

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)



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 contain less sulfur contents.

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

Sheet No.

Type: THS			Ref.	No.	: T-1		Sourc	ce o	of In	format	ion	: EN	JAR/CPA	L	
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Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

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Note: PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

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	No.	sionin	ns c	apac (MV	W)	Capa (M	W)		operati	n on	Re Re	cords c habilitation	ot n ai	Renewal , nd etc.
Unit	1	1978	8	2	10		130		25	-	Re	habilitated	l Ju	ne 2000,
Data	2	197	9	2	10		180		25		Re	habilitated	l Ju	ly 2000,
	3	198)	2	10		160		25					
	4	198)	2	10		130		25					
Total of plant	4			8	40		600							
Production		Maxim	um	A	nnual	en	nergy	St	ation use	1	Sta	ation total	effi	ciency(%)
Record in 2	002	power		р	roduct	tion (k	Wh)	en	ergy (kW	h)	At	Gen.Term.		At Trans.Term.
		output	(MW)											
		75	5		4,428	3,804,0	00							
Fuel		Design	Ty	ре		Fuel '	Туре	A	lt. Fuel		Fu	el treat.		Fuel storage
			Cr	ude	Oil			C	Dil					
		Gas Co	ntent	& Ca	alory (1	Lower)		C	Dil Chara	cter	ristic	s & Calory	(Lo	ower)
		(1.Norr	nal Cr	ude	oil/Bas	sra)	CL.		D. 1			M. C.		The design of the
Boiler		stream			ain/Ke eam Te	emp.	cap	am acit	y Dolle	er 1	ype	urer	τ-	treatment
		press.(1	MPa)	(de	eg.C/de	eg/Ĉ)	(t/ĥ))	-					
		12.	8	54	0/540							TPE	1	
Steam Turk	oine	Type (t	andem)	Revo (rpm	lution	Maı	nufa	acturer	C	Cooli	ng water	S	team Extract.
		01 0105	scomp	./	(i piii	/	LM	Z						
Electrical	&				Gene	erator						Electrica	al &	c Control
Control		Capaci	ty(MV	A)	Powe	er	Mar	nufa	acturer	F	Elect	rical	С	ontrol System
			-		facto	r	7701	-		N	Manu	ufacturer		
				м	. ¹ . Л.	C	TPI	5				0.10	1	
		Carran				ansiorr	ner	L		0	1	Gria C	oni	nection
		Capaci		4)	voita	ige(kv)	1	уре	1	2	SW1te	engear	v	oltage(kV)
Main Probl	ems	(ENAR) Outr	out i	s resti	ricted F	ov the	por	or quality	 7 an	d au	antity of c	lem	ineralised water
Action Plan	ns for	and clo	gging	of co	ndense	er tube	s and	cool	ing wate	r int	take	filters.		
Restoration	ns &	Overha	ul mai	ntena	ance of	f this po	ower st	tatic	on with Ro	ehat	oilita	tion of inst	rum	ent and control
mproveille	.110	CPA: F	or Uni	it ati	ion We	iii enna	ance the	$e re}{n+1}$	enability t	ne u	mits.	d addition	<u>ما</u> ،	nower 70MW by
		USACI	E, Com	plet	e 01-J	un-04	Com	plet	e installa	tion	of C	Cooling Tow	ver	power former by
		Water 1	Intake	was	rehab	oilitateo	d: add-	+10	8MW					
Boiler Steam Turk Electrical Control Main Probl Action Plar Restoration Improveme	ems, as for as & ent	Gas Co (1.Norr Main stream press.(1 12. Type (t or cross Capaci Capaci Capaci (ENAR and clo Overha system CPA: F USACI Water 1	ntent of nal Cr MPa) 8 andem 5 comp ty(MV)ty(MV ty(MV)ty(MV ty(MV)	X Ca Ma Stude - Ma Stude - (de 54 - - - - - - - - - - - - -	alory () oil/Bas ain/Re eam Te eam Te eg.C/de 0/540 Revo (rpm Gend Powe facto ain Trr Volta s restr ndense ance of nd 4 w ion Wa s rehab	Lower) sra) heat emp. eg/C) lution) erator er r ansforr r ge(kV) ricted k er tube f this po ill enha ater Tr un-04 illtateo	Stea cap (t/h) Man LM LM Man TPI ner T y the s and ower si ance th eatme Comp d: add	am acit,) nufa Z Z poc cool tatic pleta +103	Dil Chara Boile y acturer acturer acturer in quality ing wate on with Ro iliability t external): e installa 8MW	r interest of the term of	Cooli: Cooli: Elect: Manu dau take pilita mits. valize i of C	s & Calory Manufac urer TPE ng water Electrica rical ifacturer Grid C chgear antity of c filters. tion of insti	(Lc t- sal & C C C C C C C C C C C C C C C C C C C	Feed water treatment team Extract.

Type: TPS			Ref. 1	No.:T-7			Sour	ce of	Infor	mati	on: El	NAR		
Name of Po	ower P	lant	Najil	oiyah 1	PS		Powe	er St	ation	ID:				
It	ems								Desc	riptio	ons			
Location			Gove	rnorate	e (City						Coordina	ates	
			I	Basra					N:				E:	
	Unit No.	Year Comn sionin	of N nis c g	Vamepl apacity (MW)	ate '	Dera capa (M	ated icity W)		No. zears operat	of in tion	Reas Reco Reha	son of Dera ords o abilitation	ating f and	g. Renewal , l etc.
Unit	5	197	3	100			80		27		Rest	ored Aug.	2002	except I&C
Data	6	197	3	100			80		27		Rest	ored Nov.2	2002	except I&C
Total of plant	2			200			160							
Production		Maxim	um	Ann	ual	en	ergy	Sta	tion u	ıse	Sta	ation total	effic	ciency(%)
Record in 2	002	power		proc	luction	n (k	Wh)	ene	ergy (k	Wh)	At	Gen.Term		At Trans.Term.
		output	(MW)											
	Fuel			3	821,57	72,40	8							
Fuel		Design	Ту	vpe	F	Fuel '	Гуре	Al	lt. Fue	el	Fu	el treat.		Fuel storage
				G ai nude Oi	nd 1			Oi	il					
		Gas Co	ntent	& Calo	ry (Lo	wer)		Oi	il Cha	racte	eristic	s & Calory	, (Lo	wer)
		(1.norn (3.natu	nal Cru ral G	ude Oil) las))									
Boiler		Main stream press.(1	MPa)	Main Stear (deg.0	/Rehea n Tem C/deg/	at 1p. 7C)	Stea capa (t/h)	am acity)	Во	oiler '	Туре	Manufac urer	et-	Feed water treatment
												TPE	_	
Steam Turk	oine	Type (t or cross	andem s comp	R .) (r	evolut pm)	tion	Mar	nufac	cturer	,	Cooli	ng water	S	team Extract.
							TPE	2						
Electrical	&			0	lenera	ator	1					Electric	al &	Control
Control		Capaci	ty(MV	A) P fa	ower ictor		Mar	nufao	cturer		Elect	rıcal ıfacturer	С	ontrol System
							TPF	E						
		~ .	(Main	Trans	sforn	ner				~ .	Grid (Coni	nection
		Capaci	ty(MV/	A) V	oltage	e(kV)	T	ype			Swite	hgear	V	oltage(kV)
Main Probl Action Plar Restoration Improveme	ems, 1s for 1s & ent	(ENA of this Conditi spares	R) ove power on ass parts w	erhaul station station essmen ill have	maint t and to be	enan life cond	evalu	his p atior prior	oower n stud r to an	stati ly an ly ma	on wil nd inv jor inv	ll increase entory che vestment d	the ecks ecisi	reliability of major on.

Type: TPS			Ref	No:T-8		Sour	ce o	f Informa	tior	n:EN	AR/CPA		
Name of Pe	wor P	ont	Hort	ho TPS		Powe		ation D					
Ivanie of FC	ome	lanı	пан	na iro		rowe	er o	Doscrin	tior	19			
Location	ems		Gove	rnorato	City			Descrip	0101	.15	Coordina	toe	
Location			UUVE F	Ragra	Δ1-1	Hartha		N:				TES T:	
	Unit	Year	of N	ameplate	Der	ated	· N	IQ. of	R	Reas	on of Derat	ing.	
	No	Comm	nis ca	apacity	capa	acity	у	ears in	R	Recor	rds of Rene	wal	, Rehabilitation
TT 1.	110.	sionin	g	(MW)	(M	(W)	0	peration	a	ınd e	etc.		
Unit	1	1978)	200		175	2	4	Ŧ	. 1	D 1 1 11		
Data	2	1978)	200		0			l	Jnde	r Rehabilit	atio	on by Russia ?
	3	1979)	200		0			U	Jnde	r Rehabilit	atio	on by Russia ?
	4	1979)	200	1	175	2	4					
Total of plant	4			800	e e	350							
Production		Maxim	um	Annua	l er	nergy	Sta	ation use		Sta	ation total o	effic	eiencv(%)
Record in 2	002	power	$(\mathbf{N}\mathbf{n}\mathbf{X})$	produc	tion (k	Wh)	en	ergy (kW	h)	At	Gen.Term.		At Trans.Term.
		output 40	$(\mathbf{W} \mathbf{W})$	- 9.81	5 303 0	00				110			
Fuol		Dogion		2,010	5,505,0 Fuol	Typo	Δ	lt Fuol		Fu	ol troat		Fuel storage
I uei		Design	N(G and	ruer	Type		nt. Puer		ru	ei ti eat.		Fuel storage
			Cr	ude Oil									
		Gas Co	ntent &	& Calory()	Lower)	<u>a</u> 1	0	il Charao	cter	istic	s & Calory	Lov	wer)
		(3.Natu Oil/Bas	iral G rah)	as) (1.No	ormal	Crude							
Boiler		Main	i di li	Main/Re	eheat	Stea	am	Boile	r Ty	ype	Manufac	t-	Feed water
		stream	(D _a)	Steam T	emp.	capa	acity	7			urer		treatment
		press.(r	vii a)	(ueg.C/u	eg/C)	1	66				MHI		
Steam Turk	oine	Type (ta	andem	Revo	olution	Mar	nufa	cturer	C	Cooli	ng water	St	Leam Extract
Steam ran	,1110	or cross	comp.) (rpn	n)						-		
							Μ	HI					
Electrical	&		<i>(</i>	Gen	erator	1			Б	71 4	Electrica	al &	Control
Control		Capacit	y(MV/	facto	er or	Mar	nufa	cturer	r N	Jani	ifacturer		ontrol System
				Main Tr	ansforr	ner					Grid C	onr	nection
		Capacit	y(MV/	A) Volta	age(kV)) T	ype		S	Swite	hgear	Vo	oltage(kV)
Main Probl	ems,	Rehabi	litatior	of instr	ument	and c	onti	rol system	m c	of U	nit 1 and	4 v	will enhance its
Restoration	ns for ns &	Unit 2	ty. & 3: Re	ehabilitati	ion fron	n Jan.,	200	4, 12mon	ths.	•			
improveille	,110	Parts fo	or reha	bilitation	of Unit	1 and	4 w	ill be sur	plie	ed ui	nder UNDF	P tru	ust fund.
					-			r	•				

Type: GPS			Ref.	No.: G-1		Sour	ce of	f Inform	natic	on: FNAR		
Name of Po	wer Pl	ant	Mos	sul GPS		Powe	er St	tation I	D:			
It	ems					1		Descrip	otion	s		
Location			Gov	ernorate	City					Coordi	nate	98
			N	Ninewa	Al	Mosul		N:			E:	
	Unit No.	Year Comm sioning	of is g	Nameplate capacity (MW)	Der cap (M	rated acity IW)	N yo oj	lo. c ears i peratior	of in n	Reason of D Records Rehabilitati	erat of on a	ing. Renewal , nd etc.
Unit	1	1974	:	20		20				8 units out	of	10 gas turbine
Data	2	1974	:	20		0		27		units we under the s	re	rehabilitated,
	3	1974	:	20		20				Brown, wi	th	the materials
	4	1974	:	20		18		26		procured du	ring	; 1999 to 2001.
	5	1981		20		18		22		Unit 1 and	13	replaced with
	6	1981		20		18		22		non-original	sup	oply.
	7	1981		20		18		22				
	8	1981		20		18		22		Unit 1:roter	dan	naged
	9	1981		20		0		22		Unit 2:decre	easir	ng gear vibration
	10	1981		20		18		22		Unit3 ,4: 10	MW	operated
	11	1981		20		18		22				
	12	1981		20		18		22				
Total of plant	12			250	-	184						
Production		Maximu	ım	Annual	e	nergy	Sta	ation us	se	Station tota	l effi	iciency(%)
Record in 2	002	power	(MW) product	ion (l	(Wh	en (1	ergy kWh)		At Gen.Tern	n.	At Trans.Term.
	-	15	6	1.130).082.0	000	(-					
Fuel		Design	Т	vpe	Fuel	Type	Α	lt. Fuel	1	Fuel treat.		Fuel storage
	-	8		NG		01						
		Gas Cor	ntent	& Calory (Lower)	0	il Char	acte	ristics & Ca	lory	(Lower)
			(3	.Natural Ga	as)							
Gas turbine	e	Unit	Т	ype	Μ	anufac	ture	er	Inst	allation	Τυ	urbine Controller
		2,4	Р	G5341		Hita	ichi					
		5,6,7,8,9	9 5	001		AF	G				1	
	-	10,11,12	2			Alst	om					
Electrical	&			Gene	rator					Electri	cal &	& Control
Control		Capacit	y(M\	VA) Power facto	er r	Man	ufa	cturer	El Ma	ectrical anufacturer	(Control System
				Main Tra	nsform	ner				Grid	Con	inection
		Capacit	y(M\	VA) Volta	ıge(kV) T	ype		Sw	vitchgear	7	/oltage(kV)
Main Probl Action Plan Restoration Improveme	ems, is for is & ent	CPA: R availabl	ealiz le.	ed Additio	nal 54	MW U	JSA	CE con	nple	te 01.Jun.0	4	Details are not
	Ī	Two nev	v uni	ts for No.1	& 3, eε	ch 25N	1W,	will be i	inst	alled under §	gran	t aid from GoJ.as
		phase 1	. Two	o units to be	repla	ced in l	Phas	se 2 by l	UNI	OP		

Type: GPS			Ref.	No.: G-2		Sour	ce o	f Infoi	rmat	tion: FNAR		
Name of Po	wer Pl	ant	Dibs	GPS.		Powe	er S	tation	ID:			
It	ems							Descr	iptic	ons		
Location			Gove	ernorate	City				1	Coordi	nate	28
			Та	meem	K	lirkuk		N:			E:	
	Unit No.	Year Comn sionin	of 1 nis c	Nameplate apacity (MW)	Der cap	rated acity (W)	N y o	lo. ears perati	of in on	Reason of De Records Rehabilitatio	erat of	ing. Renewal , nd etc
Unit	4	198	2	25	(1	25		23		Rehabilitate	d by	7 May 2004
Data	5	198	2	25		25		23		Rehabilitate	d by	7 Mar. 2004
	6	198	2	25		25		23		Rehabilitate	d by	v Mar 2004
Total of plant	3			75		75						
Production		Maxim	um	Annua	l e	nergy Wh	Sta	ation	use	Station total	effi	iciency(%)
Record in 2	002	output	(MW)	produc	1011 (1	X VV 11/	(]	kWh)		At Gen.Term	1.	At Trans.Term.
Fuel		Design	Ту	vpe	Fuel	Type	A	lt. Fu	el	Fuel treat.		Fuel storage
			Ν	G								
		Gas Co	ntent	& Calory(I	Lower)		С)il Cha	arac	teristics & Cal	ory	(Lower)
		(3.Natı	ıral Ga	as) Press.3	0kg/cn	n2						
Gas turbine	e.	Unit	Ту	vpe	Μ	anufac	ture	er	In	stallation	Τυ	urbine Controller
					Fi	at/Avio						
Electrical	&			Gene	rator					Electric	cal &	& Control
Control		Capaci	ty(MV	A) Pow	er	Man	ufa	cturer	. I	Electrical Manufacturer		Control System
	-			iacit	· -						+	
	ŀ			Main Tra	nsforn	ner				Grid	Con	inection
	Capaci	ty(MV	A) Volta	age(kV) Т	ype		5	Switchgear	1	/oltage(kV)	
		<u> </u>	<u> </u>		<u> </u>					0	\uparrow	<u> </u>
Main Probl Action Plan Restoration Improveme	ems, is for is & ent											

Type: GPS			Ref. N	Io.: G-3		Sour	rce of	f Infor	mat	tion: FNAR		
Name of Po	wer Pl	ant	Dibs	Mobile GI	PS,	Pow	er St	ation	ID:			
It	ems							Descr	iptio	ons		
Location			Gover	morate	City					Coordi	nate	es
			Ta	meem	K	irkuk		N:			E:	
	Unit	Year	of N	ameplate	Der	rated	N	0.	of	Reason of D	erat	ing.
	No.	Comm	nis ca	(MW)	cap	acity	ye	ears	in	Records	of	Renewal ,
Unit	1	108	ιg γ	10	(10	0	0	Jerau	011	Shifted from	on a i ini	tial Taïi GPS ?
Data	9	198	3	10		8				Shifted from	ini	tial Taji GPS ?
Data	3	198	3	10		8	_			Shifted from	ini	tial Taji GPS ?
	4	198	3	10		8				Shifted from	ini	tial Taji GPS ?
		100	0	10		0	+			Sintea non		
										-		
Total of plant	4			40		24						
Production		Maxim	um	Annual	e	nergy	Sta	ation 1	use	Station total	l effi	iciency(%)
Record in 2	002	power	(MW)	product	tion (l	xWh)	ene (1	ergy Wh)		At Gen.Tern	1.	At Trans.Term.
		2	5	39.	599.00	0	(1	(((11)				
Fuel		Design	Tv	ne	Fuel	Type	A	lt. Fu	el	Fuel treat.		Fuel storage
1 401		Dongh	N(} }	1 401	19 00			01	1 401 01 0400		1 doi storage
		Gas Co	ontent &	z Calory (Lower)	0	il Cha	arac	teristics & Cal	orv	(Lower)
							-				5	(
Gas turbine	Э	Unit	Ty	pe	Μ	anufac	eture	r	In	stallation	Τt	urbine Controller
						IH	I?					
Electrical	0			Come						Electri		e Control
Control	æ	Comer	+++) Powe	er	λл-				Electrical		Control System
Control		Capaci	ty(IVI VA	facto	r	Mar	nurae	turer	I	Manufacturer		control by storin
				Main Tra	nsform	ner				Grid	Con	nnection
	Ca) Volta	age(kV	Γ (ſype		S	Switchgear	I	Voltage(kV)
Main Probl	ems,											
Restoration	ns &											
Improveme	ent											

Type: GPS			Ref.	No.: (3-4				S	ourc	ce o	f Information	: Fl	NAR/CPA
Name of Po	ower Pl	ant	Al-T Abu	amee dulah	m(Old) GPS		Mu	llah	n P	owe	er St	tation ID:		
Ite	ms							I	Desc	ripti	ions	3		
Location			Gove	ernora	ate	City						Coordin	nate	es
			ſ	lamee	em	K	irkuk		N:				E:	
	Unit	Year	of	Nar	neplate	Der	ated	ľ	No.	0	of	Reason of De	erat	ing.
	No.	Com	imis ing	capa (M	acity (W)	capa (M	acity W)	У	vears	3 ir ation	n	Records	of	Renewal ,
Unit	1	1977	7	(11)	-	(14)	-		9 opena	5	1	age and the	lack	of spare parts
Data	2	1973	7		20		15		2	5		for routine m	nain	tenance
Dutu	3	1981	1		20		15		2	1				
	4	1981	1		20		15		2	1				
	5	1981	1		20		15		2	1				
	6	1981	1		20		15		2	1				
	7	1981	1		20		15		2	1				
	8	1981	1		20		15		2	1				
	9	1981	1		20		15		2	1				
	10	1981	1		20		15		2	1				
	11	1981	1		20	1	15		2	1				
	12	1981	1		20	1	15		2	1				
Total of plant	12				220	1	.65							
Production		Maxi	mum		Annual	er	nergy	St	atio	n use	е	Station total	effi	ciency(%)
Record in 2	002	power outpu	r it (M	W)	product	ion (k	(Wh)	en (lergy kWł	/ n)		At Gen.Term	l .	At Trans.Term.
]	169		1,050	,290,0	00	_						
Fuel		Desig	m	Туре		Fuel	Туре	A	Alt. F	Fuel		Fuel treat.		Fuel storage
				NG										()
		Gas (Contei	nt & (Calory(L	ower)		(Dil C	hara	acte	eristics & Cal	ory(Lower)
		440kg	g/cm2	T		M				1	T	4 a 11 a 4 : a a	ጥ	unhim a Caraturallari
Gas turbine	e.	2 0 mt		5001		AF	anutae EG.	tur	er	-	ms	tallation	10	Irbine Controller
	-	3-7		5001		JB	E							
		8-12		5001		JB	E				1			
Electrical	&				Gener	ator	1				DI	Electric	al &	& Control
Control		Capa	city(N	IVA)	factor	r	Mar	nufa	lctur	er	M	lectrical anufacturer		Control System
	·			M	ain Trar	sform	er					Grid	Con	nection
		Capa	city(N	IVA)	Volta	ge(kV)	Г	ype	e		Sv	witchgear	V	/oltage(kV)
Main Probl Action Plan Restoration Improveme	ems, 1s for 1s & ent	ENAI e CPA:	R) Co nhano Reha	omple ce the abilita	te rehab reliabil	ilitationity of t	on of o he un 1,2,3	ld u its. ,5,1	units 1,12	and	l ma th	ajor overhaul rehabilitatior	of r	new units will f the main and
		auxili	ary g	as fee	ding sys	tem								

Type: GPS			Ref. 1	No.: C	ł-5					Sou	arce of Informa	atior	n: FNAR
Name of Po	ower P	ant	Al-Ta GPS	ameer	n (New I	Mullah	Abd	ullał	n)	Po	wer Station ID	:	
Iter	ns		012.0					Ι	Descri	ptior	ns		
Location			Gove	rnora	.te	City				_	Coordi	nate	es
			Tame	eem		Kirkı	ık		N:			E:	
	Unit	Ye Co	ar of ommis	Na cap	meplate pacity	Dera capa	ated acity]	No. years	of in	Reason of D Records	erat of	ing. Renewal ,
	NO.	sic	ning	(1	MW)	(M	W)	(opera	tion	Rehabilitati	on a	ind etc.
Unit	1	20	00		37	;	30		4				
Data	2	20	00		37	;	30		4				
	3	20	00		37	;	30		4				
	4	20	00		37	;	30		4				
	5	20	00		37	;	30		4				
	6	20	00		37	;	30		4				
	7										_		
	8					-							
	9					-							
	10					-							
	11	_											
T + 1 C	12	_					00				_		
plant of	6				222		80						
Production		Ma	ximum	1	Annual	ene	ergy	Sta	ition i	ıse	Station tota	l effi	iciency(%)
Record in 2	002	out	put (M	IW)	(kWh))		ene (k	Wh)		At Gen.Tern	n.	At Trans.Term.
			222		1,485,	,902,00	00						
Fuel		Des	sign	Тур	е	Fuel '	Туре	I	Alt. F	uel	Fuel treat.		Fuel storage
				NG									
		Gas	s Conte	ent &	Calory (I	Lower)		(Dil Ch	narac	teristics & Ca	lory	(Lower)
Gas turbine	e	Uni	it	Туре	9	Ma	nufa M(C)	ictur hino	er	Ir	stallation	Tu	arbine Controller
								IIIIIa	.)	+			
Electrical	&				Gener	rator					Electri	cal &	& Control
Control		Cap	pacity()	MVA)	Powe	er r	Ma	nufa	acture	r	Electrical Manufacturor	0	Control System
					Tacto.	1							
				N	lain Trai	nsform	er				Grid	Con	inection
		Car	pacitv()	MVA)	Volta	ge(kV)		Type	e,		Switchgear	1	/oltage(kV)
		Jul			,0100			- J P	-			+	
Main Probl	ems,												
Action Plan	ns for												
Improveme	ns &												
	-	CP	A: Reh	abilita	ation : Re	alized	Addi	tion	al 30N	IW b	y USACE, Co	mple	ete 01.Jul.04
											- ,	1	

Type: GPS			Ret	f. No.:	G-6		Sou	arce	of Infor	mati	ion: FNAR		
Name of Po	wer Pl	ant	Ba	ji GPS	S		Pov	wer	Station	ID:			
It	ems			-					Descri	ptio	ns		
Location			Go	verno	rate	City				-	Coordin	nate	es
			Sal	lah al	-Din	Baji			N:			E:	
	Unit No.	Year Comn sionin	of nis g	Nam capa (M	neplate acity W)	Der capa (N	ated acity IW)		No. years operati	of in ion	Reason of D Records Rehabilitati	era of on a	ting. Renewal , and etc.
Unit	1	200	3	1	159		159		1		Sep.03 start	ed o	operation
Data	2	2003	3	1	159		159		1		Sep.03 start	ed o	operation
	3	(200	4)	(1	159)	(159)		-		May 04 star	t co	mmissioning
	4	(200	4)	(]	159)	(159)		-		May 04 star	t co	mmissioning
	5												
	6												
	7												
	8												
	9												
	10												
	11												
	12												
Total of plant	4			6	336		280						
Production		Maxim	um	A	Annual	ene	ergy	St	ation us	e	Station tota	l eff	ficiency(%)
Record in 2	002	output	(MV	V)	(kWh)	on		er (iergy (kWh)		At Gen.Tern	n.	At Trans.Term.
		1							. ,				
Fuel		Design	,	Туре		Fue	l Tyr	be	Alt. Fue	el	Fuel treat.		Fuel storage
		U		Crude	e Oil								
				/Gas (Dil								
		Gas Co	nten	it & C	alory (L	ower))		Oil Cha	ract	eristics & Cal	ory	(Lower)
		(4.Gas	Oil)										
Gas turbine	e .	Unit	r	Туре		Ma	anufa	actu	rer	Ins	stallation	Tu	rbine Controller
						_	Ar	nsal	do				
						+							
Electrical	&				Gener	ator					Electric	cal &	& Control
Control		Capaci	ty(M	VA)	Power factor	r	Ma	anu	facturer	E M	lectrical Ianufacturer	(Control System
		Main Transformer Grid Connection									nection		
		Capaci	ty(M	VA)	Volta	ge(kV))	Typ	pe	S	witchgear	V	/oltage(kV)
Main Probl Action Plan Restoration Improveme	ems, is for is & ent												
1	-	CPA: C	lomp	letior	n of Un	it 3 8	z 4: 1	Rea	lized ad	ditic	onal 219MW	by '	TFRIE, complete
		31.May	.04 (Wate	r treatm Crude (ient p	lant i	is in	cluded)	ont	'Realized Add	litia	mal 125MW
		Com:	plete	ed .	UTUUE (лı (0	iiver	5101	ուրու	ient	·neanzeu Auo	<u>а</u> 110	11ai 1201vI VV

PLANT D	DATA	SHEE	Г							Sheet	No	
Type: GPS			Ref.	No.: G-7		Sou	rce	of Info	orma	tion: FNAR		
Name of Po	wer Pl	ant	Вајі	Mobile Gl	PS	Pow	ver S	Statio	n ID:			
Ite	ems							Desc	riptio	ons		
Location			Gov	ernorate	City					Coordia	nate	es
			Sal	ah al-Din		Baji		N:			E:	
	Unit	Year	of	Nameplat	e De	rated]	No.	of	Reason of De	erat	ing.
	No.	Comn	nis	(MW)	cap (N	acity AW)	2	years operat	1n tion	Records Rebabilitatio	of m a	Renewal,
Unit	1	200	4	23	(1)	20		operat		nenabilitatio	лі а	ind etc.
Data	2	200	4	23		20						
	3	2004	4	23		20						
	4	200	4	23		20						
	5	200	4	23		20						
	6	2004	4	23		20						
	7	200-	4	23		20						
	8	200	4	23		20						
										-		
Total of plant	8			184		160						
Production		Maxim	um	Annua	l e	nergy	S	tation	use	Station total	effi	iciency(%)
Record	in	power	(MW) produc	tion (kWh)	eı	nergy (kWh))	At Gen.Term	۱.	At Trans.Term.
2002		output	(1)111	,					/			
Fuel		Design	Т	vpe	Fuel	Type		Alt. Fi	uel	Fuel treat.		Fuel storage
		8		J I -	-	J 1			-			
Gasturbine	,	Unit	Т	ype	М	anufa	ctur	er	In	stallation	Τυ	urbine Controller
Gub turbine	· .											
									+			
									_			
Electrical	&			Gene	erator					Electric	al 8	& Control
Control		Canaci	tv(M\	(A) Pow	ver	Ma	nuf	acture		Electrical		Control System
		oupuoi	09 (111)	fact	or		iiuit	aovare	1	Manufacturer		
	-											
	-			Main Tra	ansforn	ner				Grid	Con	nection
		Capaci	ty(MV	VA) Volt	age(kV) [Гур	е	5	Switchgear	1	/oltage(kV)
Main Proble Action Plan	ems, is for											
Restoration	is &											
Improveme	nt	CDA · 1	Joh!		onetia	• D	<u>_1:-</u>	od - 1	الم:	nal 1901/007 1	., п	
		01.Feb	.04	e new gen	eratior	ı • Ke	aliz	ed ad	101110	nai iz91VLVV b	у 1	FRIE, Complete

Note:

PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

Type: GPS			Ref	. No.: (G-8		Sou	irce (of Inform	mat	ion: FNAR/CI	PA/J	ICA
Name of Po	ower Pl	ant	Taj	i GPS			Pow	ver S	Station 1	D:			
It	ems						1		Descri	ptio	ons		
Location			Gov	vernora	ate	City					Coordi	nate	es
			E	Baghda	ad	K	arkh	-	N:			E:	
	Unit No.	Year Comm sionin	of nis g	Name capac (MW	eplate ity V)	Der cap	ated acity IW)		No. years operatio	of in on	Reason of D Records Rehabilitati	erat of on a	ing. Renewal , nd etc.
Unit	1	197	3	2	0		20				Only 10M	W	operational,
Data	2	197	3	2	0		20				cooling & c normal	contr	rol system not
	3	197	3	2	0		17				Same as abo	ove ,	roter damaged.
	4	197	9	2	0		17		24		Roter dama	ged.	
	5	2004	4	2	0		20				Out of order	· (to	be replaced)
	6	197	9	2	0		15		24		Same as uni	it 18	τ 2
	7	197	3	2	0		16		27		Roter dama	ged.	
	8												
	9												
	10												
	11												
T 1 1	12						105						
plant	7			16	30		125						
Production		Maxim	um	A	nnual	er	nergy	St	tation u	lse	Station tota	l effi	iciency(%)
Record in 2	002	power output	(MW	() pr	roduct	10n (F	(wn)	er ((kWh)		At Gen.Terr	n.	At Trans.Term.
	-	10)1		687,	924,00	00						
Fuel		Design	J	Гуре		Fuel	Type	A	Alt. Fue	el	Fuel treat.		Fuel storage
			N	٩G									
		Gas Co	ntent	t & Ca	lory (I	lower))	(Oil Cha	ract	eristics & Ca	lory	(Lower)
Gas turbine	e .	Unit	Γ	ype		M	anufa	ctur	er	Ins	stallation	Tu	rbine Controller
	-		5	5001		Hi	tachi						
Electrical	&			_	Gener	ator					Electri	cal &	& Control
Control		Capaci	ty(M	VA)	Powe factor	er r	Ma	inufa	acturer	E N	Electrical Aanufacturer	C	Control System
				Mai	n Trar	nsform	ner				Grid	Con	nection
	-	Capaci	ty(M	VA)	Volta	ge(kV) '	Туре	9	S	Switchgear	V	/oltage(kV)
Main Probl Action Plan Restoration Improveme	ems, ns for ns & ent	CPA: 1 01.Jun	Rehal .04	bilitati	ion: (PS	Real	ized	Additi	iona	d 74MW by	US	SACE, Complete
		Unit 1,	2, 3,	5: to b	e repl	aced u	nder	grar	nt aid of	Go	J.		
		Unit 4,	6&'	7 to be	rehat	oilitate	ed uno	der U	JNDP t	rus	t fund.		

Type: GPS			Re	f. No.	: G-9		Sou	arce	of Info	rmat	tion: FNAR		
Name of Po	wer Pl	ant	Та	ji Mol	bile GP	s	Pov	ver S	Station	ID:			
It	ems			•					Descr	iptio	ons		
Location			Go	verno	orate	City				-	Coordi	nate	es
				Bagh	dad	k	Karkh	1	N:			E:	
	Unit No.	Year Comm sionin	of nis g	Nar capa (M	neplate acity W)	Der cap (M	rated acity IW)		No. years operati	of in on	Reason of D Records Rehabilitation	erat of on a	ing. Renewal , ınd etc.
Unit	1	1983			10		10		<u>^</u>				
Data	2	1983			10		10						
	3				10		?						
	4				10		?				-		
	5				10		?				ļ		
	6				10		?				ļ		
	7										ļ		
	8										ļ		
	9												
	10												
	11										ļ		
	12 al of 2										ļ		
Total of plant	2				60		20						
Production	tion Max				Annual	en ion (1	nergy	S	tation	use	Station total	l eff	iciency(%)
Record	-	output	(MV	N)	product	10n (F	(vv n)	ei	(kWh)		At Gen.Tern	n.	At Trans.Term.
Fuel		Design		Туре		Fuel	Туре	;]	Alt. Fu	el	Fuel treat.		Fuel storage
	-			Gas (Dil								
	-	Gas Co	nter	nt & C	Calory (1	Lower)	(Oil Ch	arac	teristics & Cal	lory	(Lower)
Gasturbing	2	Unit		Type		М	anufa	actur	rer	In	stallation	Т	urbine Controller
Gub fuibilit						IH	Ι						
	-		_										
Electrical	&				Gener	rator					Electri	cal à	& Control
Control	a	Capaci	ty(M	IVA)	Powe	er r	Mε	anufa	acture	. I I	Electrical Manufacturer	(Control System
	ſ												
		Main Tra				nsform	ner				Grid	Cor	nnection
	Capacity		ty(M	IVA)	Volta	ge(kV)	Тур	e	5	Switchgear	7	Voltage(kV)
							_						
Main Probl Action Plan Restoration Improveme	ems, is for is & nt												

4 Type: GP	S		Re	f. No	.: G-10		Sou	rce c	of Info	rmat	tion: FNAR/C	PA	
Name of Pc	wer Pl	ant	Do	oura (JPS		Pow	ver S	tation	ID:			
It	ems								Desci	riptio	ons		
Location			Go	vern	orate	City					Coord	inate	es
			Ba	ghda	d				N:			E:	
	Unit No.	Year Comn sionin	of nis ug	Nai cap	neplate acity IW)	Den cap	rated acity (W)	l y o	No. Tears perat	of in ion	Reason of I Records Rehabilitat	erat of	ing. Renewal , nd etc
Unit	1	198	1		25		25		22	-	The rehabi	itati	on of Unit 1,
Data	2	198	1		25		25		22		2 and 4 w	as c	ompleted. in
	3	198	2		25		25		21		2000 and 20	JU1.	
	4	198	2		25		25		21		The rehabi	litati	on of Unit 3 to
	5	100	_				_0				be complete	ed by	Jun.2004
·	6												
	7												
	. 8												
	9												
	10												
	11												
	12 otal of 4												
Total of plant	total of 4 lant Ma				100		100						
Production	Production Ma				Annual	e	nergy	St	ation	use	Station tota	ıl effi	iciency(%)
Record in 2	002	power	(M	V)	product	ion (l	xWh)	en	lergy kWh)		At Gen.Ter	n.	At Trans.Term.
		11	3	()	543 191	000		(K VVII)				
Fuel		Dogion	.0	Type	040,101	Fuol	Typo		lt Fr	ol	Fueltreat		Fuel storage
i uci	-	Design		NG		Tuci	Type	1	110. 1 0		i uci ti cat.		i dei storage
		Gas Co	nter	nt & (Calory (1	ower)	()il Ch	arac	teristics & Ca	lorv	(Lower)
		13kg/cr	m2	10 00 0	Jaiory	10 10 01	/			arac		uory	(Lower)
Gasturbine	2	Unit		Туре		Μ	anufa	ctur	ər	In	stallation	Τι	arbine Controller
Gub fuibilit				TG20)	Fi	at/Avi	0					
			_										
Electrical	&				Gener	ator					Electr	ical &	& Control
Control	~	Capacit	ty(M	IVA)	Powe	er	Ma	nufa	cture	r I	Electrical	(Control System
					Tacto	r					vianulacturer		
					l ain Trai	nsform	ner				Grid	l Con	inection
	Cap				Volta	ge(kV) ′	Турє	•	5	Switchgear	7	/oltage(kV)
					1							\uparrow	-
Main Proble Action Plan Restoration Improveme	ems, is for is & ent												
		CPA: 1 01.Jun	Reha .04	abilita	ation U	nit 3	. real	ized	Add	ition	al 20MW by	y US	SACE, Complete

Type: GPS			Ref.	No.:	G-11		So	ource	of In	form	natio	on: ENAR/CF	ΡA	
Name of Po	wer Pl	ant	Al-6	Quds (GPS		Po	wer	Stati	on II):			
It	ems								Des	script	tion	ıs		
Location			Gov	vernor	rate	City						Coordi	nate	es
			В	Bagdh	ad				N				E:	
	Unit	Year	of	Name	eplate	Der	ated	1	No.	0 	of	Reason of De	erat	ing.
	No.	sionin	ng	(MV	V)	(M	IW)	ý	opera	ation	n	Rehabilitatio	on ma	nd etc.
Unit	1	200	2	12	23	1	110			2		Crude Oil Co	nve	ersion
Data	2	200	2	1	23	1	110			2		Equipment a	adde	ed(+1601MW)
	3	200	4	12	25		96					(to be comple	eted	31 May 04)
	4	200	4	12	25		96							
	5	200-	4	4	13	;	33					(to be comple	eted	22 Mar 04)
	6	2004	4	4	13		33							
	7	200-	4	4	13		33							
	8	200-	4	4	13		33				_	T 1 4 4 4 4 4 4	1	1
	9										_	LM6000 718	be c	larified
	10										-			
	12										_			
Total of	8			6	68	5	544							
plant		668 544												
Production		Maxim power	um	A p	nnual roducti	ener ion	gy	Sta ene	tion u ergy (]	ıse «Wh		Station total	effi	ciency(%)
Record in 2	002	output	(MW	()	(kWh)				- 87 (-		,	At Gen.Term	۱.	At Trans.Term.
		25	54		534,50	04,300)							
Fuel		Design	Г	ype		Fuel	Тур	е	Alt.	Fuel		Fuel treat.		Fuel storage
		Dual	C	Crude	Oil				Gas	Oil				
		Gas Co	ontent	: & Ca	alory (I	.ower))		Oil C	hare	acte	eristics & Cal	ory	(Lower)
Cart 1:		Unit	Т	Vne		Manı	ufac	ture	r	Ins	stall	lation	Tu	rhine Controller
Gasturbine	э.	1,2,3,4	F	rame	9?	man	urac	tur ci	L	Do	ng	Fang	10	
		5,6,7,8	F	rame	6?									
	0				a								1.0	
Electrical	&	0	() () ()	74)	Gener	ator r	м	r	C		El	Electric	$\operatorname{cal} \delta$	& Control Control System
Control		Capaci	ty(M)	VA)	factor	•	М	lanu	tactu	rer	M	anufacturer		Some of System
		Main Transformer Grid Connection								nection				
		Capacity(MVA) Voltage(kV) Type Switchgear Voltage(kV)								/oltage(kV)				
Main Duch	oma													
Action Plan	enns, ns for													
Restoration	ns &													
mproveine	110	CPA: C	ompl	etion	of Uni	t 3 &	4:1	Reali	ized 4	\ddi+	ion	al 175MW	hv ′	FRIE Complete
		31.May	7 04.	Qud	s No. 5	-8 Nev	w Ge	enera	ation	: Rea	aliz	ed Additional	l 12	0MW by TFRIE ,
		Comple	ete 22	.Mar.	04									- /

Note: PREPARATORY WORK FOR THE MASTER PLAN OF ELECTRICITY SECTOR

Type: GPS			Ref.	No.:	G-12		Sou	rce c	of Inforr	nat	ion: FNAR/C	PA	
Name of Po	wer Pl	ant	Hill	a GP	S		Pow	ver S	station I	D:			
Ite	ems								Descri	ptio	ns		
Location			Gov	vernoi	rate	City					Coordi	inate	es
				Babe	el]	Hilla		N:			E:	
	Unit No.	Year Comn sionin	of nis g	Nam capa (MV	eplate city W)	Der cap	ated acity IW)	l y o	No. vears i operatio	of in n	Reason of D Records Rehabilitati	erat of on a	ing. Renewal , nd etc.
Unit	1	1972	2	2	20		18		31		Age of the u	anits	and generally
Data	2	2004	1	6	20		0				poor conditi	on.	
	3	197	2	4	20		18		31		Unit 2 was	repla	aced
	4	197	2	4	20		18		31				
	5												
	6												
	7												
	8												
	9												
	10												
	11												
	12												
Total of plant	4			8	80		54						
Production		Maxim	um	A	nnual	en (1	nergy	St	ation u	se	Station tota	l effi	iciency(%)
Record in 2	002	power output	(MW	7) p	roduct	ion (F	(Wh	en (ergy kWh)		At Gen.Terr	n.	At Trans.Term.
		8	1	,	511.	047.00	00	Ň					
Fuel		Design	Г	[vpe	,	Fuel	Type		Alt. Fue	1	Fuel treat.		Fuel storage
		0	Ν	NG			51						
		Gas Co	ntent	t & Ca	alory (I	lower))	(Dil Chai	ract	eristics & Ca	lory	(Lower)
		24kg/cr	n2		U							U	
Gas turbine	9	Unit	Т	ype		M	anufa	ctur	er	Ins	stallation	Τυ	urbine Controller
			5	5001		Al	stom						
												-	
Electrical	<i>&</i> ₇				Gonor	ator					Floetri		& Control
Control	œ	Canaci	tv(MN	VA)	Powe	r	Ma	nufa	octurer	F	lectrical		Control System
00110101		Capaci	UY (141)	VI 1)	factor	<u>.</u>	ma	nura		Ν	Ianufacturer		U U
				Ma	in Trar	nsform	ner				Grid	Con	inection
		Capaci	ty(MV	VA)	Volta	ge(kV) [Гуре	9	S	witchgear	7	/oltage(kV)
Main Probl Action Plan Restoration Improveme	ems, is for is & nt	Capacity(MVA) Voltage(kV) Type Switchgear Voltage(kV) (ENAR) Complete rehabilitation, which can reduce the operation and maintenance cost, will be beneficial. Image: Complete rehabilitation of the operation and maintenance cost, will be beneficial. Image: Complete rehabilitation of the operation and maintenance cost, will be beneficial.								d maintenance			
		CPA: 13.Feb.	Repla 04	acem	ent of	Unit	2: Re	ealiz	ed add	litio	nal 17MW b	ру Т	FRIE, Complete

PLANT I	DATA	SHEE	Г							Sheet N	0.	
Type: GPS			Ref. N	Io.: G-13		So	urce	of Infor	mat	ion: FNAR/CH	PA	
Name of Po	ower Pl	ant	Najaf	GPS		Po	wer	Station	ID:			
It	ems							Descri	ptic	ons		
Location			Gover	morate	City					Coordi	nate	28
			N	lajaf				N:			E:	
	Unit	Year	of N	ameplate	Dei	rated	l	No.	of	Reason of D	erat	ing.
	No.	sionin	nis ca	(MW)	cap (N	acity AW)	7	years operation	in m	Records Rehabilitation	ot on a	Renewal ,
Unit	1	197	6	63		30		27		Age and the	lack	of spare parts
Data	2	197	6	63		52		27		for routine n Unit 2 rehat	nain pilita	itenance. ated Jan.04
	3	197	6	63		50		27		Rehabilitate	ed:	Oct.2001 (New
	4									gas/oil syste	m)	
	5											
	6 7											
	8											
	9											
	10											
	11											
	12											
Total of plant				189		132						
Production		Maxim	um	Annual	. en	ergy	St	ation us	e	Station total	l effi	ciency(%)
Record in 2	002	power output	(MW)	(kWh)	ion)		en (ergy kWh)		At Gen.Tern	1.	At Trans.Term.
		16	30	956,4	488,50	0						
Fuel		Design	Ty	pe	Fuel	Туре	e	Alt. Fue	el	Fuel treat.		Fuel storage
			NC	х ж								
		Gas Co	ntent 8	z Calory (Lower)		Oil Cha	rac	teristics & Cal	ory	(Lower)
		21kg/ci	m2									
Gas turbine	e .	Unit	Ty	pe	Μ	anuf	actu	rer	In	stallation	Tu	rbine Controller
			13]	D	Bl	BC						
Electrical	&			Gene	rator					Electri	eal &	& Control
Control	æ	Capaci	ty(MVA) Powe	er	М	anuf	acturer	F	Electrical		Control System
				facto	1				-	iunuuovuror		
				Main Tra	nsforn	ner				Grid	Con	nection
	·	Capaci	ty(MVA) Volta	ige(kV)	Тур	e	S	Switchgear	V	/oltage(kV)
			-		-							_
Main Probl Action Plar Restoration Improveme	ems, ns for ns & ent											
		CPA: 1 25.Jan	Rehabil .04	itation U	Jnit 2	: Re	ealize	ed Addi	tior	nal 20MW by	у Т	FRIE, Complete

Type: GPS			Ref	f. No.:	G-14		Sou	rce o	f Infor	mat	tion: FNAR/CI	PA	
Name of Po	ower Pl	ant	Kh	or Al-	Zuber	GPS	Pow	ver S	tation	ID:			
It	ems								Descri	ptic	ons		
Location			Gov	verno	rate	City				_	Coordi	nate	28
				Basr	a	Al	Zube	r	N:			E:	
	Unit No.	Year Comm sionin	of nis g	Nam capa (M	eplate city W)	Der cap	ated acity IW)	N y o	lo. ears peratio	of in on	Reason of D Records Rehabilitation	erat of on a	ing. Renewal , nd etc.
Unit	1	197	6	(63		50		27		Rehabilitate	d Jı	ın 02
Data	2	197	6		63		52		27		Rehabilitate	d by	7 Feb 04
	3	197	6		63		50		27		Rehabilitate	d A	ug.02
	4	197	6		63		52		27		Rehabilitate	d by	v Feb 04
	5												
	6												
	7												
	8												
	9												
	10					_							
	11							_					
Total of	12						204	_					
plant of				2	152	2	204						
Production		Maxim	um	A	Annual	en	nergy	St	ation u	ıse	Station total	effi	ciency(%)
Record in 2	002	power output	(MW	V) I	oroduct	10n (k	(Wh	en (ergy kWh)		At Gen.Tern	ı.	At Trans.Term.
	ſ	14	5		816,	200,00	00						
Fuel		Design	7	Гуре		Fuel	Type	A	lt. Fue	el	Fuel treat.		Fuel storage
			1	NG									
	_	Gas Co	nten	t & C	alory(L	lower)		C	Oil Cha	rac	teristics & Cal	ory	(Lower)
		TT •.		n			0			-	. 11	m	
Gas turbin	e	Unit	<u>'</u>]	Гуре		Ma Al	anufa 3B/Al	<u>ctur</u> € stom	er	In	stallation	Τυ	irbine Controller
							510/110						
					~					-			
Electrical	&	<u> </u>	(2.5		Genei	rator	2.6	0		τ	Electric	$\operatorname{cal} \delta$	& Control
Control	_	Capaci	ty(M	VA)	facto	r	Ma	nufa	cturer	N	Manufacturer		Jointroi System
	-									_	~	~	
	-		<i>(</i>	Ma	in Trai	nsform	ner			-	Grid	Con	inection
	-	Capaci	VA)	ge(kV) '	Туре		5	Switchgear	1	/oltage(kV)		
Main Probl Action Plar Restoratior Improveme	ems, ns for ns & ent												
		CPA: F TFRIE	lehat , Co	oilitat omple	ion or te 29.F	Repla eb.04	cemei	nt of	Unit 2	2&	4. Realized A	4dd	itional 66MW by

Type: GPS			Ref. 1	No.: G-15		Sou	rce	of Info	rmat	tion: FNAR		
Name of Po	ower P	lant	Shua	'yba GPS		Pow	ver S	Station	n ID:			
It	ems							Desc	riptio	ons		
Location			Gove	ernorate	City					Coordi	inate	es
			F	Basra	Sh	ua'yb	a	N:			E:	
	Unit No.	Year Comr sionir	of N nis c	Nameplate apacity (MW)	e Der cap	rated acity (W)]	No. years operat	of in ion	Reason of D Records Rebabilitati	erat of on a	ing. Renewal , and etc
Unit	1	197	3	20	(12		31		Tentomut	011 0	
Data	2	197	3	20		12		31		-		
	3											
	4											
	5											
	6											
	7											
	8											
	9											
	10											
	11 12											
	Iotal of											
Total of plant	Total of plant			40		24						
Production		Maxim	um	Annua	l en	nergy	St	tation	use	Station tota	l effi	iciency(%)
Record in 2	002	output	(MW)	produc	uon (F	(VV II)	er	(kWh)		At Gen.Tern	n.	At Trans.Term.
		3	4	207	7,048,00)0						
Fuel		Design	Ту	pe	Fuel	Type	1	Alt. Fi	ıel	Fuel treat.		Fuel storage
			N	G								
		Gas Co	ontent a	& Calory	(Lower))	(Oil Ch	arac	teristics & Ca	lory	(Lower)
Gas turbin	e	Unit	Ту	vpe	Μ	anufa	ctur	rer	In	stallation	Τι	urbine Controller
			50	001	Al	stom						
Electrical	&			Gene	erator	1				Electri	cal &	& Control
Control		Capaci	ty(MV/	A) Pow facto	ver or	Ma	nufa	acture	r 1	Electrical Manufacturer	(Control System
									+			
		~ .	(Main Tra	ansform	ner			_	Grid	Con	inection
		Capaci	ty(MV/	A) Volt	age(kV) [Гур	e	5	Switchgear	1	/oltage(kV)
Main Probl	oma	TTI ·		1 ·	1.0		1					
Action Plar	ns for	The sta	ation w	as design	ed for p	beak lo	ad	service	e,			
Restoration	ns &	Overna	iui oi u	ints is rec	ommer	iaea.						
improveme	110											

Type: HPS						Sou	arce o	f Info	rmatior	n: ENAR			
Ref. No.:			H1										
Name of Po	ower Pla	nt	Derba HPS	an Dikhar	1	Pov	ver S	tatior	n ID:				
			Gov	ernorate		City				Coord	inate	28	
Location			Sulai	imaniyah	I I) Derbar Dikhar	n n	N:			E:		
Type of Hy	dropowe	er	Erthf	fill dam (A	b e- Si	irwan	Rive	r)					
Reservoir	volume	Ful	ll suppl	y water	Hig	gh wat	ter le	vel	Low	water level		Minimum oper-	
(M m	1 m3) level (1			L.m)		(EL.	.m)			(EL.m)		ating level (EL.m)	
2,50	0	495.19 Year of Nameplate				Dama				Reason of Dorating			
	Unit No.	rea Comr ni	Year of CommissioNameplate capacity (MW)			capac (MV	tea eity V)	ye ope	ars in eration	Rea Rec Reha	ason (ords abilit:	of Renewal, ation and etc.	
	1	19	1991 83										
Unit Data	2	19	1991 83										
Data	3	19	1991 83										
Total of plant	3			249		16	5			Due to the transmissi systems in Suleimani	e limi ion a 1 the vah 2	tations in the nd distribution Governorates of and Erbil	
		Max	. power	Annu	ial ene	ergy	S	tatio	n use	Station	n tota	al efficiency (%)	
Production		ou (N	itput AW)	pro	oductic GWh)	on		ener (kW	gy h)	At Gen.Te	erm.	At Trans.Term.	
Record of P	lant			(27/0	606 1991-9	2000)							
		N	lax.	Rate	$\frac{10012}{d}$	ign)		Min	n.				
Head (m)		1	<u>m)</u> 03		(m) 80			(m 53) :				
	Unit No.	Ty	pe of rbine	T discha at Ra	urbine arge (n	e n3/s) ead	F	evolu (rpr	ution n)	Manufact	urer		
Hydroulie	1									M' . b' l			
Turbine	2									Janan	1,		
	3									Japan			
											, .		
	Unit	Са	pacity	Ge	enerat	or				Electric	etrica al	al & Control	
	No.	(1	MVA)	Pov	wer fac	ctor	Ma	anufa	cturer	Manufact	urer	Control System	
Electrical	1		95							Mitsubish	i,		
& Control	2		95							Japan			
	3		95										
										1			

	Unit		Main Transforme	r	Grid Co	nnection					
	No.	Capacity (MVA)	Voltage (kV)	Туре	Switchgear	Voltage (kV)					
					1						
Main Probl Action Plar Restoration Improveme	lems, ns for ns & ent	 Not connecte Based on the a reconnaiss Derbandikha detailed stur Report of Ku 	d to the national g reports by Colenc ance geological rep an Reservoir, the s dy, consistent wit art Wermelinger, is	rid. o Power Engineer port about possible tructural integrity th the recommen- s required as part	ing Ltd, Coyne and e landslides on the y of the dam is que dations made in of long term plan	l Bellier, and e left bank of estionable. A the Mission ning for this					
		 Condition Assessment and life evaluation study and inventory checks of major spares parts will have to be conducted prior any major investment decision. 									

Type: HPS						Sou	rce o	f Info	rmatior	: ENAR		
Ref. No.:			H2									
Name of Po	ower Pla	.nt	Doka	n HPS		Pow	ver S	tatior	n ID:			
Location			Gov	ernorate		City				Coord	inate	s
Location			Sulai	maniyah	Ι	Dokan	L	N:			E:	
Type of Hy	dropowe	r	Conc	rete arch o	lam (Z	ab as	-Sagl	nir Ri	ver)			
Reservoir	volume	Ful	ll suppl	supply water High water		ater level Lo			water level		Minimum oper-	
(M m	.3)	1	evel (E	L.m)		(EL.	m)			(EL.m)	6	ating level (EL.m)
6,14	6,140		516		ta Darrat		Fod	N	la af	Dee		f Danating a
	Unit No.	Comn	r oi nissio ng	capacit (MW)	y	capac (MW	apacity (MW)		ars in eration	Rec Reha	ords bilita	of Renewal, ation and etc.
	1	19	78	82	82							
Unit Data	2	19	78	82								
Data	3	19	78	82								
	4	19	78	82								
	5	19	78	82								
Total of plant	5			410		240)			Due to the transmissi system in Suleimani	limi ion a the G yah อ	tations in the nd distribution overnorates of and Erbil
		Max.	. power	Annu	al ene	ergy	S	tatio	ı use	Station	n tota	l efficiency (%)
Production		ou (N	Itput IW)	pro ((ductio GWh)	n		ener (kW	gy h)	At Gen.Te	erm.	At Trans.Term.
Record of P	lant				947							
			-	(ave. 1	978-2	000)						
II. a. d. (m)		M (lax. m)	Rate	d (desı (m)	gn)		M11 (m	1.)			
nead (m)			95		82			50)			
	Unit	Tv	ne of	Τι	arbine		Б	avoli	ition			
	No.	tu	rbine	discha at Ra	rge (n ted he	13/s) ead	1	(rpr	n)	Manufactu	urer	
Urrdmanilia	1	Fra	ancis									
Turbino	2	Fra	ancis							Titostasi		
Turbine	3	Fra	ancis							(LMZ) Bu	ecio	
	4	Fra	ancis							(111112), 114	.551a	
	5	Fra	ancis									
	Unit	~		Ge	enerato	or	1			Elec	ctrica	l & Control
	No.	Ca (N	pacity MVA)	Pov	ver fac	tor	Ma	anufa	cturer	Electric	al urer	Control System
Electrical	1		94									
& Control	2		94				Cet	hari	nhuro			
	3		94				. Ri	assia	anoutg			
	4		94			, Kussia						
5			94									

	Unit		Main Transforme	r	Grid Co	nnection						
	No.	Capacity (MVA)	Voltage (kV)	Туре	Switchgear	Voltage (kV)						
					-							
			4									
		Not connecte	d to the national g	rid.								
		• All the units	were in operable o	condition.								
		• The overhaul	• 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										
Main Prob	lems	administratio	administration problems.									
Action Plan	ns for	• Assessment	needs to be	carried out	to determine	outstanding						
Restoration	ns &	rehabilitation	n/refurbishment w	ork.								
Improveme	ent	• Detailed stru	uctural integrity	study of the da	m can be part o	f long term						
		planning.										
		Condition As	sessment and life	evaluation study	and inventory (st	ock) check of						
		major spares	s parts will have	to be conducted	l prior any major	investment						
		decision.										

Type: HPS						Sou	irce o	f Info	rmatior	: ENAR			
Ref. No.:			H3										
Name of Po	wer Pla	nt	Him	reem HPS		Pov	ver S	tatior	n ID:				
Logation			Gov	ernorate		City				Coordin	nates	3	
Location			D	iyala				N:			E:		
Type of Hy	dropowe	r							r		-		
Reservoir	volume	Ful	ll suppl	y water	Hig	gh wat	erle	vel	Low	water level		Minimum oper-	
(M m	3)	1	evel (E	L.m)		(EL.	m)			(EL.m)	a	ting level (EL.m)	
		Voo	nof	Namonla	ato	104	.5 tod	N	lo of	Poss	000.00	fDonating	
	Unit	Comr	nissio	capacit	y j	capac	ity	ye	ars in	Reason of Derating, Records of Renewal,			
	No.	nii	ng	(MW)		(MV	V)	ope	ration	Rehab	ilita	tion and etc.	
Unit	1	19	81	25					13	Due to limit	tatio	n in the flow of	
Data	2	19	81	25					13	water			
Total of plant	2			50									
		Max	Iax. power Annual ene			ergy	rgy Station use			Station	total	efficiency (%)	
Production Record of P	lant	ou (N	tput /IW)	pro (ductic GWh)	(kW)			gy h)	At Gen.Term.		At Trans.Term.	
100010011	iant	(,					(/				
		N	Iax.	Rate	d (des	ign)		Mir	n.				
Head (m)		(m)		(m)			(m)				
	Unit	Ту	pe of	discha	Turbine discharge (n		13/s) Rev		ation	Manufactu	rer		
	No.	tu	rbine	at Ra	ated h	ead	(r]		n)	IITOCTDI			
Hydraulic	1	Ka	ıplan		98.5			166	.7	LITOSTR) J		
Turbine	2	Ka	ıplan		98.5			166	.7	(Yogslavıa	ı)		
	TT 1.			G	anorat	or				Elect	rical	& Control	
	Unit	Ca	pacity	Por	wor for	ator	М	nufo	aturor	Electrical	l	Control System	
	INO.	(1	MVA)	100	wer rau	0101	IVI o	illula	cturer	Manufactu	rer	Control System	
Electrical			27.8										
& Control													
	II		forme	۱ ۲			Gri	d Co	nnection				
	Unit No	Capacity Voltage				e		Tyr	0	Switchgo	nr oc	Voltago (kV)	
	10.	(MVA) (kV)						тур		Switchgea	11	vonage (KV)	
	No.	1)	MVA)		(kV)			Тур	00	Switchgea	ar	Voltage (kV)	

		•	• Overhaul of units will be beneficial.											
Main Proble	ems,	•	Inventory (st	ock) check of maj	or spares parts w	ill have to be con	ducted prior							
Restorations	s 10r s &		any major investment decision.											
Improvemen	nt	•	• The details of goods that are expected to arrive to this power station under											
			SCR1472/147	6 and 1483.										

Type: HPS						Sou	rce o	f Info	rmation	i: ENAR			
Ref. No.:			H4	(1/2)									
Name of Po	ower Pl	ant	Mosu	d HPS		Pow	ver S	tatior	n ID:				
Location			Gove	ernorate		City				Coordina	ates		
			N	inewa	Ν	Iosul		N:		E	:		
Type of Hy	dropow	er							-		-	<i></i>	
Reservoir (M.m.	volume	e Ful	ll suppl	y water	Hig	h wat	er lev	vel	Low	water level	N at	ing lovel (EL m)	
	10)	1	ever (E	11.III)		(111.111)					aı	ing level (ELL.III)	
	Unit	Year	r of	Namepla	ate	Derat	ted	N	lo. of	Reaso	n of	Derating,	
	No.	Comn	nissio ng	capacit (MW)	city ca N) (ity V)	ye	ars in tion	Record Rehabil	ls of litati	Renewal,	
	M1	1986 (MU)	187.5		(111)	.,	ope	iuuon		lituti		
	M2	1986 (MU)	187.5						MU: Main Unit			
Unit	Unit M3 1986 (1		MU)	187.5						Replacement is under discussion.			
Data	M4 1986 (MU)		187.5						-				
	RD1	1985 (1985 (RDU)										
	RD2	1985 (1985 (RDU)								4	Dow Unit	
	RD3	1985 (.985 (RDU)		15					KDU: Kegula	JU- Regulating Dam Unit		
	RD4	1985 (RDU)	15									
Total of plant	8			810		400)			Output is res limitation in	t is restricted due to tion in water flow.		
Production		Max.	power	Annu	al ene	ergy	S	tatior	n use	Station to	otal e	efficiency (%)	
Record of F	lant		IW)	pro (GWh)	n		(kW	gy h)	At Gen.Term	ı.	At Trans.Term.	
111 2002		7	50	2,7	713,88	8		2.61					
II. a. d. (m)		M (1	.ax. m)	Rate	d (design) (m)			M11 (m	1.)				
nead (m)													
	Unit	Ty	pe of	T	urbine	2()	R	levolu	ition	Mar Cart			
	No.	tur	bine	discha at Ra	arge (n ated he	n3/s) ead		(rpr	n)	Manufacture	er		
Hvdraulic	M1	Fra	ancis							Toshiba			
Turbine	M2	Fra	ancis							Toshiba			
	M3	Fra	ancis							Toshiba			
	M4	Fra	ancis							Toshiba	_		
				G	norota					Flootr	icol	& Control	
	Unit	Ca	pacity	Dee	nerau)1 	м	£.	-4	Electrical		Control Statem	
	NO.	(N	IVA)	FOV	ver lac	tor	IVIE	inura	cturer	Manufacture	er	Control System	
Electrical											+		
& Control											+		
											+		

	Unit]	Main Transformer	•	Grid Co	Grid Connection						
	No.	Capacity (MVA)	Voltage (kV)	Туре	Switchgear	Voltage (kV)						
					-							
		• Output was d	etermined by wate	er flow.								
Main Prob	lems,	• Overhaul of u	verhaul of units will be beneficial.									
Restoration	ns for	• Inventory che	cks of major spare	es parts will have t	o be conducted pri	or any major						
Improveme	ent											
		Discussion un	derway for rehabi	litation by grant a	id of GoJ.							

Type: HPS						Sou	irce o	f Info	rmation	i: ENAR				
Ref. No.:			H4	(2/2)										
Name of Po	wer Pla	nt	Mosul	HPS (F	PSU)	Pov	ver St	tatior	n ID:					
Location			Gove	rnorate		City				Coordir	nates	3		
Location			Niz	newa	Ν	Mosul		N:			E:			
Type of Hy	dropowe	r	Pump	ed storag	e									
Reservoir	volume	Ful	ll supply	y water	Hig	h wat	erlev	vel	Low	water level	l Minimum op			
(M m	3)	1	level (El	L.m)		(EL.	m)			(EL.m)	a	ting level (EL.m)		
	Unit	Yea	ur of missio	Namep	ity capacity years				lo. of ars in	Reas	on of rds o	f Derating, f Benewal		
	No.	ni	ng	(MW)	(MV	N)	ope	eration	Rehab	ilita	tion and etc.		
	PS1	1990	(PSU)	120						DOLLD	10			
Unit Data	PS2	1990	(PSU)	120						PSU: Pump	ed S	torage Unit		
Data														
Total of plant	2		240											
		Max	. power	Annu	al ene	rgy Station use			Station	total	al efficiency (%)			
Production Record of P	lant	ou (N	AW)	pro	GWh)	n		ener (kW	gy h)	At Gen.Ter	m.	At Trans.Term.		
1000014-011	iuni	· · ·												
		N	lax.	Rate	d (desi	ign)		Min	n.					
Head (m)		(<u>(m)</u>	(m)				(m)					
	TT 1.			T	urhine	<u>,</u>								
	Unit	Ty	pe of rhine	discha	arge (n	n3/s)	R	evolu. rnr)	ution n)	Manufactu	rer			
	NU.			at Ra	ated he	ead		(1 p1						
Hydraulic														
Turbine														
	Unit			Ge	enerat	or				Elect	rical	& Control		
	No.	Ca	pacity	Poy	ver fac	tor	Ma	nufa	cturer	Electrical	1	Control System		
	110.	(1	MVA)							Manufactu	rer			
Electrical														
& Control														
	Unit		òrmei	ſ			Gri	id Co	onnection					
	No.	Capacity Voltage				ge Type			Switchgea	ar	Voltage (kV)			
		(1	VIVA)		(kV)			<i>.</i> ,						
										ł				

		• All the units were in operable condition.											
Main Proble	• Output was determined by water flow.												
Action Plan Restoration	s for	• Overhaul of u											
Improveme	ent	• Inventory checks of major spares parts will have to be conducted prior any											
		major invest	ment decision.										

Type: HPS						Sou	irce o	f Info	rmation	: ENAR					
Ref. No.:			H5												
Name of Po	wer Pla	nt	Sadat	Al Hindia	HPS	Pov	ver S	tatior	n ID:						
Logation			Gove	ernorate		City				Coordin	ates	3			
Location			В	abel	Mu	isaiya	ıb	N:		Η	<u>-</u> :				
Type of Hy	dropowe	r									1				
Reservoir	volume	Fu	ill suppl	ly water	Hig	h wat	erle	vel	Low	water level		Minimum oper-			
(M m	3)		level (E	L.m)		(EL.	m)			(EL.m)	a	ting level (EL.m)			
Unit	Unit No. 1	Yes Com 19	ar of missio ing 988	Namepla capacit (MW) 3.75	y y	Derat capac (MV	ted eity V)	N ye ope	lo. of ars in ration	Reaso Recor Rehabi	on of ds o lita	f Derating, f Renewal, tion and etc.			
Data	2	10	200	9.75											
	3	10	988	3.75											
	4	16	900	5.75											
Total of plant	4					5.0)			Output is re- limitation in	stric wa	cted due to ter flow			
		Max	x. power	· Annu	al ene	rgy	S	tatior	n use	Station tot		efficiency (%)			
Production Record of P	lant	(MW)	pro (GWh)	n		(kW	gy h)	At Gen.Tern	n.	At Trans.Term.			
				_	- (-										
		I	Max. (m)	Rate	Rated (design) Min. (m) (m)		n.)								
Head (m)			<u> </u>						·						
	Unit No.	Ty tu	ype of ırbine	T discha at Ra	urbine arge (n ated he	n3/s) ead	R	levolu (rpr	ition n)	Manufactur	er				
Hydraulic	1														
Turbine	2									Sulzer-Esche	ər				
	3									Wyss					
	4														
	Unit			Ge	enerato	or				Electr	rical	& Control			
	No.	Ca (apacity MVA)	Pov	wer fac	tor	Ma	nufa	cturer	Electrical Manufactur	er	Control System			
Electrical	1														
& Control	2									BULB					
	3									DOID					
	4														
							0.1	1.0.							
	Unit	Ca	ermei		<i>m</i>		G it has	100							
	INO.	(MVA) (kV)						Typ	ie	Switchgea	r	voitage (KV)			

	• Due to limitation in water flow, only 2 units operated at about 5 MW and othe	\mathbf{r}
	units were kept in stand by mode.	
Main Problems,	• Overhaul of units will be beneficial.	
Restorations &	Condition Assessment and life evaluation study and inventory checks of majo	\mathbf{r}
Improvement	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	\mathbf{r}
	SCR1472/1476 and 1483.	

Type: HPS						Sou	arce o	f Info	rmatior	on: ENAR				
Ref. No.:		H6												
Name of Po	ower Pla	nt	Sama	ara HPS		Pov	ver S	tatior	n ID:					
Location			Gov	ernorate		City				Coord	inates	3		
Location			Sala	h al-Din	Sa	amara	ra N: E:							
Type of Hy	dropowe	r												
Reservoir	volume	Ful	ll suppl	y water	Hig	h wat	erle	vel	Low	water level		Minimum oper-		
(M m	3)	1	evel (E	L.m)		(EL.	m)			(EL.m)	a	ting level (EL.m)		
	Unit	Yea	r of nissio	Namepla	ate v	Derat	ted vity	N Ve	lo. of ars in	Reason of Derating, Records of Renewal,				
	No.	nii	ng	(MW)	5	(MV	V)	ope	ration	Reha	bilita	tion and etc.		
	1	19	72	28										
Unit Data	2	19	72	28										
Data	3	19	1972 28											
Total of plant	3			84	84 38					Output is a limitation	restri in wa	cted due to ter flow.		
		Max	. power	Annu	al ene	ergy	Station use		Station tota		l efficiency (%)			
Production Record of P	lant	ou (N	tput /IW)	pro ((GWh)		(kWh)		At Gen.Te	rm.	At Trans.Term.			
100010011						(/)	/							
Max		Iax.	Rate	d (desi	ign)		Mir	n.						
Head (m)		(<u>m)</u>		(m)			(m)					
				T	urbino									
	Unit	Ty	pe of rhino	discha	arge (n	n3/s)	R	evolu) (rpr	ution	Manufacto	arer			
	1 INO.			at Ra	ated he	ead		70	11/					
Hydraulic	1	Ka	ipian					79						
Turbine	2	Ka	nlan					70	·	Franco Ios	551			
	0	110	ipian					10						
	Unit			Ge	enerat	or	ı			Elec	etrical	& Control		
	No.	Ca (I	pacity MVA)	Pov	wer fac	ctor	Ma	anufa	cturer	Electrica	al urer	Control System		
Electrical	1		33											
& Control	2		33				An	saldo						
	3		33											
	Unit	0		Main	Fransf	ormei	r			G	rid Co	onnection		
	No.	Ca (I	pacıty AVA)	`	(kV)	e		Typ	e	Switchge	ear	Voltage (kV)		
	1						┨.							
	2						An	saldo						
	3													

Main Problem Action Plans f Restorations & Improvement	is, or &	 Due to limita given time ar water level, rewarding. Overhaul of u Inventory ch major investu The details of SCR1472/14? 	tion in water flow, nd the third unit w major investment units will be benefi ecks of major span nent decision. of goods that are 76 and 1483.	two units operate was kept in stand t to enhance the icial. res parts will have expected to arrive	d at about 20MW, by mode. Given th station output w e to be conducted e to this power st	each, at any ne prevailing rould not be prior to any tation under

Type: HPS						Sou	rce o	f Info	rmation	ı: ENAR				
Ref. No.:			H7											
Name of Po	ower Pla	nt	Qadi	ssiya	HPS	Pow	Power Station ID:							
			Gov	itha Dam)	City				Coordi	nato	2		
Location			Al	Anbar	H	adith	9	N:		000101	E	5		
Type of Hy	dropowe	er												
Reservoir	volume	Fu	ll suppl	y water	Hig	h wat	erlev	zel	Low	water level		Minimum oper-		
(M m	3)]	evel (EL.m)			(EL.:	m)			(EL.m)	ε	ating level (EL.m)		
										T				
	Unit	Yea	r of	Namepla	ate	Derat	ted itv	N	lo. of ars in	Rea	son o orde (f Derating, of Bonowal		
	No.	ni	ng	(MW)	,y	(MW	V)	ope	ration	Rehal	bilita	tion and etc.		
	1	19	86	110										
Unit	2	19	86	110										
Data	3	19	86	110										
	4	19	86	110										
5		19	86	110										
	6	19	86	110	110									
Total of plant	6			660	660		110			Output is r limitation i	estri n wa	cted due to ter flow.		
Production		Max	. power	Annu	ual ene	rgy	S	tatior	n use	Station	tota	l efficiency (%)		
Record of	Plant (MW)	pro	kWh)	n		(kW	gy h)	At Gen.Te	rm.	At Trans.Term.		
1n 2002		c. J	310	704	,881,00	00								
TT 1()		N (Max. Rate (m)		d (desi (m)	gn)		Miı (m	n.)					
Head (m)			<u> </u>						- -					
	Unit	Tv	rpe of	T	urbine	21)	R	evolu	ation					
	No.	tu	rbine	discha at Ra	arge (m ated he	13/s) ead		(rpr	n)	Manufactu	irer			
	1	Kε	ıplan		335									
Hydraulic	2	Kε	ıplan		335					ļ				
Turbine	3	Kε	ıplan		335					CKD/LIT				
	4	Ka	ıplan		335									
	5	Ka	ıplan		335					4				
	6	Kε	ıplan		335									
	Unit	C.		Ge	enerato	or				Elec	trica	l & Control		
	No.	(1	MVA)	Pov	wer fac	tor	Mε	nufa	cturer	Manufactu	u trer	Control System		
	1													
Electrical	2													
& Control	3						KO	NCA	R					
	4								~					
	5													
	6													

	Unit		Main Transforme	r	Grid Co	nnection				
	No.	Capacity (MVA)	Voltage (kV)	Туре	Switchgear	Voltage (kV)				
Main Probl Action Plar Restoration Improveme	lems, ns for ns & ent	 Doe to limita given time, at All the units limited to 80 Overhaul of u Condition As spares parts The details of SCR1472/147 	tions in water flow nd other units wer are in good condi MW because of vil units will be benefi sessment and life will have to be con of goods that are 76 and 1483	w, only one unit op re kept in stand by tion, except Unit 2 bration problems. icial. evaluation study iducted prior any n expected to arriv	perated at about 40 7 mode. 2. The output from and inventory che major investment of e to this power st) MW at any n this unit is ecks of major decision. tation under				
		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.								

Type: HPS						Sou	arce o	f Info	rmatior	n: ENAR				
Ref. No.:			H8											
Name of Po	wer Pla	nt	Al-Ae	dhim HPS		Pov	ver S	tatior	n ID:					
Location			Gov	ernorate		City				Coordin	ates	1		
Location			D	iyala	Al	-Khal	is	N:		I	<u>.</u> :			
Type of Hy	dropowe	r									1			
Reservoir	volume	Ful	ll suppl	ly water	Hig	h water level Low			water level		Minimum oper-			
(M m	3)	1	level (F	EL.m)		(EL.	m)			(EL.m) ating level (EL				
			0			D			T O	D	L			
	Unit	Yea Comr	r of nissio	Namepla	ate	Dera	ted vity	N Ve	lo.of ars in	Reaso Recor	on oi ds o	f Derating, f Renewal		
	No.	nii	ng	(MW)	,5	(MV	V)	ope	eration	Rehabi	lita	tion and etc.		
	1	(un	der	13										
Unit Data	2	con ruct	ist- ion)	13										
Data														
Total of plant	2			26										
		Max	power Annual ene			ergy	rgy Station use			Station t	otal	l efficiency (%)		
Production Record of P	lant	(MW) (kWh))[]		(kW	gy h)	At Gen.Term	1.	At Trans.Term.				
	Max.		Rate	d (desi	ign)		Mii	n.)						
Head (m)			,111/		(111)			(111	/					
	Unit	ጤ	mo of	Т	urbine	9	Б	Powolu	tion					
	No.	tu	rbine	discha at B	arge (n ated h	n3/s) ead		(rpr	n)	Manufactur	er			
					alea in	cau								
Hydraulic														
Turbine														
	Unit			G	enerat	or				Electr	rical	& Control		
	No.	Ca (1	pacity MVA)	Po	wer fac	ctor	Ma	anufa	cturer	Electrical Manufactur	er	Control System		
Electrical														
& Control														
	Unit			Main	Transf	forme	r			Grie	d Co	nnection		
	No.	Ca (I	pacity MVA)		voltage (kV)	e		Typ)e	Switchgea	r	Voltage (kV)		
										ł				

Main Problems, Action Plans for Restorations & Improvement	• The units were scheduled for commissioning in May 2002 but have been delayed due to the non-availability of materials ordered under MoU.

Appendix B : Demand Forecast

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Appendix B.1 Total Population

		l	000, : Init
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 i opulation	Appendix B.2	Regional Populatio	n
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	Governorate & Region			Population			Annual Increase Ratio			5
		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%
	Middle Region									
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%
	North Region									
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%
	South Region									
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%
	3 Northern Governorates							r		
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	Bagl	ndad	Mid	ldle	North +	· Dahuk	So	uth	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
Govermental	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%	

								Unit : Gwh	
Governorate & Region	Resident	Shops	Gov. offices	Industry	Street lighting	Distributed free	Losts	Total	%
Baghdad Region	2,294	352	2,198	480	116	33	2,437	7,910	39%
Middle Region									
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%
Qadissiya	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%
North Region									
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%
South Region									
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%
3 Northern Governorates									
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.4 Regional Energy Consumption at Consumers' Ends in 1990

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







Appendix B.6 Ene	rgy Consumption per	Capita at Consumers'	Ends in 1990
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	1990	1990	1990	
		Energy Consumption	kWh/capita	
Governorate & Region	Population	at Consumers' Ends	at Consumers' Ends	
	(Estimate)	(GWh)	(kWh/capita)	
Baghdad Region	4,269,317	7,910	1,853	
Middle Region				
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	
North Region				
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	
South Region				
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	
3 Northern Governorates				
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	

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

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

 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.