UNITED NATIONS DEVELOPMENT GROUP IRAQ TRUST FUND PROJECT # E4-15
MPTF OFFICE GENERIC FINALPROGRAMME[1] NARRATIVE REPORT
REPORTING PERIOD: FROM *05.2005* TO *12.2012*

Programme Title & Project Number

- Emergency Rehabilitation of Mussaib Power Station Stage II
- MPTF Office Project Atlas Number 6983
- MPTF Project number: E4-15

Country, Locality(s), Priority Area(s) / Strategic Results[2]

Babylon Governorate, Mussaib
This work is nation-wide as feeds into the national electricity grid
Country/Region
Nationwide

Priority area/ strategic results
UNDAF Priority 4: Increased access to quality essential services

Participating Organization(s)

- UNDP

Implementing Partners

- National counterparts
- Ministry of Electricity (MoE)

Programme/Project Cost (US$)

Total approved budget as per project document:

$ 33,000,000

MPTF Contribution[3]: $33,000,000

Government Contribution *N/A*

Other Contributions (donors) *N/A*

TOTAL: 33,000,000

Programme Duration

Overall Duration: * 66 months

Start Date[4]: 15 June 2005

Original End Date[5] : *15 June 2007*
Actual End date[6] : *31st Dec 2012*

Have agency(ies) operationally closed the Programme in its(their) system? Yes ■ No ☐

Expected Financial Closure date[7]: 31 December, 2013

Programme Assessment/Review/Mid-Term Eval.

Evaluation Completed
☐ Yes ■ No Date: *dd.mm.yyyy*
Evaluation Report - Attached
☐ Yes ■ No Date: *dd.mm.yyyy*

Report Submitted By

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* This project has shifted to national execution modality in 3rd quarter 2010 with a signed letter of agreement.

[1] The term "programme" is used for programmes, joint programmes and projects.
[2] Strategic Results, as formulated in the Strategic UN Planning Framework (e.g. UNDAF) or project document;
[3] The MPTF/JP Contribution is the amount transferred to the Participating UN Organizations – see MPTF Office GATEWAY
[4] The start date is the date of the first transfer of the funds from the MPTF Office as Administrative Agent. Transfer date is available on the MPTF Office GATEWAY.
[5] As per approval of the original project document by the relevant decision-making body/Steering Committee.
[6] If there has been an extension, then the revised, approved end date should be reflected here. If there has been no extension approved, then the current end date is the same as the original end date. The end date is the same as the operational closure date which is when all activities for which a Participating Organization is responsible under an approved MPTF / JP have been completed. As per the MOU, agencies are to notify the MPTF Office when a programme completes its operational activities. Please see MPTF Office Closure Guidelines.
[7] Financial Closure requires the return of unspent balances and submission of the Certified Final Financial Statement and Report.

FINAL PROGRAMME REPORT

EXECUTIVE SUMMARY

The Emergency Rehabilitation of Mussaib Power Station project aimed to respond to and support humanitarian needs of the war-effected Iraqi people by ensuring the supply of reliable and stable electricity to households and to permit operation of essential humanitarian services, such as water supply, hospitals, schools, sewage treatment plants and other community services. Based on a condition assessment carried out for the Mussaib Thermal Power Station (TPS) with the assistance of UNDP during 2004, the Ministry of Electricity (MoE) Iraq submitted a request for the rehabilitation of Mussaib Unit 1 to UNDP.

UNDP in consultation with MoE formulated a project for rehabilitation of the boiler, supply of adequate spares for future maintenance after rehabilitation, training of the MoE staff in supervising rehabilitation work of the boiler and subsequent operation and maintenance of the Unit. The project was designed to provide additional 60-80 MW generation capacity to the Mussaib TPS (total electricity demand of the Iraqi power system was approx 6400 MW while Mussaib provided approx 900MW) with higher efficiency and reliability.

There was a five year delay in project implementation due to: a) insufficient available funds to cover the rehabilitation works to install the procured parts to the boiler Unit 1. b) The frequent changes in MoE's position on the way forward, due to MoE's changing priorities. c) Change of the implementation modality and d) continued poor security situation in Iraq. Ultimately, the original project scope was amended to address the failure of Unit 4 instead of Unit 1, per MoE's request.

Rehabilitation of the Unit 4 Boiler was completed and commissioned for service in July 2012. The unit started producing critically needed electric power to the national grid to meet the summer peak needs of households. Increased power of 100MW provided additional and reliable power supply to approximately 50,000 households connected to the national grid. Improved reliability and output of the Unit 4 enhanced the operation parameters of the overall Mussaib power station and the stability of the Iraqi power system. Rehabilitation of the boiler suspended further deterioration and extended the life of Unit 4 for at least another 15 years.

The project's original scope was to respond to the immediate humanitarian needs of war-affected Iraqi people through ensuring reliable and safe electricity supply to all consumer categories, in particular key humanitarian essential services by rehabilitating the boiler of Unit 1 at Mussaib Power Station. However, it was changed to Unit 4 in accordance with the request by the MoE due to more critical and urgent rehabilitation of that unit. The project also transitioned from direct implementation modality (DIM) to national implementation (NIM) modality in 2010. MoE technical and financial teams were responsible, with the technical assistance from UNDP, to prepare bidding documents, bid evaluation, contract negotiation and contract award to select an international contractor following the best international practice. MoE appreciated the strengthened capacity given to the MoE staff during the procurement process.

I. Purpose

The rehabilitation of Unit 1 of Mussaib Thermal Power Station (TPS) was essential for improving electrical power supply to the national grid, particularly in Central Iraq. Under Stage I, previously identified rehabilitation/repairs of Thermal Unit 1 controls and turbine/generator problems were corrected wherever possible. Under Stage II, the technical capabilities of the plant staff was upgraded to not only operate and maintain the unit once rehabilitated, but also to assess the requirements for rehabilitation of other units and to undertake repair and maintenance works with minimum international supervision. Ministry of Electricity capacity for these undertakings was supported by modern maintenance management software and installation of a mobile video/audio system for plant equipment condition assessment. An official request was submitted and

approved by ITF to change the Scope of Work from the rehabilitation of Unit 1 to Unit 4 and the modality has changed to national execution by the MoE due to insufficient funds and difficulties in transferring funds to UNDP.

The development goal and immediate objectives of the project are defined as followed:

1. To respond to the immediate humanitarian needs of war-affected Iraqi people through ensuring reliable and safe electricity supply to all consumer categories, in particular key humanitarian essential services.
2. The generating capacity, reliability, availability, and efficiency of Unit No.1 (now Unit No. 4) of Mussaib Thermal Power Station increased. (Unit 1 changed to Unit 4 as of Q2 2010.)
3. Plant staff able to conduct complete maintenance and full repairs of thermal units utilizing latest available technology, modern tools, and state-of-art software for unit maintenance and overhauls.
4. Core team of MoE staff specialized in the overall condition assessment of thermal units trained in the application of state-of-art maintenance management software for monitoring, recording, reporting and planning future maintenance of thermal units in the MoE Fleet.

The project outputs could be categorized under the following outcome as stipulated in the UN 10 Strategic Planning Document (SPD), i.e. UN-Iraq Assistance Strategy 2005-2007, dated January 2005:

- SPD Outcome: "Improved electricity situation in the central and northern Iraq and more reliable supply to cover the load demands of essential humanitarian facilities and the population.

The electricity sector is continuously identified in *the National Development Strategy* (2007) and the *National Development Plan* (2101) as a priority sector and central to Iraq's economic infrastructure. The government's Strategic Programme 2011- 2014 commits to the "uninterrupted provision of electricity" to business and homes. Provision of sustainable and less expensive electricity from the national grid rather than the private generators contributes to poverty eradication per MDG Goal 1.

The project falls under the intended UNDAF priority No. 2--Inclusive, more equitable and sustainable economic growth--though the project scope was limited to the physical implementation rather than the upstream interventions. The CPAP 2011- 2014 Indicator was "Change in national level perception of improved electricity supply (2009: 40%; 2014: 70%)".

II. Assessment of Programme Results

i) Narrative reporting on results:

- **Outcomes:**

The original outcome of this project was to respond to the immediate humanitarian needs of war-affected Iraqi people through ensuring reliable and safe electricity supply to all consumer categories, in particular key humanitarian essential services by rehabilitating the Ministry of Electricity's power generating Unit 1 at the Mussaib power station to produce additional, stable and reliable electricity to the national grid based on the condition assessment and preliminary refurbishment done in Stage I.

During the course of the project, an emergency situation arose when Unit 4 failed completely. In order to maintain generation levels, the scope was changed to rehabilitate Unit 4 instead of Unit 1, as of second quarter in 2010. Since then, all efforts were re-directed to accomplish this goal.

Rehabilitation of Unit 4 boiler improved overall efficiency and performance of the Mussaib power station and provided electricity to operate essential humanitarian services, such as water supply, hospitals, schools, sewage treatment plants and other community services. The Unit produces critically needed electric power to the national grid, increased power by 100MW and provided additional and reliable power supply to approximately 50,000 households connected to the national grid. The rehabilitation project contributed countrywide, with a significant improvement in the center region of Iraq. Iraqi citizens will benefit both individually and as a nation from the overall economic growth resulting from an additional stable supply of electricity—basis of any economic and social activities.

Aside from the physical component, the project built the capacity of ten Iraqi engineers in thermal power plant unit condition assessment and maintenance skills. This on-the-job training acquainted the appropriate plant staff with the latest technology in assessments of plant equipment condition and large-scale rehabilitation works. The project assisted MoE in capacity building of Iraqi Engineers in thermal power plant unit condition assessment, rehabilitation techniques and maintenance skills. Thermal plants are the backbone of generation and this will help secure their long-term sustainability. The on-the-job training received during the rehabilitation will allow the plant staff in conducting future assessment and rehabilitation more efficiently and effectively for the Mussaib power station as well as the other thermal power stations of MoE.

From the project participant side, direct beneficiaries include the MoE and its staff, Mussaib Power Station and its staff, contractors and subcontractors (both Iraqi and international) and a variety of suppliers of goods and services in the Baghdad and Babylon governorates, in addition to the indirect beneficiaries of households, businesses and communities etc.

- **Outputs:**

Output 1.1: This task was completed 100% for the Unit 4 of the TPS with considerable delays in implementation.

UNDP provided necessary technical assistance and capacity building with the MoE to go through the international competitive procurement process of selecting a contractor for the rehabilitation works. UNDP participated in each procurement step together with MoE officials and provided quality assurance on bidding documents, bid opening, bid evaluation, contract negotiation and awarding the contract. MoE managed to sign a contract with a Russian company in November 2011 for rehabilitation works. UNDP also facilitated the financial matters including the direct payment to the contractor on behalf of MoE. The contractor completed main works in July 2012 and the Unit 4 started supplying the electricity to support the summer peak demand.

The MoE's power generating Unit 4 at the Mussaib power station is rehabilitated producing additional, stable and reliable electricity to the national grid. Through the project, the Power Station obtained additional power output of 100MW from the Unit 4, which had completely collapsed before rehabilitation. Additional power now provides reliable, stable and quality electricity to about 50,000 households.

Rehabilitation of the boiler allowed arresting further deterioration and bringing about extension of the remaining useful life of the Unit 4 at least for another 15 years.

Output 1.2: Task was completed 100%.

Comprehensive set of selected and essential spare parts were supplied to Mussaib TPS, which will be available in stock for emergency repairs and routine maintenance; in order to sustain Unit's future power

generation and reliability. UNDP provided technical assistance to MoE in selecting and procuring these essential spare parts.
After conducting a detailed assessment, the most critical and essential spare parts were ordered and delivered. The delivered spare parts allowed routine and planned maintenance of the Unit to be carried out without any major interruptions

Output 1.3: 25% of the original scope was completed, but 100% of the revised scope after changing the Direct Implementation Modality to National Implementation modality was achieved

Five plant staffs were trained in Unit rehabilitation works suited for erection, calibration, testing and commissioning in Japan. A team of five trainer-engineers was trained in Japan to enhance their expertise in instrumentation and controls. On the job training at the site and at the contractor's facilities in Russia was included in the contract and provided for 25 engineers. Capacity building of five engineers on Plant Auxiliary Equipment as well as five Trainer Engineers on instrumentation and controls for the installation and commissioning of equipment from the Mussaib power station was also conducted in Japan.

The training contributed to successful completion of the project and built a skilled technical expertise team within Generation Group to attend other similar repair and maintenance works of Mussaib TPS and other power stations in the region.

In addition, training of 25 power station engineers by the boiler rehabilitation contractor in Russia has enhanced the skills of the plant staff to repair and maintain the Unit, commencing from trouble shooting stage, repair, test, through to commissioning in future.

Qualitative assessment:

The Mussaib Rehabilitation project started in June 2005 with an expected end date of 2007. The project was successfully implemented, but with a considerable delay of five years and an emergency change of scope. The delay was caused by: a) Insufficient funds available to cover the rehabilitation works to install the procured parts to the boiler Unit 1; b) The frequent changes in MoE's position on the way forward concerning MoE's contributions to fill the funding gap; c) Change of implementation modality; and d) Continued poor security situation in Iraq.

While the original scope was to rehabilitate Unit 1, during the duration of the project, MoE officials indicated that the condition of boiler Unit 4 had become precarious with output reducing from 113 MW in August 2009 to 98 MW in November 2009. On 1 December 2009, the MoE had to completely stop its operation. In December-January 2010 MoE requested UNDP to consider shifting all the equipment procured for Unit 1 to Unit 4 and rehabilitate the boiler of Unit 4 in order to swiftly restore the 200MW generation, lost due to Unit 4 economizer failure, rather than adhering to the original scope (i.e. rehabilitation of Unit 1).

Rehabilitation of the Unit 4 Boiler was completed and commissioned for service in July 2012 and started producing critically needed electric power to the National Grid to meet the summer peak needs of households. Unit 4 was generating approximately 100 MW (original design rate is 300MW) before the rehabilitation and started generating 200MW after the rehabilitation. Increased power of 100MW provided additional and reliable power supply to approximately 50,000 households connected to the national grid. Improved reliability and output of the Unit 4 enhanced the operation parameters of the overall Mussaib power station and the stability of the Iraqi power system. Rehabilitation of the boiler allowed arresting further deterioration and brought about extension of the remaining life of the Unit 4 for at least another 15 years.

The project included the supply of material and spare parts, training of technical staff and installation of parts, in addition to the boiler rehabilitation at an estimated cost of USD33 million, the largest financial contribution by the International Reconstruction Fund Facility for Iraq (IRFFI) (through Japanese funding earmarked to UNDP) to any single project. The project successfully achieved its objective of generating electricity supply in July 2012. Yet some of the outputs originally planned for were not achieved since they became irrelevant during the project implementation stage. These outputs are: conducting complete maintenance and full repair of thermal units by plant staff; utilizing latest technology, modern tools and state-of-art software for unit maintenance and overhauls; specialization of core teams of MoE staff in the overall condition assessment of thermal units, after receiving training in the application of state-of-art maintenance management software for monitoring, recording, reporting and planning future maintenance of thermal units in the MoE fleet.

Training sessions in Japan and Russia, by two separate contractors, for plant engineers and staff enhanced the skills of the plant staff in the application repair and maintenance works, from trouble shooting, repair and test to commissioning. Five engineers received training on Plant Auxiliary Equipment and five trainer-engineers were trained on instrumentation and controls for the installation and commissioning of equipment from the Mussaib power station at the manufacturer's facilities in Japan. Combined, these exercises contributed to a successful completion of the project and built a skilled technical expertise team within Power Generation Group to attend other similar repair/maintenance works of Mussaib and other power stations in Iraq.

The project assisted MoE in capacity building of Iraqi Engineers in thermal power plant unit condition assessment, rehabilitation techniques and maintenance skills. Thermal plants are the backbone of electricity generation and this will help secure their long-term sustainability. The on-the-job training received during the rehabilitation will allow the plant staff to conduct future assessment and rehabilitation more efficiently and effectively for the Mussaib power station as well as the other thermal power stations of MoE.

As a result of the prevailing power shortage due to ailing power stations and delay in commissioning of the new power stations, the national grid supplies only about 60% of present loads in 2012. Therefore, small diesel generators operated by the private sector provide limited electricity to domestic consumers at a very high cost compared to the grid costs. Therefore most vulnerable and low-income groups that cannot afford paying for private vendors also benefit from the additional power generated from the Unit 4 and supplied through national grid. Rehabilitation of the boiler resulted in an improved performance of the unit particularly the burners and increased its efficiency in terms of energy conversion.

ii) Indicator Based Performance Assessment:

*Using the **Programme Results Framework from the Project Document / AWPs** - provide details of the achievement of indicators at both the output and outcome level in the table below. Where it has not been possible to collect data on indicators, clear explanation should be given explaining why.*

The Project Document was prepared and approved in June 2005. As described under Qualitative Assessment implementation of the project was delayed by 5 years due to the following: a) Insufficient funds to cover the rehabilitation works to install the procured parts to the boiler Unit 1; b) The frequent changes in MoE's position on the way forward, including the changes of the project scope; c) Change of the implementation modality; and d) Continued poor security situation in Iraq. Hence, the original performance indicators have been changed/modified to reflect the actual indicator based performance of the project.

	Performance Indicators	Indicator Baselines	Planned Indicator Targets	Achieved Indicator Targets	Reasons for Variance (if any)	Source of Verification	Comments (if any)
Outcome 1 To respond to the immediate humanitarian needs of war-affected Iraqi people through ensuring reliable and safe electricity supply to all consumer categories, in particular key humanitarian essential services							
Output 1.1 The Ministry of Electricity's power generating Unit 1 at the Mussaib power station is rehabilitated producing additional, stable and reliable electricity to the national grid.	Indicator 1.1.1 Unit 1 operates satisfactorily providing additional output power Of 60-80 MW (scope changed from Unit 1 to Unit 4)	100MW	160-180 MW	200MW	No Variance	Unit output measuring instruments, Power station controls and National Dispatch Centre log sheets. Test and commissioning reports. Warranty assurance	
	Indicator 1.1.2 Reduced hours of load shedding to MoE consumers	Number of hours of load shedding before commissio ning of Unit 4	Not quantified	As a result of reduced hours of load shedding, increased electricity supply during the summer 2012	No Variance	National Dispatch Center measurement records/log sheets	
	Indicator 1.1.3 Enhanced Stability and reliability of the Power System	Frequent Brown out and poor quality of electricity supply to consumers	Less brown outs and improved Quality of electricity	Overall improvement of the stability and reliability of National Grid	No Variance	System Control/National Dispatch Centre log sheets	

Output 1.2 Comprehensive set of selected and essential spare parts supplied to Mussaib TPS, which will be available in stock for emergency repairs and routine maintenance; in order to sustain Unit future generation and reliability.	Indicator 1.2.1 Independent QA inspector's Factory inspection report complying with the specification of spare parts	Essential spares not available at the power station	Delivery of spares to Mussaib TPS for future use	Specified Items & quantities delivered to Mussaib TPS	No Variance	Receipt and acceptance report by MoE warehouse and Directorate and UNDP's own asset verification report	
	Indicator 1.2.2 Poor performing auxiliary controls of the UNIT replaced	Poor reliability of the Unit auxiliary equipment controls	Poorly maintained critical auxiliary controls replaced	Critical auxiliary controls replaced and improved reliability of the overall Unit and the power station	No Variance	Information from Mussaib TPS operation and maintenance staff	
	Indicator 1.2.3 Satisfactory repair of the Unit 4 equipment during Emergency break down and planned outages	Poor quality repair work and unpredictable outage periods	Timely attendance of repair work to put back the Unit 4 into operation within possible shortest duration	Repair of the Unit 4 was done in an optimum manner during an emergency shut down and planned maintenance using the delivered spares	No Variance	Reports of Operation & Maintenance units of Mussaib TPS and system control records	
Output 1.3 Five plant staff trained in Unit rehabilitation works suited for erection, calibration, testing and commissioning in Japan. In addition, another team of 5 trainer	Indicator 1.3.1 MoE engineers trained at manufacturer's sites/facilities in Japan for testing, commissioning and accepting of the Auxiliary Equipment	Availability of limited number of experts in MoE and at Mussaib TPS	Minimum 5 engineers in installation, testing and acceptance of Auxiliary equipment	5 engineers were trained at Hitachi in Japan on Auxiliary equipment	No Variance	MoE training records and certificates issued by the Trainers. UNDP documents in arranging and monitoring the conduct of training	
	Indicator 1.3.2 MoE engineers trained at manufacturer's sites/facilities in Japan for testing, commissioning and accepting of	Availability of limited number of experts in MoE and at Mussaib TPS	Minimum 5 engineers in installation, testing and acceptance of	5 engineers were trained at Hitachi in Japan in instrumentation and controls for	No Variance	MoE training records and certificates issued by the Trainers. UNDP documents in arranging and monitoring the conduct of training	

engineers' expertise in instrumentation and controls were also enhanced in Japan. On the job training at site and at contractor's facilities in Russia for 25 Engineers.	Instrumentation and Controls		instrumentation and controls during rehabilitation works	the Units			
	Indicator 1.3.4 On-the-job and specialized overseas training for MoE engineers for condition assessment, trouble-shooting, repair, operation and maintenance of large boilers	Availability of limited number of experts in MoE and at Mussaib TPS for condition assessment, trouble-shooting, repair, operation and maintenance of large boilers	Reasonable number of MoE engineers involved with boiler rehabilitation work trained on on-the-job training and specialized training at manufacturers facilities	25 engineers were trained at the Contractor's facilities in Moscow on condition assessment, trouble shooting, repair, operation and maintenance of Large boilers. Further, a large number of MoE engineers received the on the job training **at site.**	No Variance	MoE training records and assessment /certificates issued by the contractor	

iii) Evaluation

UNDP contracted an independent consultant to conduct an Outcome Evaluation of the CPAP Outcome 5—Enabling policy and frameworks for rapid economic recovery, inclusive and diversified growth and private sector development—in July 2011. The evaluation included the Mussaib II project. The consultant visited the Mussaib power station and interviewed the project staff as well as the other station staff and the senior management of Directorate General covering the Mussaib power station. The report by the consultant with the Title "Evaluation of enabling policy framework for rapid economic recovery, inclusive and diversified growth and private sector development" – Outcome 5, UNDP Iraq Country Programme Action Plan 2011-2014 was issued in May 2012.

In the Outcome Evaluation, this project was evaluated against the CPAP 2011- 2014 indicator "Change in national level perception of improved electricity supply (2009: 40%; 2014: 70%)". The Outcome Evaluation stated the following: "Public perception has worsened over the project's implementation life. This reflects growing public frustration over slow progress delivering improvements to the grid, and the effect of extended power outages in the daily lives of citizens. In this regard, the Mussaib Power Station project was a small part of the overall problem. The indicator itself was inappropriate and beyond the scope of the project's influence, given that the project was to restore 60-80 MW to a power grid that was functioning between 5000 and 8000 MW during the project period. As such, the project had limited ability to improve public opinion."

The evaluation conducted in 2011 pointed out that the main cause of delays appears to be flaws embedded in the project design, aggravated by limited UNDP engagement during the critical 2007 to 2009 period. Project implementation shows a significant improvement after 2009, in part resulting from a change in UNDP project management and the implementation modality. UNDP worked effectively with Iraqi officials and the donor to resolve implementation bottlenecks, and complete procurement for the final output. UNDP had already taken the action of changing the team in 2010 by recognizing the weakness of the UNDP project management.

No other evaluation has been conducted and there are no plans to conduct one in the future.

Challenges

The project started in June 2005 with the original project duration of 24 months. The project was successfully implemented, but with a considerable delay of five years. The fundamental reasons for the delay were the: a) Insufficient funds to cover the rehabilitation works to install the procured parts to the boiler Unit 1; b) The frequent changes in MoE's position on the way forward; c) Change of implementation modality; and d) Continued poor security situation in Iraq. The project included the supply of material and spare parts, training of technical staff and installation of parts in addition to the boiler rehabilitation at an estimated cost of USD33 million. By 2009, approximately USD19 million worth of equipment had been procured and delivered; however, estimates indicated that there were insufficient funds to implement the installation works in accordance with a revised implementation arrangement. The project was originally designed for MoE to hire a contractor for the installation works with remote supervision by M/s. Hitachi, which was the supplier of the majority of Mussaib TPS's equipment when it was first commissioned in 1987.

Therefore, in 2008, UNDP kept approximately USD13 million aside for installation works, based on the then estimated costs to carry out the installation in accordance with the original project design. However, MoE indicated that it was not in a position to directly hire a contractor for installation works. Hence, it was decided that Hitachi would engage an implementation contractor and undertake remote installation supervision. Based on this revised arrangement, Hitachi submitted a new estimate in July 2008, but the estimate turned out to be significantly higher than the funds available. The new estimate set the price for the rehabilitation at $38

million, and it was then agreed that UNDP would initiate an international tendering process and the MoE and Government of Iraq would cost share covering the difference in cost up to a ceiling of USD20 million.

In November 2008, an agreement was reached for MoE to bridge the funding gap. However, in June 2009, the Minister indicated that MoE was no longer in a position to provide the additional funds during the year due to budgetary shortfalls following the drop in the global price of oil. In the meantime, MoE Officials indicated that the condition of boiler Unit 4 had become precarious with output reducing from 113 MW in August 2009 to 98 MW in November 2009. On 1 December 2009, the MoE had to completely stop its operation. Between December 2009 and January 2010 MoE requested UNDP to consider shifting all the equipment procured for Unit 1 to Unit 4 and rehabilitate the boiler of Unit 4 in order to swiftly restore the 200MW generation lost due to Unit 4 economizer failure, rather than adhering to the original scope (i.e. rehabilitation of Unit 1).

Based on the decision by the Iraq Strategic review Board (ISB), MoE agreed to bridge the funding gap from its own budget for the installation work of boiler Unit 4. MoE also confirmed that the installation work of water economizer will be completed with its own resources. It was estimated that installation of boiler Unit 4 will be completed by end 2011. MoE and UNDP signed the letter of agreement to change the implementation modality from DIM to NIM and MoE to hire an international contractor following MoE procurement procedures with the assistance of UNDP, due to insufficient funds and difficulties of MoE's transferring funds to UNDP. Following a competitive bidding process, in November 2011 a contract was signed between MoE and an international contractor to undertake the implementation work of the boiler Unit 4. The contractor commenced the rehabilitation work in January 2012 and completed the major contract works and commissioned the Unit 4 in July 2012.

The worsening security situation in Iraq, during the project's lifetime, resulted in a high turnover of international staff and the absence of experts with relevant background experience which hampered the successful implementation of the project within the scheduled project completion period. In particular, the absence of a competent Chief Technical Manager to oversee, advice and manage the project managers during the project implementation stage added to the management challenges of the project. UNDP changed the project team by assigning the qualified and experienced Technical Advisor as a project manager. Timely arrangements were made to train key MoE staff (10 engineers) at international facilities to undergo training on installation, test and commissioning of plant's auxiliary equipment, instrumentation and controls. Supervision of the contractor's work by the above trained staff ensured that contractor comply its work according to the technical specifications and Unit 4 delivered specified power outputs.

Best Practices and Lessons Learned

UNDP embarked on implementation of electricity sector projects, based on the successful achievements of the implementation of electricity sector projects in Kurdistan Region during oil for food programme (ENRP). Considering that very few international staff with ENRP experience remained and that UNDP's focus was shifted from physical implementation projects, UNDP should have focused more on capacity building fields. UNDP should have utilized more the remaining international staff with ENRP from the beginning.

Conducting a sufficient and detailed procurement market survey for equipment, material supply and rehabilitation works, particularly from proprietary equipment suppliers during the project planning and design stage, could have allowed for a more accurate time frame for project implementation, especially for the procurement stage and for an adequate project budget to avoid any supply shortage.

To avoid frequent changes in MoE's position on the way forward, continuous engagement with senior MoE officials could have been sought to mitigate the continuous opinion change at the Ministerial level.

Considering that MoE had been implementing international competitive bidding processes, the change of implementation modality could have been discussed earlier with UNDP's close technical assistance. This could have helped to overcome the security constraints, by having MoE directly implement the project through UNDP's remote management.