control System		
			Ansaldo/Siemens					
	Main Transformer				Grid Connection			
	Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)			
Main Problems, Action Plans for Restorations & Improvement	(ENAR): Condition assessment and life evaluation study and inventory checks of major spares parts will have to be conducted prior to any major investment decision.							
	CPA: under rehabilitation for Unit 5 & 6: Realized additional power: 256MW: by USAID/Bechtel Complete:02-Jun-04 :							

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: TPS		Ref. No.:T-4		Source of Information: ENAR/CPA			
Name of Power Plant		Baghdad South TPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Baghdad		N:	E:		
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc. (ENAR) due to lack of spare parts for routine maintenance, problems in the super heaters, pre-heaters and combustion system and, over-age of thermal units 5 and 6.	
	1	1984	55	40	19		
	2	1984	55	40	19		
	3	1984	55	40	19		
	4	1984	55	30	19		
	5	1966	67.5	30	38		
Total of plant	6		355	210			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		230	1,489,957,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			Fuel Oil				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
		(7.Fuel Oil/Middle Refinery Project)					
Boiler		Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)	Steam capacity (t/h)	Boiler Type	Manufact-urer	
		8.6	514			CE	
Steam Turbine		Type (tandem or cross comp.)	Revolution (rpm)	Manufacturer	Cooling water	Steam Extract.	
				GE			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		(ENAR) It is unlikely that partial rehabilitation of this power station will be technically and economically justified. It is recommended that minimum maintenance required to sustain the present level of generation should be carried out over next few years.					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: TPS		Ref. No.:T-5		Source of Information: ENAR?CPA						
Name of Power Plant		Musayab TPS		Power Station ID:						
Items		Descriptions								
Location		Governorate		City		Coordinates				
		Babel		Musayab		N:	E:			
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.				
Unit Data	1	1987	300	210	15	(ENAR) ① Defects in the turbine and control system ② Inadequate and incomplete maintenance and forced prolonged operation beyond the original manufacturer's recommendations.				
	2	1987	300	215	15					
	3	1991	300	220	12					
	4	1987	300	235	15					
Total of plant	4		1,200	880						
Production Record in 2002		Maximum power output (MW)		Annual energy production (kWh)		Station use energy (kWh)		Station total efficiency(%)		
		935		5,622,020,000				At Gen.Term. At Trans.Term.		
Fuel		Design	Type	Fuel Type		Alt. Fuel	Fuel treat.		Fuel storage	
			Crude and Fuel Oil			Gas				
		Gas Content & Calory (Lower)				Oil Characteristics & Calory (Lower)				
Boiler		Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)		Steam capacity (t/h)	Boiler Type		Manufact-urer	Feed water treatment	
		167	538/538		272			B-H		
Steam Turbine		Type (tandem or cross comp.)		Revolution (rpm)	Manufacturer		Cooling water		Steam Extract.	
					Persons					
Electrical & Control		Generator				Electrical & Control				
		Capacity(MVA)		Power factor	Manufacturer		Electrical Manufacturer		Control System	
		Main Transformer				Grid Connection				
		Capacity(MVA)		Voltage(kV)		Type		Switchgear		Voltage(kV)
Main Problems, Action Plans for Restorations & Improvement		(ENAR) Complete rehabilitation of the units and common rehabilitation of instrument and control system of Unit 1 and 4 will enhance the reliability of the units.								
		CPA: under rehabilitation Unit 2: Realized additional power : 112MW by USAID/Bechtel Complete:04-Oct.-04 Principally on the turbines and control system								

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: TPS		Ref. No.:T-6		Source of Information: ENAR			
Name of Power Plant		Nasiriyah TPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Thi-Qar	Nasiriya	N:		E:	
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
Unit Data	1	1978	210	130	25	Rehabilitated June 2000,	
	2	1979	210	180	25	Rehabilitated July 2000,	
	3	1980	210	160	25		
	4	1980	210	130	25		
Total of plant	4		840	600			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)		Station use energy (kWh)	Station total efficiency(%)	
		755	4,428,804,000			At Gen.Term. At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat. Fuel storage	
			Crude Oil		Oil		
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
		(1.Normal Crude oil/Basra)					
Boiler		Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)	Steam capacity (t/h)	Boiler Type	Manufact-urer Feed water treatment	
		12.8	540/540			TPE	
Steam Turbine		Type (tandem or cross comp.)	Revolution (rpm)	Manufacturer	Cooling water	Steam Extract.	
				LMZ			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
				TPE			
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		(ENAR) Output is restricted by the poor quality and quantity of demineralised water and clogging of condenser tubes and cooling water intake filters. Overhaul maintenance of this power station with Rehabilitation of instrument and control system of Unit 1 and 4 will enhance the reliability the units.					
		CPA: Rehabilitation Water Treatment(external): Realized additional power 70MW by USACE, Complete 01-Jun-04 Complete installation of Cooling Tower Water Intake was rehabilitated: add+108MW					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: TPS		Ref. No.:T-7		Source of Information: ENAR			
Name of Power Plant		Najibiyah TPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Basra		N:	E:		
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal Rehabilitation and etc.	
	5	1976	100	80	27	Restored Aug.2002 except I&C	
	6	1976	100	80	27	Restored Nov.2002 except I&C	
Total of plant	2		200	160			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		203 (?)	321,572,408		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG and Crude Oil		Oil		
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
		(1.normal Crude Oil) (3.natural Gas)					
Boiler		Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)	Steam capacity (t/h)	Boiler Type	Manufact-urer	
						TPE	
Steam Turbine		Type (tandem or cross comp.)	Revolution (rpm)	Manufacturer	Cooling water	Steam Extract.	
				TPE			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
				TPE			
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		(ENAR) overhaul maintenance of this power station will increase the reliability of this power station. Condition assessment and life evaluation study and inventory checks of major spares parts will have to be conducted prior to any major investment decision.					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: TPS		Ref. No.:T-8		Source of Information:ENAR/CPA			
Name of Power Plant		Hartha TPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Basra	Al-Hartha	N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal , Rehabilitation and etc.	
Unit Data	1	1979	200	175	24		
	2	1979	200	0		Under Rehabilitation by Russia ?	
	3	1979	200	0		Under Rehabilitation by Russia ?	
	4	1979	200	175	24		
Total of plant	4		800	350			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		400	2,815,303,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG and Crude Oil				
		Gas Content & Calory(Lower)			Oil Characteristics & Calory(Lower)		
		(3.Natural Gas)	(1.Normal Crude Oil/Basrah)				
Boiler		Main stream press.(MPa)	Main/Reheat Steam Temp. (deg.C/deg/C)	Steam capacity (t/h)	Boiler Type	Manufact-urer	
				166		MHI	
Steam Turbine		Type (tandem or cross comp.)	Revolution (rpm)	Manufacturer	Cooling water	Steam Extract.	
				MHI			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		Rehabilitation of instrument and control system of Unit 1 and 4 will enhance its reliability. Unit 2 & 3: Rehabilitation from Jan.,2004, 12months.					
		Parts for rehabilitation of Unit 1 and 4 will be supplied under UNDP trust fund.					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-1		Source of Information: FNAR			
Name of Power Plant		Mosul GPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Ninewa	Al Mosul	N:	E:		
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc. 8 units out of 10 gas turbine units were rehabilitated, under the supervision of John Brown, with the materials procured during 1999 to 2001. Unit 1 and 3 replaced with non-original supply. Unit 1:roter damaged Unit 2:decreasing gear vibration Unit3 ,4: 10 MW operated	
	1	1974	20	20			
	2	1974	20	0	27		
	3	1974	20	20			
	4	1974	20	18	26		
	5	1981	20	18	22		
	6	1981	20	18	22		
	7	1981	20	18	22		
	8	1981	20	18	22		
	9	1981	20	0	22		
	10	1981	20	18	22		
	11	1981	20	18	22		
Total of plant	12		250	184			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		156	1,130,082,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
		(3.Natural Gas)					
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
		2,4	PG5341	Hitachi			
		5,6,7,8,9	5001	AEG			
		10,11,12		Alstom			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		CPA: Realized Additional 54MW USACE complete 01.Jun.04 ----Details are not available.					
		Two new units for No.1 & 3, each 25MW, will be installed under grant aid from GoJ.as phase 1. Two units to be replaced in Phase 2 by UNDP					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-2		Source of Information: FNAR			
Name of Power Plant		Dibs GPS,		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Tameem	Kirkuk	N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
Unit Data	4	1982	25	25	23	Rehabilitated by May 2004	
	5	1982	25	25	23	Rehabilitated by Mar. 2004	
	6	1982	25	25	23	Rehabilitated by Mar 2004	
Total of plant	3		75	75			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
					At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
				NG			
		Gas Content & Calory(Lower)			Oil Characteristics & Calory(Lower)		
		(3.Natural Gas) Press.30kg/cm2					
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
				Fiat/Avio			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement							

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-3		Source of Information: FNAR			
Name of Power Plant		Dibs Mobile GPS,		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Tameem	Kirkuk	N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.	
Unit Data	1	1983	10	0		Shifted from initial Taji GPS ?	
	2	1983	10	8		Shifted from initial Taji GPS ?	
	3	1983	10	8		Shifted from initial Taji GPS ?	
	4	1983	10	8		Shifted from initial Taji GPS ?	
Total of plant	4		40	24			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		25	39,599,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
				IHI ?			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement							

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-4			Source of Information: FNAR/CPA			
Name of Power Plant		Al-Tameem(Old Abudulah) GPS			Mullah Power Station ID:			
Items		Descriptions						
Location		Governorate		City		Coordinates		
		Tameem		Kirkuk		N:	E:	
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.		
	1	1977	-	-	25	age and the lack of spare parts for routine maintenance		
	2	1977	20	15	25			
	3	1981	20	15	21			
	4	1981	20	15	21			
	5	1981	20	15	21			
	6	1981	20	15	21			
	7	1981	20	15	21			
	8	1981	20	15	21			
	9	1981	20	15	21			
	10	1981	20	15	21			
	11	1981	20	15	21			
	12	1981	20	15	21			
Total of plant	12		220	165				
Production Record in 2002		Maximum power output (MW)		Annual energy production (kWh)		Station use energy (kWh)	Station total efficiency(%)	
		169		1,050,290,000			At Gen.Term. At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	Fuel storage	
			NG					
		Gas Content & Calory(Lower)				Oil Characteristics & Calory(Lower)		
		440kg/cm2						
Gas turbine		Unit	Type	Manufacturer		Installation	Turbine Controller	
		2	5001	AEG,				
		3-7	5001	JBE				
		8-12	5001	JBE				
Electrical & Control		Generator				Electrical & Control		
		Capacity(MVA)		Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer				Grid Connection		
		Capacity(MVA)		Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		ENAR) Complete rehabilitation of old units and major overhaul of new units will enhance the reliability of the units.						
		CPA: Rehabilitation of Unit 1,2,3,5,11,12 with rehabilitation of the main and auxiliary gas feeding system						

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-5			Source of Information: FNAR		
Name of Power Plant		Al-Tameem (New Mullah Abdullah) GPS			Power Station ID:		
Items		Descriptions					
Location		Governorate		City	Coordinates		
		Tameem		Kirkuk	N:	E:	
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.	
	1	2000	37	30	4		
	2	2000	37	30	4		
	3	2000	37	30	4		
	4	2000	37	30	4		
	5	2000	37	30	4		
	6	2000	37	30	4		
	7						
	8						
	9						
	10						
	11						
	12						
Total of plant	6		222	180			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		222	1,485,902,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
				CCM(China)			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement							
		CPA: Rehabilitation : Realized Additional 30MW by USACE, Complete 01.Jul.04					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-6		Source of Information: FNAR			
Name of Power Plant		Baji GPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Salah al-Din	Baji	N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
Unit Data	1	2003	159	159	1	Sep.03 started operation	
	2	2003	159	159	1	Sep.03 started operation	
	3	(2004)	(159)	(159)	-	May 04 start commissioning	
	4	(2004)	(159)	(159)	-	May 04 start commissioning	
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
Total of plant	4		636	280			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
					At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			Crude Oil /Gas Oil				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
		(4.Gas Oil)					
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
				Ansaldo			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement							
		CPA: Completion of Unit 3 & 4: Realized additional 219MW by TFRIE, complete 31.May.04 (Water treatment plant is included) Commissioning : Crude Oil Conversion Equipment :Realized Additional 125MW :Completed					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-7		Source of Information: FNAR		
Name of Power Plant		Baji Mobile GPS		Power Station ID:		
Items		Descriptions				
Location		Governorate	City	Coordinates		
		Salah al-Din	Baji	N:	E:	
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.
	1	2004	23	20		
	2	2004	23	20		
	3	2004	23	20		
	4	2004	23	20		
	5	2004	23	20		
	6	2004	23	20		
	7	2004	23	20		
	8	2004	23	20		
Total of plant	8		184	160		
Production Record in 2002	Maximum power output (MW)		Annual energy production (kWh)		Station use energy (kWh)	Station total efficiency(%)
						At Gen.Term. At Trans.Term.
Fuel	Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	Fuel storage
Gas turbine	Unit	Type	Manufacturer	Installation	Turbine Controller	
Electrical & Control	Generator			Electrical & Control		
	Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
	Main Transformer			Grid Connection		
	Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement						
	CPA: Mobile new generation : Realized additional 129MW by TFRIE, Complete 01.Feb.04					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-8		Source of Information: FNAR/CPA/JICA			
Name of Power Plant		Taji GPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Baghdad	Karkh	N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.	
Unit Data	1	1976	20	20		Only 10MW operational, cooling & control system not normal Same as above, roter damaged. Roter damaged. Out of order (to be replaced) Same as unit 1& 2 Roter damaged.	
	2	1976	20	20			
	3	1976	20	17			
	4	1979	20	17	24		
	5	2004	20	20			
	6	1979	20	15	24		
	7	1976	20	16	27		
	8						
	9						
	10						
	11						
	12						
Total of plant	7		160	125			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		101	687,924,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
			5001	Hitachi			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		CPA: Rehabilitation: GPS Realized Additional 74MW by USACE, Complete 01.Jun.04					
		Unit 1, 2, 3, 5: to be replaced under grant aid of GoJ. Unit 4, 6 & 7 to be rehabilitated under UNDP trust fund.					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-9		Source of Information: FNAR			
Name of Power Plant		Taji Mobile GPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Baghdad	Karkh	N:	E:		
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.	
	1	1983	10	10			
	2	1983	10	10			
	3		10	?			
	4		10	?			
	5		10	?			
	6		10	?			
	7						
	8						
	9						
	10						
	11						
	12						
Total of plant	2		60	20			
Production Record		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
					At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			Gas Oil				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
				IHI			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement							

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

4 Type: GPS		Ref. No.: G-10		Source of Information: FNAR/CPA		
Name of Power Plant		Doura GPS		Power Station ID:		
Items		Descriptions				
Location		Governorate	City	Coordinates		
		Baghdad		N:	E:	
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.
Unit Data	1	1981	25	25	22	The rehabilitation of Unit 1, 2 and 4 was completed. in 2000 and 2001.
	2	1981	25	25	22	
	3	1982	25	25	21	
	4	1982	25	25	21	
	5					The rehabilitation of Unit 3 to be completed by Jun.2004
	6					
	7					
	8					
	9					
	10					
	11					
	12					
Total of plant	4		100	100		
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)	
		113	543,191,000		At Gen.Term.	At Trans.Term.
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.
			NG			
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)	
		13kg/cm2				
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller
			TG20	Fiat/Avio		
Electrical & Control		Generator			Electrical & Control	
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System
		Main Transformer			Grid Connection	
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)
Main Problems, Action Plans for Restorations & Improvement						
		CPA: Rehabilitation Unit 3. realized Additional 20MW by USACE, Complete 01.Jun.04				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTO

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION Sheet No.

Type: GPS		Ref. No.: G-11		Source of Information: ENAR/CPA			
Name of Power Plant		Al-Quds GPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Baghdad		N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
Unit Data	1	2002	123	110	2	Crude Oil Conversion Equipment added(+160MW)	
	2	2002	123	110	2		
	3	2004	125	96		(to be completed 31 May 04)	
	4	2004	125	96			
	5	2004	43	33			
	6	2004	43	33		(to be completed 22 Mar 04)	
	7	2004	43	33			
	8	2004	43	33			
	9					LM6000 :To be clarified	
	10						
	11						
	12						
Total of plant	8		668	544			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		254	534,504,300		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
		Dual	Crude Oil		Gas Oil		
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
		1,2,3,4	Frame 9?		Dong Fang		
		5,6,7,8	Frame 6?				
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement							
		CPA: Completion of Unit 3 & 4 : Realized Additional 175MW by TFRIE, Complete 31.May 04. Quds No. 5-8 New Generation : Realized Additional 120MW by TFRIE , Complete 22.Mar.04					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-12		Source of Information: FNAR/CPA			
Name of Power Plant		Hilla GPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Babel	Hilla	N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
Unit Data	1	1972	20	18	31	Age of the units and generally poor condition. Unit 2 was replaced	
	2	2004	20	0			
	3	1972	20	18	31		
	4	1972	20	18	31		
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
Total of plant	4		80	54			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		81	511,047,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
		24kg/cm2					
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
			5001	Alstom			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		(ENAR) Complete rehabilitation, which can reduce the operation and maintenance cost, will be beneficial.					
		CPA: Replacement of Unit 2: Realized additional 17MW by TFRIE, Complete 13.Feb.04					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-13		Source of Information: FNAR/CPA				
Name of Power Plant		Najaf GPS		Power Station ID:				
Items		Descriptions						
Location		Governorate		City		Coordinates		
		Najaf				N:	E:	
Unit Data	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.		
	1	1976	63	30	27	Age and the lack of spare parts for routine maintenance. Unit 2 rehabilitated Jan.04 Rehabilitated: Oct.2001 (New gas/oil system)		
	2	1976	63	52	27			
	3	1976	63	50	27			
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
Total of plant			189	132				
Production Record in 2002		Maximum power output (MW)		Annual energy production (kWh)		Station use energy (kWh)	Station total efficiency(%)	
		160		956,488,500			At Gen.Term. At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	Fuel storage	
			NG					
		Gas Content & Calory (Lower)				Oil Characteristics & Calory (Lower)		
		21kg/cm2						
Gas turbine		Unit	Type	Manufacturer		Installation	Turbine Controller	
			13D	BBC				
Electrical & Control		Generator				Electrical & Control		
		Capacity(MVA)		Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer				Grid Connection		
		Capacity(MVA)		Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement								
		CPA: Rehabilitation Unit 2: Realized Additional 20MW by TFRIE, Complete 25.Jan.04						

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-14		Source of Information: FNAR/CPA		
Name of Power Plant		Khor Al-Zuber GPS		Power Station ID:		
Items		Descriptions				
Location		Governorate	City	Coordinates		
		Basra	Al-Zuber	N:	E:	
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.
Unit Data	1	1976	63	50	27	Rehabilitated Jun 02
	2	1976	63	52	27	Rehabilitated by Feb 04
	3	1976	63	50	27	Rehabilitated Aug.02
	4	1976	63	52	27	Rehabilitated by Feb 04
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
Total of plant			252	204		
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)	
		145	816,200,000		At Gen.Term.	At Trans.Term.
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.
			NG			
		Gas Content & Calory(Lower)			Oil Characteristics & Calory(Lower)	
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller
				ABB/Alstom		
Electrical & Control		Generator			Electrical & Control	
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System
		Main Transformer			Grid Connection	
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)
Main Problems, Action Plans for Restorations & Improvement						
		CPA: Rehabilitation or Replacement of Unit 2 & 4. Realized Additional 66MW by TFRIE, Complete 29.Feb.04				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PLANT DATA SHEET

Sheet No.

Type: GPS		Ref. No.: G-15		Source of Information: FNAR			
Name of Power Plant		Shua'yba GPS		Power Station ID:			
Items		Descriptions					
Location		Governorate	City	Coordinates			
		Basra	Shua'yba	N:	E:		
	Unit No.	Year of Commissioning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating. Records of Renewal, Rehabilitation and etc.	
Unit Data	1	1973	20	12	31		
	2	1973	20	12	31		
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
Total of plant			40	24			
Production Record in 2002		Maximum power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency(%)		
		34	207,048,000		At Gen.Term.	At Trans.Term.	
Fuel		Design	Type	Fuel Type	Alt. Fuel	Fuel treat.	
			NG				
		Gas Content & Calory (Lower)			Oil Characteristics & Calory (Lower)		
Gas turbine		Unit	Type	Manufacturer	Installation	Turbine Controller	
			5001	Alstom			
Electrical & Control		Generator			Electrical & Control		
		Capacity(MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		Main Transformer			Grid Connection		
		Capacity(MVA)	Voltage(kV)	Type	Switchgear	Voltage(kV)	
Main Problems, Action Plans for Restorations & Improvement		The station was designed for peak load service, Overhaul of units is recommended.					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS			Source of Information: ENAR			
Ref. No.:		H1				
Name of Power Plant		Derban Dikhan HPS		Power Station ID:		
Location		Governorate	City	Coordinates		
		Sulaimaniyah	Derban Dikhan	N:	E:	
Type of Hydropower		Erthfill dam (Ab e- Sirwan River)				
Reservoir volume (M m ³)		Full supply water level (EL.m)		High water level (EL.m)	Low water level (EL.m)	Minimum oper- ating level (EL.m)
2,500		495.19				
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.
	1	1991	83			
	2	1991	83			
	3	1991	83			
Total of plant	3		249	165		Due to the limitations in the transmission and distribution systems in the Governorates of Suleimaniyah and Erbil.
Production Record of Plant		Max. power output (MW)	Annual energy production (GWh)	Station use energy (kWh)	Station total efficiency (%)	
			606 (ave. 1991-2000)		At Gen.Term.	At Trans.Term.
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)		
		103	80	53		
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m ³ /s) at Rated head	Revolution (rpm)	Manufacturer	
	1				Mitsubishi, Japan	
	2					
	3					
Electrical & Control	Unit No.	Generator			Electrical & Control	
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System
	1	95			Mitsubishi, Japan	
	2	95				
	3	95				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

	Unit No.	Main Transformer			Grid Connection	
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)
Main Problems, Action Plans for Restorations & Improvement		<ul style="list-style-type: none"> • Not connected to the national grid. • Based on the reports by Colenco Power Engineering Ltd, Coyne and Bellier, and a reconnaissance geological report about possible landslides on the left bank of Derbandikhan Reservoir, the structural integrity of the dam is questionable. A detailed study, consistent with the recommendations made in the Mission Report of Kurt Wermelinger, is required as part of long term planning for this plant. • Condition Assessment and life evaluation study and inventory checks of major spares parts will have to be conducted prior any major investment decision. 				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H2					
Name of Power Plant		Dokan HPS		Power Station ID:			
Location		Governorate	City		Coordinates		
		Sulaimaniyah	Dokan	N:		E:	
Type of Hydropower		Concrete arch dam (Zab as-Saghir River)					
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
6,140		516					
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	1	1978	82				
	2	1978	82				
	3	1978	82				
	4	1978	82				
	5	1978	82				
Total of plant	5		410	240		Due to the limitations in the transmission and distribution system in the Governorates of Suleimaniyah and Erbil	
Production Record of Plant		Max. power output (MW)	Annual energy production (GWh)	Station use energy (kWh)	Station total efficiency (%)		
			947 (ave. 1978-2000)		At Gen.Term.	At Trans.Term.	
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
		95	82	50			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
	1	Francis			Litostroj (LMZ), Russia		
	2	Francis					
	3	Francis					
	4	Francis					
	5	Francis					
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
	1	94		Catharienburg , Russia			
	2	94					
	3	94					
	4	94					
5	94						

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

	Unit No.	Main Transformer			Grid Connection	
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)
Main Problems, Action Plans for Restorations & Improvement	<ul style="list-style-type: none"> • Not connected to the national grid. • All the units were in operable condition. • The overhaul of 3 units was completed and the other 2 units were scheduled for completion by 2001. However, this was not executed because of contractual and administration problems. • Assessment needs to be carried out to determine outstanding rehabilitation/refurbishment work. • Detailed structural integrity study of the dam can be part of long term planning. • Condition Assessment and life evaluation study and inventory (stock) check of major spares parts will have to be conducted prior any major investment decision. 					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H3					
Name of Power Plant		Himreem HPS		Power Station ID:			
Location		Governorate	City		Coordinates		
		Diyala			N:	E:	
Type of Hydropower							
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
				104.5			
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	1	1981	25		13	Due to limitation in the flow of water	
	2	1981	25		13		
Total of plant	2		50	10			
Production Record of Plant		Max. power output (MW)	Annual energy production (GWh)	Station use energy (kWh)	Station total efficiency (%)		
					At Gen.Term.	At Trans.Term.	
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
	1	Kaplan	98.5	166.7	LITOSTRJ (Yogslavia)		
	2	Kaplan	98.5	166.7			
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
		27.8					
	Unit No.	Main Transformer			Grid Connection		
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)	

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Main Problems, Action Plans for Restorations & Improvement	<ul style="list-style-type: none">• Overhaul of units will be beneficial.• Inventory (stock) check of major spares parts will have to be conducted prior any major investment decision.• The details of goods that are expected to arrive to this power station under SCR1472/1476 and 1483.				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H4 (1/2)					
Name of Power Plant		Mosul HPS		Power Station ID:			
Location		Governorate	City	Coordinates			
		Ninewa	Mosul	N:		E:	
Type of Hydropower							
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	M1	1986 (MU)	187.5			MU: Main Unit Replacement is under discussion.	
	M2	1986 (MU)	187.5				
	M3	1986 (MU)	187.5				
	M4	1986 (MU)	187.5				
	RD1	1985 (RDU)	15			RDU: Regulating Dam Unit	
	RD2	1985 (RDU)	15				
	RD3	1985 (RDU)	15				
RD4	1985 (RDU)	15					
Total of plant	8		810	400		Output is restricted due to limitation in water flow.	
Production Record of Plant in 2002		Max. power output (MW)	Annual energy production (GWh)	Station use energy (kWh)	Station total efficiency (%)		
		750	2,713,888		At Gen.Term.	At Trans.Term.	
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
	M1	Francis			Toshiba		
	M2	Francis			Toshiba		
	M3	Francis			Toshiba		
	M4	Francis			Toshiba		
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
 LIST OF GENERATION

Sheet No.

	Unit No.	Main Transformer			Grid Connection	
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)
Main Problems, Action Plans for Restorations & Improvement		<ul style="list-style-type: none"> • Output was determined by water flow. • Overhaul of units will be beneficial. • Inventory checks of major spares parts will have to be conducted prior any major investment decision. • Discussion underway for rehabilitation by grant aid of GoJ. 				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H4 (2/2)					
Name of Power Plant		Mosul HPS (PSU)		Power Station ID:			
Location		Governorate	City	Coordinates			
		Ninewa	Mosul	N:		E:	
Type of Hydropower		Pumped storage					
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	PS1	1990 (PSU)	120			PSU: Pumped Storage Unit	
	PS2	1990 (PSU)	120				
Total of plant	2		240				
Production Record of Plant		Max. power output (MW)	Annual energy production (GWh)	Station use energy (kWh)	Station total efficiency (%)		
					At Gen.Term.	At Trans.Term.	
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
	Unit No.	Main Transformer			Grid Connection		
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)	

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Main Problems, Action Plans for Restorations & Improvement	<ul style="list-style-type: none">• All the units were in operable condition.• Output was determined by water flow.• Overhaul of units will be beneficial.• Inventory checks of major spares parts will have to be conducted prior any major investment decision.					

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H5					
Name of Power Plant		Sadat Al Hindia HPS		Power Station ID:			
Location		Governorate	City		Coordinates		
		Babel	Musaiyab		N:	E:	
Type of Hydropower							
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	1	1988	3.75				
	2	1988	3.75				
	3	1988	3.75				
	4	1988	3.75				
Total of plant		4	15	5.0	Output is restricted due to limitation in water flow		
Production Record of Plant		Max. power output (MW)	Annual energy production (GWh)	Station use energy (kWh)	Station total efficiency (%)		
						At Gen.Term.	At Trans.Term.
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
	1				Sulzer-Escher Wyss		
	2						
	3						
	4						
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
	1				BULB		
	2						
	3						
4							
	Unit No.	Main Transformer			Grid Connection		
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)	

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Main Problems, Action Plans for Restorations & Improvement	<ul style="list-style-type: none">• Due to limitation in water flow, only 2 units operated at about 5 MW and other units were kept in stand by mode.• Overhaul of units will be beneficial.• Condition Assessment and life evaluation study and inventory checks of major spares parts will have to be conducted prior to any major investment decision.• The details of goods that are expected to arrive to this power station under SCR1472/1476 and 1483.
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Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H6					
Name of Power Plant		Samara HPS		Power Station ID:			
Location		Governorate	City	Coordinates			
		Salah al-Din	Samara	N:		E:	
Type of Hydropower							
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	1	1972	28				
	2	1972	28				
	3	1972	28				
Total of plant	3		84	38		Output is restricted due to limitation in water flow.	
Production Record of Plant		Max. power output (MW)	Annual energy production (GWh)	Station use energy (kWh)	Station total efficiency (%)		
						At Gen.Term.	At Trans.Term.
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
	1	Kaplan		79	Franco Tossi		
	2	Kaplan		79			
	3	Kaplan		79			
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
	1	33		Ansaldo			
	2	33					
	3	33					
	Unit No.	Main Transformer			Grid Connection		
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)	
	1			Ansaldo			
	2						
	3						

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
 LIST OF GENERATION

Sheet No.

Main Problems, Action Plans for Restorations & Improvement	<ul style="list-style-type: none"> • Due to limitation in water flow, two units operated at about 20MW, each, at any given time and the third unit was kept in stand by mode. Given the prevailing water level, major investment to enhance the station output would not be rewarding. • Overhaul of units will be beneficial. • Inventory checks of major spares parts will have to be conducted prior to any major investment decision. • The details of goods that are expected to arrive to this power station under SCR1472/1476 and 1483. 				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H7					
Name of Power Plant		Qadissiya HPS (Haditha Dam)		Power Station ID:			
Location		Governorate	City		Coordinates		
		Al-Anbar	Haditha	N:		E:	
Type of Hydropower							
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	1	1986	110				
	2	1986	110				
	3	1986	110				
	4	1986	110				
	5	1986	110				
	6	1986	110				
Total of plant	6		660	110		Output is restricted due to limitation in water flow.	
Production Record of Plant in 2002		Max. power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency (%)		
		310	704,881,000		At Gen.Term.	At Trans.Term.	
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
	1	Kaplan	335		CKD/LIT		
	2	Kaplan	335				
	3	Kaplan	335				
	4	Kaplan	335				
	5	Kaplan	335				
	6	Kaplan	335				
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
	1			KONCAR			
	2						
	3						
	4						
	5						
6							

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
 LIST OF GENERATION

Sheet No.

	Unit No.	Main Transformer			Grid Connection	
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)
Main Problems, Action Plans for Restorations & Improvement		<ul style="list-style-type: none"> • Due to limitations in water flow, only one unit operated at about 40 MW at any given time, and other units were kept in stand by mode. • All the units are in good condition, except Unit 2. The output from this unit is limited to 80 MW because of vibration problems. • Overhaul of units will be beneficial. • Condition Assessment and life evaluation study and inventory checks of major spares parts will have to be conducted prior any major investment decision. • The details of goods that are expected to arrive to this power station under SCR1472/1476 and 1483 • 				
		CPA: rehabilitation of 350 MW by USACE finished on April 2004.(US\$56 m\$), with 223 km T/L Increase a capacity to 550MW from the previous 100 ~200MW and 660 MW at June 2004.				

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

Type: HPS				Source of Information: ENAR			
Ref. No.:		H8					
Name of Power Plant		Al-Adhim HPS		Power Station ID:			
Location		Governorate	City	Coordinates			
		Diyala	Al-Khalis	N:		E:	
Type of Hydropower							
Reservoir volume (M m3)		Full supply water level (EL.m)		High water level (EL.m)		Low water level (EL.m)	Minimum oper- ating level (EL.m)
Unit Data	Unit No.	Year of Commissio ning	Nameplate capacity (MW)	Derated capacity (MW)	No. of years in operation	Reason of Derating, Records of Renewal, Rehabilitation and etc.	
	1	(under const- ruction)	13				
	2		13				
Total of plant	2		26				
Production Record of Plant		Max. power output (MW)	Annual energy production (kWh)	Station use energy (kWh)	Station total efficiency (%)		
					At Gen.Term.	At Trans.Term.	
Head (m)		Max. (m)	Rated (design) (m)	Min. (m)			
Hydraulic Turbine	Unit No.	Type of turbine	Turbine discharge (m3/s) at Rated head	Revolution (rpm)	Manufacturer		
Electrical & Control	Unit No.	Generator			Electrical & Control		
		Capacity (MVA)	Power factor	Manufacturer	Electrical Manufacturer	Control System	
	Unit No.	Main Transformer			Grid Connection		
		Capacity (MVA)	Voltage (kV)	Type	Switchgear	Voltage (kV)	

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR
LIST OF GENERATION

Sheet No.

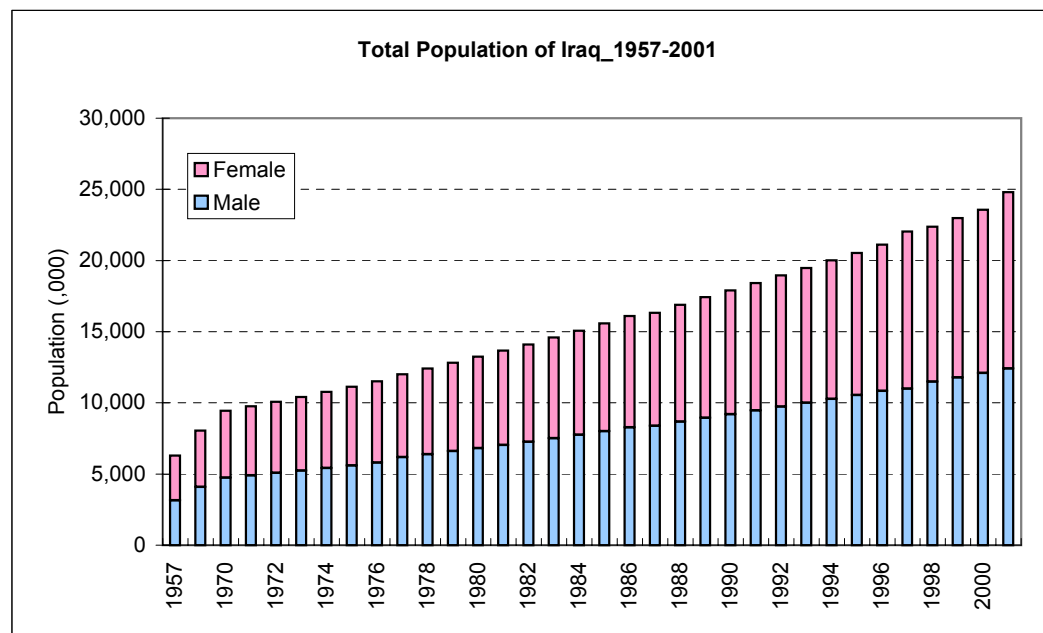
Main Problems, Action Plans for Restorations & Improvement						<ul style="list-style-type: none">• The units were scheduled for commissioning in May 2002 but have been delayed due to the non-availability of materials ordered under MoU.

Note:

Appendix B : Demand Forecast

Appendix B.1 Total Population

Unit : ,000			
Year	Male	Female	Total
1957	3,155	3,144	6,299
1965	4,102	3,945	8,047
1970	4,754	4,686	9,440
1971	4,910	4,840	9,750
1972	5,074	5,000	10,074
1973	5,244	5,169	10,413
1974	5,422	5,343	10,765
1975	5,603	5,521	11,124
1976	5,795	5,710	11,505
1977	6,183	5,817	12,000
1978	6,389	6,016	12,405
1979	6,603	6,218	12,821
1980	6,815	6,423	13,238
1981	7,035	6,634	13,669
1982	7,260	6,850	14,110
1983	7,504	7,082	14,586
1984	7,756	7,321	15,077
1985	8,015	7,570	15,585
1986	8,283	7,827	16,110
1987	8,396	7,939	16,335
1988	8,675	8,207	16,882
1989	8,953	8,475	17,428
1990	9,190	8,700	17,890
1991	9,460	8,959	18,419
1992	9,731	9,218	18,949
1993	10,001	9,477	19,478
1994	10,271	9,736	20,007
1995	10,541	9,995	20,536
1996	10,843	10,281	21,124
1997	10,987	11,059	22,046
1998	11,484	10,895	22,379
1999	11,795	11,194	22,989
2000	12,096	11,481	23,577
2001	12,425	12,388	24,813



Source)
Iraq Population Census 1957, 1965, 1977, 1987, 1997

Appendix B.2 Regional Population

	Governorate & Region	Population				Annual Increase Ratio				
		1977	1987	1997	2002	2003	77-87	87-97	97-03	77-03
1	Baghdad Region	3,189,700	3,841,268	5,423,964	6,054,355	6,024,300	1.9%	3.5%	1.8%	2.5%
	<i>Middle Region</i>									
2	Diyala	587,754	961,073	1,135,223	1,195,530	1,224,357	5.0%	1.7%	1.3%	2.9%
3	Anbar	466,059	820,690	1,023,736	1,193,343	1,230,139	5.8%	2.2%	3.1%	3.8%
4	Najaf	389,680	590,078	775,042	898,733	929,995	4.2%	2.8%	3.1%	3.4%
5	Kerbela	269,822	469,282	594,235	700,063	723,840	5.7%	2.4%	3.3%	3.9%
6	Qadissiya	423,006	559,805	751,331	865,171	886,594	2.8%	3.0%	2.8%	2.9%
7	Wassit	415,140	564,670	783,614	883,839	913,386	3.1%	3.3%	2.6%	3.1%
8	Babylon	592,016	1,109,574	1,181,751	1,336,826	1,385,783	6.5%	0.6%	2.7%	3.3%
	Total Middle Region	3,143,477	5,075,172	6,244,932	7,073,503	7,294,094	4.9%	2.1%	2.6%	3.3%
	<i>North Region</i>									
9	Tameem	495,425	601,219	753,171	829,757	848,007	2.0%	2.3%	2.0%	2.1%
10	Salah al-Din	363,819	726,138	904,432	917,169	942,314	7.2%	2.2%	0.7%	3.7%
11	Ninewa	1,105,671	1,479,430	2,042,852	2,382,348	2,453,116	3.0%	3.3%	3.1%	3.1%
	Total North Region	1,964,915	2,806,787	3,700,455	4,129,274	4,243,437	3.6%	2.8%	2.3%	3.0%
	<i>South Region</i>									
12	Basrah	1,008,626	872,176	1,556,445	1,823,017	1,880,178	-1.4%	6.0%	3.2%	2.4%
13	Muthanna	215,637	315,816	436,825	521,472	537,658	3.9%	3.3%	3.5%	3.6%
14	Thi-Qar	622,979	921,066	1,184,796	1,435,866	1,472,097	4.0%	2.5%	3.7%	3.4%
15	Missan	372,575	487,448	637,126	783,288	803,225	2.7%	2.7%	3.9%	3.0%
	Total South Region	2,219,817	2,596,506	3,815,192	4,563,644	4,693,158	1.6%	3.9%	3.5%	2.9%
	Total the above 4 regions	10,517,909	14,319,733	19,184,543	21,820,776	22,254,989	3.1%	3.0%	2.5%	2.9%
	<i>3 Northern Governorates</i>									
16	Sulaymaniyah	690,557	951,723	1,362,739	1,548,064	1,546,652	3.3%	3.7%	2.1%	3.1%
17	Erbil	541,456	770,439	1,095,992	1,298,499	1,313,718	3.6%	3.6%	3.1%	3.5%
18	Dahuk	250,575	293,304	402,970	785,409	782,490	1.6%	3.2%	11.7%	4.5%
	Total 3 Northern Governorates	1,482,588	2,015,466	2,861,701	3,631,972	3,642,860	3.1%	3.6%	4.1%	3.5%
	Grand Total	12,000,497	16,335,199	22,046,244	25,452,749	25,897,849	3.1%	3.0%	2.7%	3.0%

Appendix B.3 Number of CoE Consumers in 2001

Category	Baghdad		Middle		North + Dahuk		South		Total	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
Household	609,617	73.2	640,998	83.5	411,161	82.5	355,295	85.5	2,017,071	80.2
Commercial	211,687	25.4	86,265	11.2	62,606	12.6	45,917	11.1	406,475	16.2
Industrial	2,530	0.3	3,684	0.5	2,774	0.6	1,843	0.4	10,831	0.4
Governmental	7,356	0.9	10,074	1.3	10,335	2.1	5,508	1.3	33,273	1.3
Agricultural	1,776	0.2	26,963	3.5	11,687	2.3	6,844	1.6	47,270	1.9
Total	832,966	100.0	767,984	100.0	498,563	100.0	415,407	100.0	2,514,920	100.0
	33.1%		30.5%		19.8%		16.5%		100.0%	

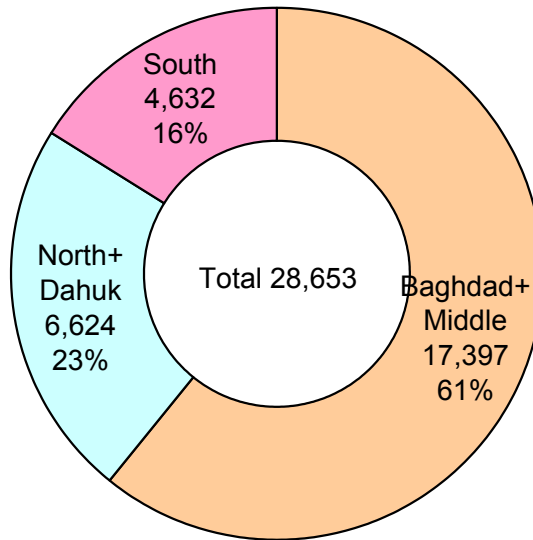
Appendix B.4 Regional Energy Consumption at Consumers' Ends in 1990

Unit : Gwh

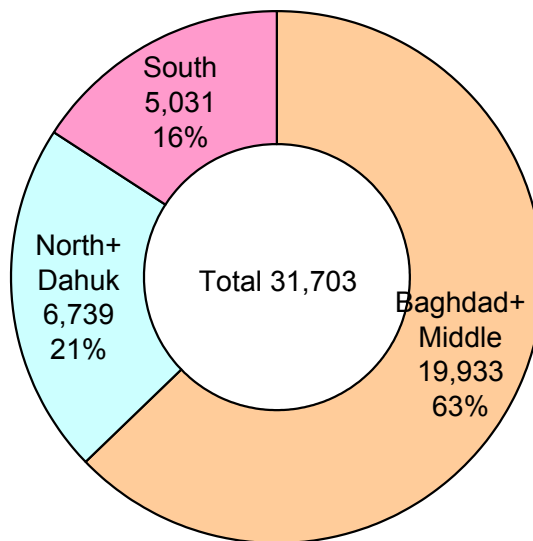
Governorate & Region	Resident	Shops	Gov. offices	Industry	Street lighting	Distributed free	Losses	Total	%
Baghdad Region	2,294	352	2,198	480	116	33	2,437	7,910	39%
<i>Middle Region</i>									
Diyala	378	19	142	74	18	4	168	803	4%
Anbar	386	24	238	85	11	58	136	938	5%
Najaf	278	17	27	212	30	8	115	687	3%
Kerbela	212	18	86	32	19	6	83	456	2%
Qadisiya	215	11	172	92	5	3	109	607	3%
Wassit	212	12	169	94	5	3	218	713	3%
Babylon	363	26	177	50	9	6	90	721	4%
Total Middle Region	2,044	127	1,011	639	97	88	919	4,925	24%
<i>North Region</i>									
Tameem	309	19	60	64	17	2	151	622	3%
Salah al-Din	302	12	103	203	1	0	250	871	4%
Ninewa	739	68	363	186	71	11	124	1,562	8%
Total North Region	1,350	99	526	453	89	13	525	3,055	15%
<i>South Region</i>									
Basrah	457	27	329	79	24	7	318	1,241	6%
Muthanna	122	6	58	36	22	3	29	276	1%
Thi-Qar	275	6	80	-28	7	2	263	605	3%
Missan	153	10	93	36	53	9	94	448	2%
Total South Region	1,007	49	560	123	106	21	704	2,570	13%
Total the above 4 regions	6,695	627	4,295	1,695	408	155	4,585	18,460	90%
<i>3 Northern Governorates</i>									
Sulaymaniyah	339	26	97	44	10	4	164	684	3%
Erbil	387	25	133	94	11	10	319	979	5%
Dahuk	116	8	74	30	13	4	76	321	2%
Total 3 Northern Governorates	842	59	304	168	34	18	559	1,984	10%
Grand Total	7,537	686	4,599	1,863	442	173	5,144	20,444	100%

Appendix B.5 Energy Consumption at MoE Network Ends in 2001 and 2002

2001	Baghdad+ Middle	North+ Dahuk	South	Total
Total	17,397	6,624	4,632	28,653
	61%	23%	16%	100%



2002	Baghdad+ Middle	North+ Dahuk	South	Total
Total	19,933	6,739	5,031	31,703
	63%	21%	16%	100%



Appendix B.6 Energy Consumption per Capita at Consumers' Ends in 1990

Governorate & Region	1990 Population (Estimate)	1990 Energy Consumption at Consumers' Ends (GWh)	1990 kWh/capita at Consumers' Ends (kWh/capita)
Baghdad Region	4,269,317	7,910	1,853
<i>Middle Region</i>			
Diyala	1,012,476	803	793
Anbar	878,846	938	1,067
Najaf	641,749	687	1,071
Kerbela	504,803	456	903
Qaddisiya	612,782	607	991
Wasit	624,336	713	1,142
Babylon	1,133,178	721	636
Total Middle Region	5,408,171	4,925	911
<i>North Region</i>			
Al-Tameem	644,647	622	965
Salah-Al-Din	777,244	871	1,121
Ninewa	1,633,309	1,562	956
Total North Region	3,055,200	3,055	1,000
<i>South Region</i>			
Basra	1,039,906	1,241	1,193
Muthanna	348,841	276	791
Thi Qar	995,469	605	608
Missan	529,357	448	846
Total South Region	2,913,573	2,570	882
Total the above regions	15,646,260	18,460	1,180
<i>3 Northern Governorates</i>			
Sulaimaniya	1,062,215	684	644
Erbil	858,203	979	1,141
Dohuk	323,322	321	993
Total 3 Northern Governorates	2,243,740	1,984	884
Grand Total	17,890,000	20,444	1,143

Appendix B.7 Energy Consumption per Capita at MoE Network Ends in 2001 and 2002¹

Regions	Population ² (x 1,000)		Energy Consumption at MoE Network Ends (GWh)		kWh/capita at MoE Network Ends (kWh/capita)	
	2001	2002	2001	2002	2001	2002
Baghdad + Middle	12,842	13,128	17,397	19,933	1,355	1,518
North + Dahuk	4,738	4,915	6,624	6,739	1,398	1,371
South	4,409	4,564	4,632	5,031	1,051	1,102
Total	21,989	22,606	28,653	31,703	1,303	1,402

¹ Sulaymaniyah and Erbil are not included in the data.

² The population in 2001 is estimated from the population by Governorate in 2002 and the annual increase ratio from 1997 to 2003 in Appendix C.2.