



Global Environment Facility

Monique Barbut
*Chief Executive Officer
and Chairperson*

1818 H Street, NW
Washington, DC 20433 USA
Tel: 202.473.3202
Fax: 202.522.3240/3245
E-mail: mbarbut@TheGEF.org

November 22, 2006

Dear Council Member:

I am writing to notify you that World Bank, the Implementing Agency for the project entitled, ***Morocco: Solar Based Thermal Power Plant***, has submitted the proposed project document for CEO endorsement prior to final approval of the project in accordance with World Bank procedures.

Over the next four weeks, the Secretariat will be reviewing the project document to ascertain that it is consistent with the proposal included in the work program approved by the Council in May 1999, and with GEF policies and procedures. The Secretariat will also ascertain whether the proposed level of GEF financing is appropriate in light of the project's objectives.

If by December 20, 2006, I have not received requests from at least four Council Members to have the proposed project reviewed at a Council meeting because in the Member's view the project is not consistent with the Instrument or GEF policies and procedures, I will complete the Secretariat's assessment with a view to endorsing the proposed project document.

We have today posted the proposed project document on the GEF website at www.theGEF.org. If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

cc: Alternates, Implementing Agencies, STAP




**PROJECT EXECUTIVE SUMMARY
REQUEST FOR CEO ENDORSEMENT**

GEFSEC PROJECT ID: 647
AGENCY'S PROJECT ID: P041396
COUNTRY: Morocco
PROJECT TITLE: Integrated Solar Combined
 Cycle Power Plant
GEF IA/ExA: The World Bank
OTHER PROJECT EXECUTING AGENCY(IES):
 Office National de l'Electricite (O.N.E.)
DURATION: 6 years
GEF FOCAL AREA: Climate Change
GEF STRATEGIC OBJECTIVES: S5
GEF OPERATIONAL PROGRAM: OP 7
COUNCIL APPROVAL DATE: May 1999
COUNCIL APPROVED AMOUNT*: 43.2 M
CEO ENDORSEMENT AMOUNT*:43.2 M
ESTIMATED STARTING DATE: February 2007

FINANCING PLAN (\$)		
	PDF	Project
GEF	A	43,200,000
	B	
	C	
GEF Total	700,000	43,200,000
Co-financing	(provide details in Section b: Co-financing)	
GEF IA/ExA		
O.N.E.		16,280,000
AfDB		160,130,000
Co-financing Total		176,410,000
Total	700,000	219,610,000
Financing for Associated Activities If Any:		

Approved on behalf of the *World Bank*. This proposal has been prepared in accordance with GEF policies and procedures and meets the standards of the GEF Project Review Criteria for CEO endorsement.

Steve Gorman 
 GEF Executive Coordinator
 Date: November 15, 2006

Elsie Garfield
 Project Contact Person

Tel. and email: 202 473 5007
 egarfield@worldbank.org

1. FINANCING

a) Financing Plan

Sources of Fund	
Classification	Amount (\$)
GEF Grant	43200000
Bilateral/Multi-lateral donors	160130000
Implementing/Executing Agency	16280000
Total Sources of Funds	219610000

Uses of Fund			
Project Components/Outcomes	GEF (\$)	Co-financing (\$)	Total (\$)
EPC cum O&M contract	43200000	142190000	185390000
Transmission lines		11240000	11240000
Substations		9040000	9040000
Access Road		3800000	3800000
Boreholes		350000	350000
Land acquisition		870000	870000
Gas pipeline		1510000	1510000
Environment and social dev. & Mangt		2310000	2310000
Consulting services		5090000	5090000
Total Uses of Funds	43200000	176410000	219610000

b) Co-financing (indicate if cash or in-kind)

Name of Co-financiers (source)	Classification	Type	At Work Program (million \$)	At CEO Endorsement (\$ million)*
IA	Multilat. Agency	Cash	0,35	0
Other International	Multilat. Agency	Cash	0.53	0
Government	Nat'l government	Cash	0.18	0
Private sector	Private sector	Cash	69.40	0
O.N.E.	Exec. Agency	Cash		16.28
African Development Bank	Multilat. Agency	Cash		160.13
Total Co-financing			70.46	176.41

* Reflect the final commitment amount of co-financiers and attach documents from co-financiers confirming co-financing commitments. Describe any difference of final commitment compared to those expressions of interest at concept stage or at work program inclusion.

2. RESPONSE TO REVIEWS

a) COUNCIL

The replicability is considered very high but I feel that this is too optimistic given the low fossil fuel prices. As the STAP review suggests, the costs per ton CO₂ emissions avoided are over US\$170 and thus extremely high. The capital costs are also very high and it is debatable whether a substantial decrease would be possible. In this respect, I would like to note that the GEF response to the STAP Technical Review is acceptable except the point on the likely medium to longer term cost reductions which can be expected for this technology.. From the point of view of GEF procedures and criteria, there is no reason to withhold approval of the project. The Council comment was made in 1999 when oil prices were low. The picture has since dramatically changed with persistently high oil prices. The price of oil has more than doubled between 2000 and 2006 by moving from \$30 a barrel in 2000 to about \$70 a barrel in 2006. As more ISCC power plants come on stream, the high capital cost is likely to go down due to learning and economies of scale. The prospects of capital cost reduction are analyzed in a recent study¹ undertaken by the World Bank GEF Program which is summarized in Annex 18 of the Project Document. The three projects being supported by GEF are not an isolated experience, as other projects are being developed worldwide. For example, Algeria has recently signed a contract with a Spanish firm to build, own and operate a hybrid solar combined cycle power plant and several ISCC plants are under development in Spain. Many factors have an effect on the cost of power: plant configuration, including size, location, solar resource, financing structure, and tax incentives. While, for example, increasing plant size offers the easiest opportunity for reducing the cost of power, there are a number of technological advances that are coming on stream that can also reduce costs significantly such as increasing the collector size (if sufficient land is available) and improvements in receiver coatings, etc. (paras. A2 and B6, and Annex 18 of the GEF Project Document, pp. 8-9).

Providing a 40% contribution for a plant with a capacity of 150 MW seems incompatible with the general guidelines for government intervention in the electric power sector. OECD members as a whole have ceased to develop such plants, because individual countries cannot afford them. The plants are likely to prove economically non-viable in light of current prices per barrel and probable price trends over the next 10 years. Consequently, the World Bank should provide further justifications and arguments in support of its decision, and a project such as this needs to be modified, because as it stands it has more to do with very long-term research than with the development of a beneficiary country. The size of the plant is 227 MW and is co-financed by O.N.E., the African Development Bank (AfDB) and GEF. Their respective share in the financing of the project is 7, 73 and 20 percent. OECD countries such as Spain and the United States are developing solar thermal as well as hybrid solar thermal combined cycle power plants. As stated earlier, the current price of the barrel of oil is quite high and the latest price projections predict that they will remain high. Furthermore, the solar thermal and the combined cycle power technologies are well proven and in use in several parts of the world. Their integration does not pose a special technical problem and the technology is well past the research stage. The technology is slowly being integrated in power sector expansion plans. As already

¹ World Bank GEF Program: *Assessment of the World Bank/GEF Strategy for the Market Development of Concentrating Solar Thermal Power*, Washington D.C. 2006

mentioned, Algeria has recently signed a contract with a Spanish firm for an IPP based on the hybrid integrated solar combined cycle power technology. (para. 3 of the GEF Project Document, pp.4)

Solar thermal power has been proven technologically viable in California (about 354 MW installed and operated since the mid 80's which compares to the total 120 NEW SPV potential production per year. There it serves as a peak generation power production (cooling loads are maximum during day). Its cost per unit of peak power installed is significantly less than Solar Photovoltaic. For various reasons, this technology has not been replicated on a large scale in recent years. There are various developments at research stage for different technologies of solar thermal based power generation as well as system integration.

Solar thermal power generation is a very promising technology for the 21st Century.

Main Concerns

1) Fossil fuel cost:

- *Located on the gas pipeline, the gas is actually extremely cheap. The incentive to run a solar plant are somewhat artificial. A contract will define conditions for the minimal solar output to be met. With the present political willingness, it may work fine, but it may change. As stressed earlier, oil prices are high and rising and there is therefore a very strong incentive to maximize generation from the solar component. Furthermore, there are penalties in the EPC cum O&M contract for not meeting target generation from the solar component (Para. B4 and B5 of the GEF Project Document, pp. 6 and 8). As part of the bidding process, firms are obligated to fill out and submit a detailed technical and financial model that includes penalties for not meeting operating and performance targets for the solar component).*

2) Site selection:

- *The foreseen location shows about 20-25 % less solar irradiation than the optimal sites in Morocco. Even if preliminary studies show that the site is optimal, it would be of interest to reconsider that when performing a detailed feasibility study. No integration of the power plant with any large scale industry requiring heating/cooling has been mentioned. The pre-feasibility study financed by the European Community (EC) provided the economic analysis for the 11 alternatives studied at the Jerada and Ain Beni Mathar sites. The alternative at Ain Beni Mathar (about 80 km south of Oujda), which provided the lowest levelized tariff and the highest rate of return, was selected. The selection also included criteria about the sun level, the availability of cooling water, and the location with regards to the electricity grid and gas network. The solar field is integrated with a combined cycle power plant to produce more electricity to feed into the grid to satisfy demand. (para. B6, pp.8 of the GEF Project Document). The solar thermal technology could be used separately (i.e. without the combined cycle power plant) to supply industries requiring heating or cooling in their process. This is however not the case in this project. The main purpose of the heat generated by the solar field of the Morocco Integrated Solar Combined Cycle Power Plant is to generate electricity. This*

electricity is fed into the national grid and used by a variety of domestic, commercial and industrial users and is not intended to meet a specific industry's requirements.

3) *Information exchange:*

- *For a project of this size, and with such GEF contribution, no systematic exchange of information has been described (to the knowledge of reader). There are other similar projects in the pipeline (India, Egypt, ...) which would ideally be coordinated with this one. For practical reasons (different national mechanisms) it may be difficult to do so, but at least monitoring and lessons learned out of the various projects should-be shared. Dissemination of experience and lessons learned and encouraging the sharing of knowledge about the construction and operation of the proposed Morocco Integrated Solar Combined Cycle Power Plant is at the heart of the comprehensive monitoring and evaluation plan, including quantitative and qualitative indicators, that has been put in place. (Paras. B2 and B3, pp. 5 and 6; Para C3, pp. 10 and 11, and Annex 3, pp. 29, 30 and 31 of the GEF Project Document). Furthermore, the three Bank teams involved in the preparation of the Mexico, Egypt and Morocco projects are closely working together and exchanging their respective experience as they prepare these projects for GEF approval.*

4) *Technological choice, bidding process:*

- *The technological choice will be left to the project developer. This bears an important risk. The normal procedure is to award the contract to the lowest bid. In such a project, and depending on the technical options, the lowest bid may not be the best choice. The bidding for the project was done in two stages: In the first stage, bidders responded to broad specifications of the desired power plant. A conference was held with the bidders at the end of which new specifications, representing a broad consensus, were issued to bidders who were invited to submit technical and commercial proposals for the second stage. Concerning the contract award, the normal procedure is to award the contract to the lowest evaluated bid. This means, in particular, that the bid with the lowest price will not necessarily be awarded the contract because there are technical and commercial conditions to be met as well. Therefore, having the lowest price is no guarantee that a bid will win a contract. (Para. A2, pp. 3 and B6 of the GEF Project Document, pp. 9)*

5) *Impact in the region:*

A project of this size should not hamper the development of other smaller scale initiatives in the same technology. Integration of power plant with industrial processes even though difficult at a large scale present a bright future for solar thermal power generation with cogeneration applications. We agree with the Council member's concern that the project should not hamper the development of other smaller scale initiatives using the same technology. However, we do not, for our part, see a crowding out of smaller uses of the technology which is at a very early stage of development in Morocco. We also agree with Council that the integration of solar thermal with a combined cycle power plant to produce more electricity is only a first step in the use of a very promising technology.

b) REVIEW BY EXPERT FROM STAP ROSTER

“the O&M contract should contain appropriate incentive structure for both maximizing the total plant reliability as well as maximizing the utilization of the solar field over the long term. The PAD only discusses the latter issue, but the O&M contract will need to address both issues...” See Section B. Para. 4 and 5 of the GEF Project Document. Please see also our answer to the council member’s concern on fossil fuel cost above.

“Finally, the use of only pre-qualified bidders is likely to allow the selected EPC contractor and key suppliers to capture technology and organizational learning effects that are essential to achieving long-term cost reductions for solar thermal power.” See Section C. Replicability. Long-term cost reductions in solar thermal power will result from three factors: reduced component costs due to increased manufacturing volume, economies of scale from increased plant size, and technological improvements. The experience gained by one EPC contractor has a minor effect on competition and cost reduction over the long term.

“.....One question that this reviewer could not assess from the PAD is whether the bidder prequalification includes the potential manufacturers of the solar collectors and heat collection elements.” The prequalification of consortia that have both combined cycle and solar thermal power experience ensures the effective integration of the solar field and the combined cycle power plant. Section A. Para 2 and Section B, Para. 4.

“....As the technology selection will be left to the EPC Bidders, who will all be pre-qualified, the bid documents must establish minimum requirements for the solar thermal steam raising component to ensure that the minimum solar share target can be met. Effective integration of the steam systems for the solar thermal field and the gas-fired combined cycle plant is essential to achieving significant cost reductions and proper performance of the power plant.” Section B. Para. 4. Please see also our answers to the council member’s concern on fossil fuel cost and to STAP reviewer’s question 12 below.

“ The selection process should review plant designs to ensure that the plant operates effectively in all modes. In particular, integration and control of the system should allow the solar contribution to be consistently maximized. In addition, the system should allow power to be efficiently generated on natural gas only, if required (during nighttime or if the solar field is not operational).” Included in the bidding documents and the Engineer, Procure and Construct (EPC) and Operation and Maintenance (O&M) contract.

“..... the O&M contract should contain appropriate incentive structure for both maximizing the total plant reliability as well as maximizing the utilization of the solar field over the long term. “ See Section B. Para. 4 and 5, pp. 6 and 8 of the GEF Project Document. Please see also our answer to the council member’s concern on fossil fuel cost above.

“.....strong importance needs to be placed on training of O.N.E. power plant staff in the requisite skills for operating and maintaining an ISCC power plant during the construction and initial operation of the plant.” We agree. A strong emphasis has been placed on O.N.E.’s staff training in various aspects of the ISCC technology and an indicator has been included in the

monitoring and evaluation (M&E) plan. Staff training is included in the EPC cum O&M contract. Section B. Para. 3 and 4, and Annex 3.

“..... In addition, successful implementation of the Project should provide local manufacturing and job opportunities within the region,” Agree. The project provides jobs and economic activities in the region. The development of local manufacturing should be left to the private sector and is likely to evolve over time.

3. MAJOR CHANGE SINCE WORK PROGRAM ENTRY

The project was approved in May 1999 as an independent power producer (IPP) scheme. The major change that has occurred is that following an unsatisfactory response to a competitive bid for an IPP, Morocco’s public power utility decided to finance the integrated solar thermal combined cycle power plant itself through an Engineer, Procure and Construct (EPC) cum Operation and Maintenance (O&M) contract. The actors have therefore changed and so have the scope and the cost of the project. The capacity to be installed at work program was 150 MW. Demand for electricity has increased substantially since then and the new capacity of the combined cycle power plant is now 227 MW. The total cost of the project has nearly doubled. It was expected to be \$114.36 million at work program entry, and it is now estimated at \$219.61 million. The co-financing from other sources has more than doubled. It was estimated at \$70.46 million at work program. It is now about \$176.4 million.

4. REQUIRED ATTACHMENTS

- a) Project Appraisal Document**
- b) Confirmed letters of commitments from co-financiers (with English translations)**

Document of
The World Bank

Report No: 36485

GEF PROJECT DOCUMENT
ON A
PROPOSED GRANT FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND
IN THE AMOUNT OF US\$ 43.2 MILLION
TO THE
OFFICE NATIONAL DE L'ELECTRICITE
(National Electricity Utility)
OF THE KINGDOM OF MOROCCO
FOR AN
INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

November 14, 2006

Sustainable Development Department
Middle East and North Africa (MNA)

CURRENCY EQUIVALENTS

(Exchange Rate Effective June 19, 2006)

Currency Unit = Morocco Dirham (MAD)

MAD 8.7623 = US\$1

MAD 1 = US\$ 0.11

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
CDER	Centre de Développement des Energies Renouvelables (Renewable Energy Center)
MAD	Moroccan Dirham
DSM	Demand Side Management
EA	Environmental Assessment
EE	Energy Efficiency
EMP	Environmental Management Plan
EPC	Engineer, procure, and construct
ESMAP	Energy Sector Management Assistance Program
EU	European Union
GEF	Global Environment Facility
GHG	Greenhouse Gas
GoM	Government of Morocco
HV	High Voltage
IPP	Independent Power Producer
ISCC	Integrated Solar Combined Cycle Power Plant
JLEC	Jorf Lasfar Energy Company (JLEC)
LV	Low Voltage
LYDEC	Casablanca Power Distribution Company
MEM	Ministry of Energy and Mines
MoF	Ministry of Finance
MV	Medium Voltage
MW	Megawatt
O&M	Operation and Maintenance
ONAREP	Office National de la Recherche Pétrolière (National Petroleum Office)
O.N.E.	Office National de l'Electricité (National Electricity Utility)
PIU	Project Implementation Unit
STP	Solar Thermal Power
RAP	Resettlement Action Plan
UNFCCC	United Nations Framework Convention on Climate Change

Vice President:	Daniela Gressani
Country Manager/Director:	Theodore Ahlers
Sector Manager:	Jonathan Walters
Task Team Leader:	Noureddine Bouzaher

MOROCCO
INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

CONTENTS

	Page
A.STRATEGIC CONTEXT AND RATIONALE	1
1. Country and sector issues.....	1
2. Rationale for Bank involvement	2
3. Higher level objectives and Rationale for GEF funding.....	4
B.PROJECT DESCRIPTION	5
1. Lending instrument	5
2. Project development objective and key indicators.....	5
3. Global development objective	5
4. Project components.....	6
5. Lessons learned and reflected in the project design.....	7
6. Alternatives considered and reasons for rejection	8
C.IMPLEMENTATION	9
1. Partnership arrangements	9
2. Institutional and implementation arrangements	9
3. Monitoring and evaluation of outcomes/results.....	10
4. Sustainability.....	12
5. Critical risks and possible controversial aspects.....	14
6. Grant conditions and covenants	14
D.APPRAISAL SUMMARY	15
1. Economic and financial analysis.....	15
2. Technical.....	19
3. Fiduciary	20
4. Social.....	20
5. Environment.....	21
6. Safeguard policies.....	22
7. Policy Exceptions and Readiness.....	24
Annex1: Country and Sector Background	25

Annex 2: Major Related Projects Financed by the Bank and/or other Agencies.....	28
Annex 3: Results Framework and Monitoring	29
Annex 4: Detailed Project Description	32
Annex 5: Project Costs	35
Annex 6: Implementation Arrangements	36
Annex 7: Financial Management and Disbursement Arrangements	37
Annex 8: Procurement Arrangements	40
Annex 9: Economic and Financial Analysis	45
Annex 10: Safeguard Policy Issues.....	49
Annex 11: Project Preparation and Supervision	64
Annex 12: Documents in the Project File	65
Annex 13: Statement of Loans and Credits	66
Annex 14: Country at Glance	67
Annex 15: Solar Technologies and Integration.....	68
Annex 16: Incremental Cost	70
Annex 17: Scientific and Technical Advisory Panel (STAP) Review.....	78
Annex 18: Cost Reduction of Solar Thermal Power Technology	87
Annex 19: MAP 34713	92

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

With a growing population and economic development, Morocco's electricity demand is increasing rapidly. Between 1983 and 2003, electricity consumption grew an average of 6% per year and was met by domestic production and imports from Spain and Algeria. The need for additional capacity and a desire to control public spending have led the Moroccan government to call more on the private sector to meet the country's power needs.

The main issues include the need for capacity to meet the demands of a growing economy and improved access, the cost of which should be minimized with measures both on the demand and supply sides, the use of imported natural gas for power generation and domestic uses, the lack of resources to finance energy programs, and the uncertainties and vulnerabilities created by the over-dependence on imported energy.

Taking these issues into account, the Government has taken a number of measures to address them:

- On the supply side, several privately owned power plants, among which are Jorf Lasfar and Tahaddart power plants, were successfully completed. On the demand side, however, there is no coordinated program of energy efficiency and demand management. An ESMAP mission that visited Morocco recently has agreed with the government on a number of studies that should lead to a well coordinated program of energy efficiency and energy conservation in Morocco.
- The restructuring of the power sector:
 - The reform proposal now being examined by the government foresees the creation of two markets. A regulated (or non-competitive) market and a free (or competitive) market. The regulated market will operate in the same manner as the current system on the single buyer model. The proposed solar thermal power project will be part of the regulated market. The free market will be open to consumers whose consumption exceeds a minimum threshold. The free market is a liberalized market based on: (i) the open choice of suppliers of electricity by eligible consumers and (ii) the free entry of producers to supply this segment of the market on a competitive basis. In addition, several institutions will be set up: a regulatory authority, (which will either be a new institution or a restructuring and consolidation of existing regulatory bodies), a transmission/system operator, commercial and distribution affiliates, and a shared services company.
 - Under the reform proposal, O.N.E. would be transformed into a joint stock company and broken into several entities. Some of O.N.E.'s activities will operate in the free market (non-regulated generation and commercial activities) while others will be regulated (regulated generation, transmission, and distribution). Third party access tariffs will be established to encourage the free access to the transmission and distribution networks.
- Introduction of natural gas: Natural gas is gradually being introduced in power generation because it is a cheaper and cleaner fuel compared to alternatives. New power stations are gas fired and the government is evaluating the opportunity of converting older power stations (especially coal fired) to gas firing as well. The challenge is to

mitigate the risks attached to a single supply source and the uncertainties attached to the price of gas, especially in a period of volatile oil prices. The energy strategy, to be prepared by the government and financed by ESMAP, would look at possible mitigation measures.

- Reducing vulnerabilities and uncertainties through diversification of supply sources and supply mix but also through the use of renewable energy and a better use of existing supplies of energy: Morocco has initiated and implemented important actions to gradually meet some of the important targets included in its policy of developing renewable energy. To achieve these objectives, the government created the Centre de Développement des Energies Renouvelables (CDER), which is responsible for undertaking studies and research promoting the utilization of mini-hydro, solar, and wind technologies. At the same time, CDER plays an important role in the implementation of measures promoting the reduction of greenhouse gas emissions. The project is part of O.N.E.'s least-cost expansion plan provided the GEF grant for the solar component is taken into account. The project also fits well with energy sector development plans that call for an increase not only in capacity addition but also in the share of renewable energy, for which Morocco has a great potential, in the energy mix.

Morocco ratified the United Nations Framework Convention on Climate Change (UNFCCC) on the 28th of December 1995. In addition, Morocco hosted the seventh Conference of the Parties to the UNFCCC in November 2001 and ratified the Kyoto Protocol on January 25, 2002. As a non-Annex I country, Morocco is eligible for financing from the GEF through the mechanisms established by the Convention. The Project has received the endorsement from the GEF Operational Focal Point and is formulated in accordance with national priorities.

Although great progress has been made in solar thermal power technology (STP) since the early 1980s, based on the commercial success of the 354 MW installed in nine solar electricity generating systems in California, it is not currently cost effective in most power markets. Thus, STP technology falls within GEF Operational Program (OP) 7, with its aim of reducing the long-term cost of low greenhouse gas emitting energy technologies. In that context, GEF support for STP projects in a number of countries, including Morocco, represents a significant step in support of GEF's programmatic objectives. GEF support is lending credibility to the technology and positively affecting the development of other STP projects worldwide.

2. Rationale for Bank involvement

The Bank's strategy in Morocco is to support policies and investments that encourage economic growth and efficiency through social development, public and private capital investments, environmentally-friendly projects, and sound public sector management. In particular, the CAS (2005) identifies the support to the development and quality improvement of infrastructure as a focus for Bank assistance. The proposed Solar Thermal Power Project is specifically mentioned in the CAS as an instrument for furthering this objective. The CAS also put focus on enhancing the conditions for rapid and sustained economic growth and job creation. In a country where the economy is growing, sustained growth is based on the availability of reliable and affordable energy, including electricity. The legal and regulatory framework currently being put in place under the energy Development Policy Loan (DPL), now under preparation, supports the

development of renewable energy and its integration into the grid and lays the ground for replication of the solar combined cycle power technology in Morocco.

The proposed project would add a much needed generation capacity to the power sector and contribute to the reduction of greenhouse gas emissions (GHG). It is co-financed with the African Development Bank (AfDB), a major partner of the Moroccan power sector. AfDB has already approved a loan of about \$160 million towards the financing of the combined cycle power plant which is a major part of the proposed project.

While grid-based solar thermal technology has a strong experience base and has exciting technical and environmental potential, it is still at a relatively early stage of commercialization. Recently, in the United States and a few countries in Western Europe, a number of demonstration and commercial projects have been successfully initiated through cooperative efforts between governments and the private sector to reduce the capital cost and performance risk of the new technology. The proposed project will be the second of its kind to be financed by GEF. Its successful implementation and operation will have a demonstration effect on solar thermal power plants in other developing countries (Egypt, Mexico, India, Algeria, etc.). The Bank with its knowledge of the power sector in Morocco and renewable energy development worldwide, combined with the assistance of GEF, has a comparative advantage in the promotion of grid-based renewable energy.

The bidding documents have already been issued by O.N.E to pre-qualified firms¹ and Bank involvement has attracted serious bidders because of the assurance of a fair competitive process. GEF financial commitment to the project is critical to the removal of barriers to the adoption of grid-based solar technologies because of: (a) its significantly higher cost per kW installed, relative to conventional power plants, which is a consequence of the relatively small number of solar thermal power plants that have been constructed, all of them in developed countries and (b) the technical performance risks, due to the limited design and operational experience in a developing country context.

Over the long run, it is expected that the cost of the technology will come down due to technical progress and lessons learned from earlier deployment (as in the case of the proposed project). In the Northern Mediterranean “sunbelt”, several STP projects are already being planned in Greece, Spain, and Italy through national programs and the support of the EU. Bulk transmission of electricity from STP plants from high insulation sites in Southern Mediterranean countries, such as Algeria, Lybia, Egypt, Morocco, and Tunisia, may also open wider opportunities for European utilities to finance solar plants in that region for electricity consumed in Europe. Reform of electricity sectors across Europe, the rising demand for “green power”, and the possibility of gaining carbon credits are increasing the viability of such projects. Finally, research and development work continues in Europe and the United States to further reduce costs by improving plant components such as the collector array, receiver tubes, mirrors, etc.

¹ Each pre-qualified consortium is formed by a combined cycle power plant manufacturer/supplier/contractor and a solar thermal power plant manufacturer/supplier/contractor.

3. Higher level objectives and Rationale for GEF funding

The government of Morocco (GoM) has taken important steps to improve the performance of the power sector through restructuring and private sector participation and to develop the use of renewable energy. The proposed project would address key issues in the government strategy such as increasing institutional capacity and reliance on renewable energy, while meeting growing demand for electricity.

The development of a solar based thermal power plant in Morocco fully supports the GEF strategy of reducing the long-term costs and increasing the market share of low greenhouse-gas emitting technologies. The project is consistent with GEF Operational Program (OP) #7, which stresses the development of solar thermal electric generation technologies in high insulation regions. The northern part of Morocco has suitable sites to develop the proposed project, which are near to natural gas, water and power grid facilities. Furthermore, given the growing demand for power and the commitment shown by GoM, CDER, and ONE, replication potential and capacity building within Morocco are significant.

GEF support for the proposed project is critical for the following reasons: (a) the financial and technical/operational risks of grid based solar technology are high in any developed country and are more challenging even in a relatively advanced middle-income country such as Morocco; (b) the success of the proposed project is a critical step in the gradual but global approach for adapting and developing grid based solar technologies on a large scale, and GEF and Bank involvement would leverage technical knowledge and international best practice to ensure the success of the project; (c) Morocco and the Mediterranean region in general have a large potential market for dissemination of the technology; (d) the potential for cost reduction is high because of the important size of the market for this type of technology not only in the region but also worldwide; (e) the GEF support will accelerate the dissemination of grid based solar energy in the power market of Morocco and other parts of the world, and will ultimately achieve a very large reduction in greenhouse gas emissions. Furthermore, STP may become a common choice for many countries with high solar insulation, especially with the entry into force of the Clean Development Mechanism (CDM) of the Kyoto Protocol.

The GEF/World Bank portfolio, however, including therefore the proposed project, *is not moving in isolation* but is a part of increasingly interconnected developments in both OECD and developing countries that might trigger the take-off of the solar thermal technology. Governments and industry are making large efforts to promote grid-connected solar technologies and there are today significant STP and ISCC projects emerging in the world such as the Algeria 25 MW trough, ISCC; Iran 67 MW trough, ISCC, Jordan 135 MW trough, Nevada 50 MW trough and more than ten projects in Spain from 5 MW to 350 MW. Perhaps, the most advanced long-term program currently in place that aims to foster the development of solar thermal power is the Global Market Initiative (GMI). The objective of GMI is to facilitate and expedite the building of 5,000 MWe of solar power worldwide over the next ten years. This initiative represents the world's largest coordinated action in history for the deployment of solar electricity.

B. PROJECT DESCRIPTION

1. Lending instrument

A GEF grant will be used to finance part of the proposed solar-thermal power plant, by covering most of the cost of the solar component, or about 20% of total investment costs. The remainder of the project cost will be covered by an AfDB loan (already approved) and O.N.E.'s own contribution. Solar-based power plants are not yet competitive because of high capital costs and low plant availability. GEF support through the proposed grant will help reduce the long-term costs of the proposed technology and will assist Morocco as well as other countries adopt environmentally clean and cost effective technologies.

2. Project development objective and key indicators

The main national objective of the project is to increase the contribution of renewable energy sources in Morocco's energy mix and add capacity to the power grid to help cope with the sustained growth in electricity demand

Key specific performance indicators are the following:

- Total electricity generated from the ISCC power plant (GWh/year)
- Share of ISCC energy in total energy production (%)
- Solar output (GWh/year)
- Solar output as a percentage of total energy produced by the ISCC power plant

3. Global development objective

The global development objective of the project is to reduce greenhouse gas emissions from anthropogenic sources by increasing the market share of low greenhouse gas emitting technologies.

The project will test the viability of solar thermal technology and contribute to replication of integrated solar combined cycle (ISCC) power generation technology in Morocco and elsewhere through the learning effect provided by its construction and operation. It is one of a number of similar projects in the world to be supported by GEF as part of a program to accelerate cost reduction and commercial adoption of large-scale low greenhouse emitting generation technologies.

The main global benefits of the project are: (a) contribution to the demonstration of operational viability of hybrid solar thermal power generation in Morocco; (b) contribution to accelerated market penetration of large-scale backstop power generation technologies globally; and (c) reduction of greenhouse gas emissions from power generation.

To evaluate the performance of the project in achieving this global objective, the following indicators have been chosen:

- Cost of solar thermal ($\text{¢} / \text{kWh}$)
- Cost of solar power as a % of natural gas price

- Reduction in CO₂ emissions (tons / year) estimated at about 450,000 tons over the 20-year economic life of the plant
- Number of O.N.E.'s staff trained in various aspects of solar thermal technology
- Dissemination
 - Number of visitors to and information requests about the plant
 - Number of workshops and conferences in which the experience about the construction and operation of the plant was presented
 - Information about the plant posted on O.N.E.'s external web site

Other qualitative indicators:

- Lessons learned during the pre-construction phase (feasibility study and bidding process, environmental and social safeguards and financing.)
- Lessons learned during the construction of the plant; and
- Lessons learned from the operation of the plant and initial assessment of the viability of the technology after three years of operation of the ISCC power plant

The dissemination and other qualitative indicators are designed to capture the learning effect of the project. They are considered at least as important as the quantitative indicators.

(See Annex 3 – Results Framework for baseline and targets)

4. Project components

The project includes the integration of a solar trough collector field (of about 151,000 m²) producing a minimum energy output with a traditional natural gas-based power generating unit. The proposed project will be implemented in two phases. The first phase, now well under way, entails the engagement of specialized consultants to prepare a feasibility study, bidding documents, draft contracts, and to advise O.N.E. during the evaluation of proposals. The following phase involves the construction and operation of a solar/fossil fuel hybrid power station of about 227 MW² with an expected annual net production of 1,572 GWh per year. The solar output is estimated at 2.4% of the annual production representing 37.5 GWh per year. It is expected that the solar thermal power plant will be in service by December 2009.

Following an unsatisfactory response to competitive bidding for an IPP, Morocco's public power utility has decided to finance the solar thermal plant itself through an Engineer, Procure and Construct (EPC) cum Operation and Maintenance (O&M) contract. O.N.E. will thus be the owner of the plant. The O&M contract will last 5 years and include appropriate incentives to ensure an efficient operation of the plant, particularly the solar field. These incentives are related to the output of the solar field and efficiency of its operation and are enforced by monetary penalties. The O&M contract will also lay the ground for maximizing the utilization of the solar field over the long term through on the job training of O.N.E.'s staff in the operation and maintenance of the solar field. The bidding documents issued in July 2005 establish minimum requirements for the solar thermal power to ensure that the minimum solar share target can be met. The prequalification of consortia that have both combined cycle and solar thermal power

² O.N.E. may increase the size of the combined cycle plant from 227 MW to 360-400 MW.

experience ensures the effective integration of the solar field and the combined cycle power plant.

A breakdown of the project components is provided in the table below.

<i>Component</i>	<i>Indicative Costs (US\$M)</i>	<i>% of Total</i>	<i>Bank financing (US\$M)</i>	<i>% of Bank financing</i>	<i>GEF financing (US\$M)</i>	<i>% of GEF financing</i>
<i>1. Design, Construction and Operation of an Integrated Solar Combined Cycle Power Plant</i>	<i>185.39</i>	<i>85.00</i>			<i>43.2</i>	<i>100</i>
<i>2. Transmission lines</i>	<i>11.24</i>	<i>5.00</i>				
<i>3. Substations</i>	<i>9.04</i>	<i>4.00</i>				
<i>4. other infrastructure (1)</i>	<i>6.53</i>	<i>3.00</i>				
<i>5. Environmental and Social Dev. and Management</i>	<i>2.31</i>	<i>1.00</i>				
<i>6. Technical Assistance</i>	<i>5.09</i>	<i>2.00</i>				
<i>Total Project Costs</i>	<i>219.61</i>	<i>100.0</i>	<i>0.00</i>	<i>0.0</i>	<i>43.2</i>	<i>100</i>

(1) See Annexes 4 and 5 for details

(2) Costs include physical and price contingencies (see Annex 4)

The timeline up to construction is as follows:

1. Pre-qualification - Done
2. Preparation of bid documents - Done
3. Preparation and submissions of offers - Done
4. Technical and commercial evaluation of offers – Underway
5. Contract negotiations - February 2007

5. Lessons learned and reflected in the project design

Power Sector Development in Morocco

In earlier Bank projects, some of the critical issues were the high level of subsidy provided by GoM to O.N.E.'s investment program to compensate for delayed tariff increases, the high level of arrears, and the lack of autonomy of O.N.E. GoM has now shifted its policy by promoting private participation, which in turn has substantially reduced O.N.E.'s investment requirements. Furthermore, recent GoM actions on electricity tariff increases and those adopted by O.N.E. to recover arrears and to streamline its organization have substantially improved the financial and institutional performance of the sector.

Solar Thermal Power Plant Development Worldwide

No large scale thermal power plants have been built in developing countries to date. GEF-supported projects are now in preparation in Morocco, Mexico and Egypt. The most significant solar thermal installations are in California where 354 MW of parabolic troughs, with back-up gas fired steam boilers have been generating electricity and selling it to the utility for more than 15 years. To meet the cost reduction objective of the project, it is necessary to move beyond the trough/back-up boiler design upon which the California projects were based. The purpose is to permit higher thermal efficiencies, improve the dispatching of the plant and encourage greater competition in the design and supply of the equipment. Such a plant would be more attractive to utilities, thus increasing the market size. For this reason the project includes the following features: (i) bidders have been allowed to choose among qualified manufacturers for the parabolic trough designs and the gas-fired power equipment; (ii) competition is key to ensure the lowest electricity cost possible and, whenever possible, locally manufactured components; and (iii) the contractor will have incentives to maximize output from the solar field, which will bring about a focus on O&M costs, thus bringing down life-cycle costs.

To accelerate utility acceptance of a power generation technology based on intermittent energy sources such as solar, a way must be found to provide reliable backup and enable the delivery of firm power. The project integrates the STP plant with a gas-fired combined cycle power plant such that continuous generation by the hybrid plant is possible regardless of the solar radiation intensity at any particular time. Furthermore, more efficient construction, financing and operation can also be expected as a result of private sector involvement in the EPC and operation and maintenance contracts.

6. Alternatives considered and reasons for rejection

Choice of plant site

The pre-feasibility study financed by the European Community (EC) provided the economic analysis for the 11 alternatives studied at the Jerada and Ain Beni Mathar sites. The alternative at Ain Beni Mathar (about 80 km south of Oujda), which provided the lowest levelized tariff and the highest rate of return, was selected. The selection also included criteria about the sun level, the availability of cooling water, and the location with regards to the electricity grid and gas network.

Choice of solar technology

The Global Environment Facility (GEF) has identified “solar thermal-electric technologies in high insolation regions, initially emphasizing the proven parabolic trough variant for electric power generation”³, as one of the renewable energy technologies it supports through its operational program number 7. Development of solar power technology (STP) represents one of the most cost-efficient options for renewable bulk, power production, and the most cost-effective way of producing electricity from solar radiation. Indeed, STP could play an important role in

³ GEF: Operational Program Number 7: Reducing the Long-Term Costs of Low Greenhouse Gas-Emitting Energy Technologies.

meeting some of the increasing demand for electricity, with fewer emissions than the alternative plants powered purely with fossil fuels.

STP plants produce electricity in the same way as conventional power stations, except they obtain all or part of their thermal energy input by concentrating solar radiation and converting it to high temperature steam or gas to drive a turbine. Essentially, STP plants include four main components: the concentrator, receiver, transport-storage, and power conversion. Many different types of systems are possible using variations of these components. Although there are, broadly, three solar thermal technologies: the parabolic trough, the central receiver, and the parabolic dish system; the parabolic trough is the most technically and commercially proven option. However, although solar electric generating systems have proven to be a mature electricity generating technology, they do not represent the end of the learning curve of parabolic trough technology. A number of improvements and developments have taken place since. One of these improvements is the integrated solar combined cycle system (ISCCS), which integrates a parabolic trough plant with a gas turbine combined-cycle plant. Essentially, the ISCCS uses solar heat to supplement the waste heat from a gas turbine in order to augment power generation in the steam turbine. This represents cost savings for project using this design. Both the incremental cost and O&M cost of the ISCCS are lower than a trough plant alone, and the solar-to-electric efficiency is improved. Studies have shown that the ISCCS configuration reduces the cost of solar power by as much as 22 percent over the cost of power from a conventional solar electric generating station (SEGS) of similar size. The ISCCS is the most efficient technology available and it has been adopted for the proposed project (see Annex 15 for an illustration). It has however been decided to exclude thermal storage as this technology has not yet been commercially proven on a large scale

The Government, through the Ministry of Energy and Mines (MEM), is committed to the proposed project and has stressed its preference for a commercially proven technology. As such, it has been decided that the project design be based on the parabolic trough technology. The bidding for the proposed integrated solar combined cycle (ISCC) project is a two-stage bidding process. In the first stage, bidders responded to broad specifications for the desired power plant. A conference was held with the bidders at the end of which new specifications, representing a broad consensus, were issued to bidders who were invited to submit technical and commercial proposals for the second stage.

C. IMPLEMENTATION

1. Partnership arrangements

The project is co-financed by O.N.E., GEF and the African Development Bank (AfDB). Their respective contributions to the total project cost are 7, 20, and 73%.

2. Institutional and implementation arrangements

Consultants partially financed under a GEF PDF C grant, now closed, have assisted O.N.E. in the preparation of bidding documents, draft EPC and O&M contracts and will advise O.N.E. during the evaluation of proposals. This phase, which is still ongoing, is being carried out by O.N.E.'s Production Department following an agreed timetable.

The construction and operation of the ISCC power plant will be implemented by an EPC cum O&M arrangement to be secured through international competitive bidding. The Production Department of O.N.E. will have the responsibility for overall project management. This Department will ensure the coordination and the technical and administrative management of the project. It will work in close collaboration with the Supply and Markets Department for the procurement aspects, with the Environment and Quality Department for the coordination of the studies and the monitoring of environmental measures, and with the Technical Department for the technical controls and oversight. The Financial Department will be in charge of the project financial management, and coordination with the various loan/grant providers. The production department will be assisted by a consulting engineer to be recruited under the project and financed by AfDB and O.N.E.

The World Bank will supervise and monitor the implementation of the activities through regular supervision missions (with the African Development Bank) and regular contacts with O.N.E. The project will be co-financed by GEF, AfDB and O.N.E. The power station which comprises a combined cycle and a solar component will be jointly financed by AfDB and GEF because there will be a single contract signed for both. Following the pre-qualification exercise that took place in May 2004, four consortiums were formed each of which was composed of a combined cycle manufacturer and a solar manufacturer. This arrangement minimizes the risk to the project due to the fact that the responsibility and the risk of interface between the combined cycle and the solar component is left to the consortium and is not borne by O.N.E. Since the responsibilities are clearly defined, the arrangement also reinforces the incentives for operating the plant in the most efficient manner possible.

The implementation period will be three (3) years and is expected to take place between January 2007 and December 2009. In addition, the project will be supervised over the next three years to learn from its operation and ensure that the integrated solar combined cycle power plant is optimally operated.

The Personnel and Generation Departments of O.N.E. will oversee the training of their own staff in various aspects of ISCC technology.

3. Monitoring and evaluation of outcomes/results

Monitoring and evaluation

The project's primary purpose is to demonstrate and encourage replication of ISCC power generation technology in Morocco and elsewhere. Consequently, an adequate project performance monitoring, evaluation, and dissemination system is a key component of the project design.

The monitoring and evaluation of results and outcomes will be the responsibility of O.N.E. Data will be collected and reported on by the EPC contractor and the consulting engineer while under contract. The successor, be it O.N.E. or a private operator, will take over this responsibility for the remaining life time of the plant. This would allow continuous monitoring of the project's key indicators.

The format, contents and frequency of implementation progress reports as well as reporting procedures have been agreed with O.N.E.. The Bank will closely supervise the project during its construction and first three years of operation to make sure that the learning from this experience has been fully captured and disseminated. A mid-term review will be carried out after the first year of operation to evaluate the achievement of the project development objective and take corrective action to ensure an efficient operation of the project, especially the solar component.

The monitoring and evaluation of global benefits (market penetration, global cost reduction of ISCC technology, etc.) should be the responsibility of a global institution (e.g. GEF, World Bank, etc.)

Dissemination

O.N.E. has the primary responsibility for disseminating the results from the project both domestically and internationally, as a way to support future replication. The main components of O.N.E.'s dissemination strategy include: (a) transparency in the availability of information from monitoring and evaluation activities; (b) ease of access to relevant monitoring and evaluation information, as required by decision-makers and other users, including full disclosure of non-confidential information; (c) special initiatives to engage policy and operations decision-makers and program stakeholders in internalizing the lessons from experience and best practices; (d) use of lessons learned and best practices in the development of new policies and projects; and (e) systematic action on findings and recommendations that flow from the M&E program.

Some of the main dissemination techniques will include: preparation of reports, summaries and abstracts; management and staff review sessions; wide participation in project review processes by project staff and intended beneficiaries; special analyses of experience in project documents; country and regional seminars and workshops. O.N.E. will also make all the information about the ISCC power plant, including performance indicators, available on its external web site

The dissemination will also be made through facilitating visits by the power industry, utilities and other interested institutions from all over the world to learn from the construction and operation of the plant and the results achieved. O.N.E. has indicated that it welcomes such visits as well as requests for information.

The primary end users of monitoring and evaluation products are: GEF Council and GEF Secretariat, the relevant Conventions, STAP, other international organizations, NGOs, country representatives, power industry, utilities and related stakeholders and interested members of the public.

Capacity building of ONE for the above activities will be implemented as part of a technical assistance component to be financed by the project. A result indicator has been included in the results framework regarding the training of O.N.E.'s staff in integrated solar combined cycle power technology. The format will be a combination of formal and on-the-job training.

The dissemination of global results and outcomes should be the responsibility, as for the monitoring and evaluation of global benefits, of a global institution such as GEF, the World Bank, etc.

4. Sustainability

Project sustainability

The higher capital cost of the hybrid plant will be offset by the proposed GEF incremental cost grant and will not require increases in tariffs to consumers. The integration of the solar field with a CCGT is the most efficient technology available. The hybrid power plant is expected to operate sustainably as an integral part of the Moroccan power system. The incentive structure for the EPC cum O&M will ensure optimal design for integration of the solar thermal with the gas-fired plant and maximize solar output from the plant when in operation. Dissemination of information about this demonstration project will contribute to future replication in Morocco and elsewhere and help refine GEF strategy regarding this technology.

The Government is currently engaged in the implementation of strong policy measures that would: (i) open up the electricity market; (ii) rationalize energy pricing to increase the competitiveness of firms; and (iii) promote renewable energy and energy efficiency to reduce the country's energy dependence.

O.N.E. has devoted considerable effort to preparing the proposed project to address growing concerns in Morocco about the adverse environmental impacts of SO₂ and CO₂ emissions from conventional power plants. The Government of Morocco (GoM) and O.N.E., which will be directly responsible for the project, are fully committed to the project's success and sustainability and have already collected a considerable volume of information and data on the construction, operation and maintenance of solar thermal power plants in the US and Europe. O.N.E. power plant staff will be trained in the requisite skills for operating and maintaining a hybrid solar combined cycle power plant during the construction and operation of the plant.

Solar thermal power (STP) technology has made remarkable progress over the past decade. Many new STP plant technologies and component designs are now being operated successfully. Teething problems experienced during adjustment periods have been successfully addressed. Because of the important risks related to the introduction of this complex technology, governments and agencies in Europe and the US have cooperated with the private sector, sponsors and financial institutions to support demonstration projects to minimize investment risk. As expected, performance of some of the STP demonstration plants was lower than expected and appreciable adjustments and operational modifications were made to ensure trouble-free operation. After the initial teething problems, the performance characteristics of the plants have approached design targets and even exceeded them in a few cases.

For the proposed project, a large part of the experience gained in constructing and operating new STP projects in the US and Europe will be made available through GEF support. However, implementation and operation of the technology in a developing country still carries appreciable risks. The plant availability factor may be lower during the first year or two than those achieved in overseas projects. Nevertheless, the chance of ultimate success for the project is high as are

the global benefits from the dissemination of the technology in Morocco and other countries. The success of the proposed project, which GEF support would promote, is the critical first step in Morocco's and the Northern Africa region's gradual approach for adopting and developing ISCC technology on a large scale. GEF support is also critical to strengthening and speeding up the dissemination and replication strategy.

Replicability

The general approach adopted by the project is highly replicable within Morocco, regionally and globally. The main barriers for future replication are costs and the associated learning needs, the overcoming of which this project is expected to address by providing cost reduction and operation information and disseminating it throughout the STP community. Successful construction and operation of the proposed commercial-scale ISCC project will convincingly demonstrate a cleaner and reliable way to meet growing power demand in Morocco and thus pave the way for replicating the technology elsewhere in Morocco and particularly in the Southern Mediterranean "sunbelt" (Algeria, Tunisia, Libya, and Egypt). The project would also promote replication of the technology in Morocco and elsewhere by: (a) transferring experience in the design, construction, and operation of ISCC plants in a developing country context; (b) facilitating the manufacture of some ISCC components in Morocco, which will reduce their cost and make the technology more cost-effective; and (c) training personnel of neighboring countries' utilities to operate ISCC power plants.

Furthermore and most importantly for replicability, there are no countervailing reductions in international prices of competing fuels (particularly fossil fuels) and competing technologies. Quite the contrary is currently happening in international markets, particularly for fossil fuels where the high price levels achieved are widely believed to be a long-run trend not likely to be reversed.

The legal and regulatory framework currently being put in place under the Bank's energy Development Policy Loan (DPL), now under preparation, supports the development of renewable energy and its integration into the grid and lays the ground for replication of the solar combined cycle power technology in Morocco. Furthermore, the project's potential for replicability in Morocco alone is large because the country has one of the world's best solar resources. The success of the proposed project, with GEF support, is the critical first step in Morocco's gradual approach for adopting and developing ISCC technology on a large scale. GEF support is also critical to strengthening and speeding up the dissemination and replication process. After the replication of the proposed ISCC project on a larger scale in Morocco and elsewhere, it is expected that the production cost of the ISCC power plants will fall significantly and that the levelized electricity generation cost will be about the same or even less than that of conventional power plants. The cost reductions will result from three factors: reduced component costs due to increased manufacturing volume, economies of scale from increased plant size, and technological improvements.

5. Critical risks and possible controversial aspects

Risk	Risk Rating	Risk Mitigation Measure
From Outputs to Objective		
The continued commitment to innovative approaches to clean energy production (especially renewables) is not maintained	M	Continued engagement with the Go M for the success of the project through sectoral policy dialogue.
The level-playing field between renewables and other sources of energy is not established / maintained	M	1. Develop an energy strategy (including renewables) (to be financed by ESMAP) as part of the Energy DPL 2. GEF grant and competitive bidding provide safeguards
From Components to Outputs		
Technological or design problems are encountered	M	Only pre-qualified firms are allowed to bid.
There is no incentive to ensure that the solar contribution is maximized / the incentive is not working properly?	M	Ensure that incentives are properly designed and included in the contractual arrangements, particularly in the O&M contract
O.N.E. does not have experience with hybrid solar combined cycle power plants.	M	O.N.E. staff will be trained in the requisite skills during the construction and operation of the plant.
O.N.E. does not place a high priority on disseminating learning.	M	A monitoring and evaluation plan has already been agreed with ONE, including dissemination indicators to be monitored during the operation of the plant
Overall Risk Rating	M	

6. Grant conditions and covenants

Effectiveness conditions

The following event is specified as condition of effectiveness of the Grant Agreement:

- Engineering consultant recruited.
- EPC/O&M signed.

Disbursement Conditions

- Effectively compensate the people affected by the land acquisition for the power station
- Effectively compensate the people affected by the land acquisition for the gas pipeline

Other covenants: Project Execution and Environmental and social safeguard measures

1. In carrying out the Project, the Recipient shall ensure that:

- (a) all land acquisition required for the purposes of carrying out any works under the Project, and activities related to the resettlement, rehabilitation and compensation of PAPs in connection with such works, will be completed prior to the carrying out of such works and in accordance with the provisions set forth in the EA, EMP, the RPF and the relevant RAPs in a manner satisfactory to the World Bank; and
 - (b) the RPF and related safeguard policies shall uniformly apply to all components of the Project that result in involuntary resettlement and/or land acquisition, regardless of the source of financing.
2. (a) The Environmental Assessment, the EMP, the RPF and the RAPs shall not be amended, revised, or abrogated without the prior approval of the World Bank;
- (b) Prior to the carrying out of any Project activities not identified, assessed, nor included in the Environmental Assessment or EMP, such activities shall be subject to an environmental assessment, under terms of reference and in form and substance satisfactory to the World Bank; and
 - (c) Land acquisition activities under the Project which have not been identified, assessed, nor included in a RAP or RPF shall be subject to an environmental and social assessment under terms of reference and in form and substance satisfactory to the World Bank.

D. APPRAISAL SUMMARY

1. Economic and financial analysis

The economic benefits of the proposed project include increased availability and improved quality of power supply. Furthermore, the project would assist ONE to develop institutional and technical capabilities in solar thermal combined cycle technology.

Although the project is expected to play an important role in the optimal development and operation of the power subsector, its benefits to consumers cannot be separated from those of other least-cost generation, transmission, and distribution investments and institutional improvements. In these circumstances, it is appropriate to carry out the cost-benefit analysis on O.N.E.'s entire investment program to ensure that it is justified. For this purpose, a "time-slice" of O.N.E.'s investment program for generation, transmission, and distribution for the period 2006-2030 has been analyzed. The capital costs of the investment program, together with incremental fuel as well as operating and maintenance costs associated with the investment program, are shown in Annex 9. All costs are expressed in terms of their equivalent border values. A minimum measure of the economic benefits associated with the investment program is represented by incremental sales revenue. On this basis, the net present value is estimated at USD 1,792 million at 10% discount rate.

The foregoing revenue based measure of the net present value is, by its nature, more a measure of the adequacy of tariffs than of the true economic merit of the investment program, which includes the project. A better measure of economic benefits could have been obtained by estimating consumers' willingness to pay (WTP) for the incremental electricity sales. However, since domestic consumers are subsidized, the WTP is likely to be much higher than the average 2004 tariff used in the calculations. If, therefore, the program, including the project, is justified

with the average tariff used as proxy for economic benefits, it is *a fortiori* justified if one were to use WTP.

The switching values⁴ of critical variables (investment cost, operation and maintenance, fuel cost, sales and average tariff) calculated in Annex 9, show that the project is robust to variations in these variables. Tariffs, however, should be kept under constant review over the life of the investment program and measures to adjust them taken in a timely manner.

Incremental Cost Analysis

An incremental cost analysis based on intertemporal comparisons of the baseline and likely plant and the proposed GEF alternative is shown in Annex 16. This incremental cost analysis shows that the incremental cost of the Ain Beni Mathar ISCC plant is \$49.6 million. US\$43.2 million will be contributed by GEF and US\$6.4 million will be covered by the AfDB loan already in place.

Financial analysis

1. Historical analysis (2003-2005) :

O.N.E.'s financial position during the last three years (2003-2005) was sound. This is supported by the following: (i) adequate tariff (average of USD 0.08 per KWh in 2006, second highest in the MENA region after Lebanon) compared with O.N.E.'s operating cost excluding depreciations of USD 0.065 per KWh; (ii) new client arrears, which were substantially reduced from 9 months in 1994 to 4 months in 1997. According to the 2005 financial data, last year arrears have represents about 4 months and half of turn over. Table 1 (Annex 9) provides a summary of O.N.E. financial statements and performances during the last three years⁵. The historical analysis shows that:

- O.N.E. operating revenues increased by more than 16% in 2005. Half of the growth was due to the quantity of energy sold which increased by about 9 %, confirming the tendency of the last three years in terms of growth in electricity demand in Morocco. The remaining change in operating revenue was due to other operating revenues which doubled in 2005.
- However, the increase in operating revenues was more than offset by a sharp increase in production costs due to: (i) increase in fuel costs which almost doubled between 2003 and 2005 and (ii) 14 % increase in the cost of power purchased and imported by O.N.E. mainly from Jorf Lasfar IPP and Spain. Consequently, the operating income was negative in 2005 for the first time in three years. In order to preserve its financial autonomy, O.N.E. obtained the government approval for a 7% average increase in tariff. The change in prices was made effective in two stages during 2006 (in February for industrials and in

⁴ A switching value indicates by how much the variable has to change to reduce the net present value to zero.

⁵ Audit report for 2005 is yet due. The financial data used however is considered as final by ONE finance department.

July for households). This was the first increase in O.N.E. electricity prices since 1997 (See Box 1).

- Arrears over a year old owed by former publicly-owned and operated regional utilities companies remain an issue. Their total amount is MAD 1,072 million (USD 123 million equivalents). Most of the arrears, 900 MAD, are due to the former public water and electricity utility of Casablanca which is now operated by Suez under a concession contract. Under the contract the private operator is not responsible for the liabilities of the previous public entity. Therefore, unless an agreement with the Municipality of Casablanca is reached; O.N.E. will have to write them off as part of the extensive balance sheet cleaning exercise currently underway. These arrears are expected to have minimal impact on O.N.E.'s future financial viability.

Box 1 : Brief overview of ONE tariff policy

In 1997, following a major tariff study, an inter-ministerial commission fixed prices in an effort to effect a more demand-oriented tariff structure. Under the restructuring, peak hours were introduced, customers were provided with the option of new tariff initiatives better adapted to their activities, low voltage tariffs were readjusted, and medium voltage tariffs were reduced to a level better suited for industrial consumption. Over the next seven years, electricity tariffs were reduced, overall, by 34 percent, as follows: 5 percent in 1997, 6 percent in 1998, 17 percent in 2000, and 6.2 percent in 2004. Consequently, ONE had a deficit of MAD 2.3 billion (USD 274 million equivalent) in 2001. The transfer of the Jorf Lasfar plant to the private sector under an IPP agreement contributed further to the loss of revenue.

2. Projections and scenarios analysis (2006-2011) :

Financial projections for 2006-2011 (Table2, Annex 9) are largely based on the assumptions summarized in table 1. These assumptions were discussed with O.N.E. and are based on the utility least cost plan for production and expectations in terms of coal, fuel and natural gas prices. The base case scenario takes into account conservative expectation for hydropower production; succession of low and medium years in terms of water flows.

Table 1 : Base case scenario assumptions

Assumptions	2006	2007	2008	2009	2010	2011
Hydropower production expectation	Low	Medium	low	Medium	Low	Medium
Sales growth rate (%)	8.0%	7.0%	7.0%	6.8%	6.8%	6.8%
Sales in GWh	19,114	20,452	21,883	23,372	24,961	26,658
Increase in average price	7%	0%	0%	0%	0%	0%
Average price (Cts MAD)	72.54	72.50	72.55	72.74	72.93	73.12
Power production growth(%)	7.9%	7.0%	7.0%	6.5%	6.5%	6.5%
Technical losses rates(%)	9.2%	9.2%	9.2%	9.0%	8.7%	8.5%
Power production in GWh	21,050	22,525	24,100	25,675	27,350	29,134
Electricity purchased by ONE in GWh	14,385	15,750	15,680	18,825	20,970	23,115
Average price for power purchased Cts MAD/kwh	38.23	40.48	37.68	34.55	30.26	30.26
Imported Coal cost (US\$/Tonne)	71	67	67	67	67	67
Fuel costs (US\$/Tonne)	273	274	273	273	308	308
Natural gas (US\$/1000m3)	5.3	5.3	5.3	5.3	5.3	5.3
MAD/ US Dollar exchange rate	9	9	9	9	9	9
MAD/ Euro exchange rate	11	11	11	11	11	11
Investment program (Millions MAD) ⁶	7,035	5,400	5,640	8,330	8,660	3,410
Debt service (Millions MAD)	1,087	1,171	7,163	2,207	2,463	2,680

The Planned investments for the period 2006-2011 will total approximately MAD 36 billion (USD 4 billion equivalent). These represent the expansion and upgrading of more than 70 percent of O.N.E.'s fixed assets.

The base case scenario includes also O.N.E. planned externalization of its pension fund which will require about 11 billion MAD (USD 1.2 billion equivalent) of additional debt to be financed through the issuance of two bonds in 2006 and 2008. Note that 2006 losses in terms of net income are mainly due to O.N.E. write off of the pension fund assets. The write off should not affect O.N.E. cash position.

Overall under the base case scenario and taking into account the 2006 tariff increase, O.N.E.'s financial situation should remain sound during the next five years as perceived from its cash position, earning before interest and taxes (EBITA) and debt service ratio.

Nevertheless, given that O.N.E. is currently undertaking an update of its investments master plan in order to be able to respond to the recent upward change in terms of growth in electricity demand, it is likely that capital expenditure will be higher than currently planned. While the financing of any additional capital expenditures would be financed through PSP/IPP schemes, O.N.E. might need further tariff revisions in order to be able to raise additional capital (see scenario analysis below).

⁶ Including the investments implemented by the private sector under concessions contracts with ONE.

A sensitivity analysis was carried out to assess O.N.E.'s financial situation under different scenarios for fuel, coal and natural gas prices as well as the price of power purchased. The analysis included two scenarios: (i) 5% annual increase in the cost of fuel, coal and natural gas and 5% annual increase in the price of power purchased and (ii) same as scenario 1 but with 10% annual increase instead of 5%. The table below summarizes the impacts of both scenarios on O.N.E.'s EBITA and Debt coverage.

Scenarios summary	2005	2006	2007	2008	2009	2010	2011
Base case							
EBITA	2,583	3,789	3,770	4,963	6,173	6,291	6,739
Debt coverage ratio	6.6	3.5	3.2	1.5	2.8	2.6	3
Scenario 1							
EBITA	2,583	3,330	3,747	4,222	4,744	5,316	5,695
Debt coverage ratio	6.6	3.1	3.2	1.4	2.1	2.2	2
Scenario 2							
EBITA	2,583	2,876	2,772	2,650	2,490	2,286	2,449
Debt coverage ratio	6.6	2.6	2.4	1.1	1.1	0.9	1

O.N.E.'s financial position remains sound under the first scenario. However, as shown by the results from scenario 2, an increase of more than 5% will require a further increase in O.N.E.'s tariff. Should the second scenario materialize, the lengthy process for public utility tariff revision in Morocco might have a further negative impact on O.N.E.'s financial performance.

2. Technical

The main technical issue to be addressed is the specification of the performance required from the plant in terms of its capacity, output, fuel consumption, and efficiency and how these are to be divided between the conventional and solar portions of the plant. In addition to minimum qualifications for the solar trough technology, these performance specifications will ensure effective integration of the steam systems for the solar field and the gas-fired combined cycle plant. The contractor selection process will review plant designs to ensure that the plant will operate effectively in all modes. In particular, integration and control of the system should be flexible enough to allow the solar contribution to be consistently maximized, while under other circumstances allow power to be efficiently generated on natural gas only (e.g., during night time or if, for some reason, the solar field is not operational). Creating an incentive structure to maximize solar output from the field for the whole life of the plant and a bid evaluation mechanism, which is transparent but does not inadvertently introduce a bias for or against a particular technology or cause bidders to 'game' the evaluation is a significant task. The bid evaluation criteria and the determination of the levelized electricity cost (LEC) include incentives for the maximization of the solar output. This will be reflected in the EPC and O&M contracts.

3. Fiduciary

The financial management system was appraised to determine if it complies with the requirements of the Bank in respect to OP/BP10.02. The evaluation of the O.N.E. covered the areas of accounting and financial management, as well as the reporting and auditing process of the project. The financial management system, including necessary arrangements to respond to the needs of the financial monitoring of the project, satisfies the requirements of the Bank.

The financial management system presents a low fiduciary risk. The project will be carried out while being based on the procedures and the accounting and financial organization of the O.N.E., which has a financial management system considered to be satisfactory. As an autonomous public entity with commercial and industrial characteristics, the O.N.E. has financial autonomy and is subjected to the financial control of the State. Its accounting system is based on the rules applicable to the state owned enterprises and its financial statements are submitted to an annual external audit. In addition, the O.N.E. has acquired a substantial experience in financed project management.

The financial management will be ensured by the finance and treasury divisions within the financial department of the O.N.E., in coordination with the concerned technical departments. Specific arrangements for the needs for financial reporting were approved during the evaluation. Financial monitoring reports (FMR), which will cover all the activities and sources of funds of the project, will be prepared quarterly by the O.N.E. and transmitted to the World Bank and the other donors of the project 45 days after the end of each period. The final format of these reports has been transmitted to the O.N.E. during appraisal. An annual audit report of the project accounts, transmitted to the Bank no later than six months after the end of each exercise, will be carried out in accordance with the Bank guidelines by an acceptable auditor and according to acceptable terms of references by the Bank.

The project is co-financed by GEF, AfDB, and O.N.E. Financial flows will come from the funds of the GEF via the Bank, loan funds from the AfDB, and counterpart funds financed by the O.N.E. Flows of funds between the World Bank, the ONE, and the recipients will be organized according to traditional disbursement procedures of the Bank. In order to facilitate the disbursement of the eligible expenditures, the O.N.E. will open separate accounts individualized for each donor in the name of the project in a commercial bank. The opened account for the funds will be managed in accordance with the procedures of the Bank as regards to disbursement.

4. Social

The development of the power plant is expected to have a positive social impact on the local population and the local economy (i) providing both direct (and indirect) sources of employment during the construction and production phases (500 direct jobs during the former and 50 during the latter phase) - the majority of workers will be locally recruited; (ii) leading to improvements in local infrastructure including the rehabilitation of local roads; and (iii) improving access to electricity particularly for poor rural families who are currently not connected.

During project preparation, the World Bank's team and a representative of the *Office Nationale d'Électricité* (O.N.E.) conducted a series of informal consultations with pastoralists in the immediate vicinity of the proposed plant. The local pastoralists viewed the plant as an asset to the region given its employment generation potential and improved availability of electricity.

The project site is situated 10 kilometers to the West of the national route P19 linking Oujda (90 km to the North) and the town of Ain Beni Mathar. The entrance to the access road for the project site is about 5km to the north of the town of Ain Beni Mathar. The project site itself and its immediate vicinity are sparsely populated. The main economic activities of the inhabitants are extensive agriculture and extensive livestock grazing. The site itself is used by local nomadic pastoralists for grazing purposes. However, given the large tracts of land available in the vicinity it has been determined that the livelihoods of the pastoralists will not be unduly compromised by the presence of the power plant, or the access roads, power lines or gas lines.

A potential negative social impact of the project is the spontaneous development of a shanty town community in the vicinity of the project site drawn to the increased employment opportunities in the area. The presence of a sizeable town in the area, Ain Beni Mathar, may mean however, that immigrants to the area may relocate there. Local authorities and O.N.E. will have to be aware of the potentially negative impacts and monitor the development of the area.

5. Environment

An initial environmental assessment was undertaken by a consultancy firm and completed in mid-2004. The project was designated as Category B project on the basis of this first report and the subsequent Environmental Assessment Study performed by a consortium composed of another international and a local consultancy firm; as the O.N.E. decided to undertake a complementary study in order to cover the aspects related to the construction of the two 225 kV and the 60 kV transmission lines, and to cover some of the missing aspects related to the World Bank policies and requirements.

The new assessment, undertaken for the totality of the project, with both components integrating the solar trough collector field and the traditional natural gas-based power generating unit, confirmed that the project has minimal negligible impacts on the environment as the plant utilizes solar and natural gas. The use of solar power does not produce any pollutants, and the combustion of natural gas generates the lowest level of CO₂ emissions compared to any other fossil fuel. In addition, the combustion of natural gas does not entail SO₂ emissions, and has significantly lower emissions of NO₂ than other fossil fuels. In that respect, the project has an overall direct environmental benefit as it will lead also to an increase in the share of renewable energies in the country's energy sector, and a reduction of green house gases emissions. The report also confirmed the potential very positive socio-economic fallouts due to the creation of employment.

The key environmental issues raised and properly addressed in the environmental assessment and the EMP are the main risks that could exist due to an accidental contamination of the site by the heating fluids during operation as well as during transportation to the site in the construction phase. Such risks will be largely reduced and properly managed through the inclusion of a retention and treatment system and by following the safety measures for proper handling and transportation of hazardous substances.

The volumes of cooling water to be pumped from the aquifer, in the selected proposal presented in the international competitive bidding, should not exceed the maximum amounts, as determined in the environmental assessment in order to maintain the current balance of the resource.

The most important impacts expected during the construction phase are due to the large volumes of construction and solid wastes that will be generated.

The Environmental Management Plan has included the potential environmental impacts associated with the construction of the Power Plant, the substations, the access road to the Plant and the transmission lines; in addition to the proposed mitigation measures, and a proper monitoring program. A capacity building program to strengthen the capacities of the O.N.E. for the follow-up on the implementation of the overall EMP, as well as the implementation of the parts of the EMP under the direct mandate of the O.N.E., has also been built in into the project.

In addition and given the special nature of the project as a GEF project aiming at disseminating the results and the lessons learned to increase the overall global benefits, a comprehensive monitoring and evaluation program that goes beyond the environmental safeguards requirements of the Bank has been included in the Environmental and Social Development and Management Component.

6. Safeguard policies

Environmental

The project has triggered the Environmental Assessment Policy (OP 4.01), which requires a partial assessment to be conducted for the project, and the preparation of an Environmental Management Plan. The Borrower has contracted out an independent consultant to undertake this assessment and prepare the EMP. The review of the first drafts of the EMP revealed an obvious lack of details and specific mitigation measures, which did however exist in the Impact Assessment Report. The Borrower was accordingly requested to amend the EMP with the support of the consultant, to integrate the specific mitigation measures. The potential environmental impacts of the power plant are confined to the site and appropriate mitigation measures have been identified and included in the Environmental Management Plan (EMP), which follows the World Bank's guidelines, notably OP 4.01.

Social

The Social Safeguards policy on *Involuntary Resettlement* (OP/BP 4.12) has been triggered as it has been determined that land acquisition will be required for the construction site of

the power plant, the gas pipelines, the access road and the electric lines. Specifically, the project requires the acquisition of:

- 159 ha 97 are 50 ca for the power plant,
- 6 ha 17 are 11 ca where the gas pipelines will be laid and 12 ha 35 are 20 ca will be temporarily occupied/used during the construction phase;
- For the access road and electric lines, a study is being undertaken to determine the exact land size requirements.

A Resettlement Action Plan (RAP) and a Resettlement Policy Framework (RPF) have been prepared for the project. The RAP applies to the power plant site and the gas pipelines because the project-affected people have already been identified and land acquisition procedures have been launched. Since the exact nature and extent of land acquisition for the access roads and electric lines has not yet been determined, an RPF has been formulated, which will be followed with a Resettlement Action Plan downstream once the feasibility study has been completed.

At the time of appraisal, the project affected persons on the Power Plant site had been compensated by O.N.E. for the loss of agricultural productivity. The assets valuation of the people on the gas pipeline site has been completed and O.N.E. anticipates to proceed to the compensation due to these people prior to the start of the work. As mentioned earlier, the precise sites and lands to be acquired for the construction of the access roads and the electric lines have not yet been determined; hence the compensation procedure will be launched once the sites and the people whose land will be acquired have been determined, as stated in the RPF.

The persons and government agencies affected by the land acquisition can be classified as follows:

- **Public land:** For the power plant site, the *Office Nationale de l'Electricité* (O.N.E.) has proceeded with the purchase of land from the Ministry of Interior, the custodian of public collective land. Two land parcels for the gas pipelines will also be acquired in the same manner.
- **Collective land owned by the Commune of Beni Mathar - *Collectivité Ethnique de Béni Mathar*:** O.N.E. has compensated the collective land users who are actually farming on the site selected for the power plant for the loss of their crops/harvest.
- **Private land:** For the gas pipelines, 21 land owners will be compensated for their land and any eventual loss of crops/harvest. As for the power plant site, there are no private land owners whose land will be acquired.
- **Land owned by public Agencies (*Office Nationale de Chemin de Fer, Direction Régionale de l'Equipement, et l'Agence du Bassin Hydraulique de Moulouya*):** O.N.E. is preparing and processing a request letter for the permission of temporary occupation of these lands owned by public entity agencies during the construction phase.

In June 2006, a social assessment was conducted at the project site with all the acquisition-affected people. A series of intensive consultations were conducted with 8 persons whose land and/or assets will be affected by the power plant construction and 21 persons affected by the gas pipelines. The people were informed about the project and the compensation

procedures for their loss. In addition the consultations touched upon the implications of the project in terms of employment generation. The assessment further improved the local communities' understandings of the project and its implications, and confirmed that the populations are awaiting the employment opportunities which the project will likely offer.

Equally, elected representatives of the local commune of Béni Mathar as well as three public agencies that will be affected by the land acquisition for the gas pipeline, including *l'Office National des Chemins de Fer (ONCF)*; *la Direction Régionale du Ministère de l'Équipement et l'Agence du Bassin Hydraulique du Moulouya* have been consulted in this regard.

The entity responsible for land acquisition in O.N.E. is the *Division Gestion du Patrimoine et des Affaires Immobilières*. The Division has experience in land acquisition issues and operates according to Moroccan law. However, given their unfamiliarity with Bank guidelines, a capacity building program will be conducted for the ONE staff working on land acquisition in order to enhance their knowledge about the Bank's guidelines on Social safeguards, and precisely the policy on Resettlement and Land acquisition. It is further recommended that a third party (NGO or consultant) be hired to work with O.N.E. and provide additional oversight on land acquisition issues during the implementation and supervision stage of the RPF and RAP, in compliance with Bank social safeguards to ensure the timely implementation of land acquisition procedures.

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Natural Habitats (OP/BP 4.04)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pest Management (OP 4.09)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cultural Property (OPN 11.03 , being revised as OP 4.11)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Involuntary Resettlement (OP/BP 4.12)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Indigenous Peoples (OD 4.20 , being revised as OP 4.10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Forests (OP/BP 4.36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Safety of Dams (OP/BP 4.37)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects in Disputed Areas (OP/BP/GP 7.60)*	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (OP/BP/GP 7.50)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

7. Policy Exceptions and Readiness

Not Applicable

* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas

Annex 1: Country and Sector Background

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

The Economy

- 1. *Promoting rapid growth and creating jobs:*** Morocco's population is about 30 millions and its 2005 income per capita was about \$1,653. Approximately 400,000 new jobs must be created annually until 2010 to meet the goal of 6% unemployment set in 2004 by the government. The challenge for the country is therefore to promote rapid economic growth as an engine for job creation.
- 2. *Maintaining macroeconomic stability:*** Morocco has maintained macroeconomic stability. Morocco's inflation rate was 1% in 2005, down from 1.5% in 2004. As a result of higher food and fuel prices, it is forecast to reach about 2.5% in 2006. The challenge for Morocco is to keep the inflation rate differential between Morocco and its main trading partners in check so as to maintain the competitiveness of Moroccan exports.
- 3. *Controlling fiscal expenditures:*** Controlling fiscal expenditures remains a priority for Morocco. The fiscal position of the Kingdom improved in 2005 despite important expenditures generated by the implementation of early retirement programs and higher petroleum product prices, because of the remarkable resilience of fiscal revenues. The 2005 budget deficit was about 4.2%. The public wage bill accounts for more than half of government expenditures and control is therefore a priority for the government. The purpose is to reduce its weight relative to gross domestic product (GDP) and to strengthen public savings to finance public investment. Early retirement and other measures which have benefited about 38,800 public servants have contributed to the reduction of the wage bill from 13% of GDP in 2005 to 12 % of GDP in 2006.
- 4. *Fostering efficiency and trade:*** Since the early 1980s, Morocco has pursued other economic liberalization efforts including a reform program supported by the World Bank and International Monetary Fund (IMF). Morocco has signed several agreements with the European Union on economic cooperation, including one establishing a free trade zone for industrial goods over a 12-year transition period. The U.S.-Morocco Free Trade Agreement (FTA), which was signed in 2004, eliminated tariffs on 95% of bilateral trade, with the remaining tariffs to be eliminated over the next nine years.

The Energy sector

- 5. *Overwhelming dependence on imports to meet energy needs:*** Morocco is almost entirely dependent on imported fossil fuels with 81 percent of its needs met through imports. The country is the largest energy importer in northern Africa with a total cost for its imports fluctuating between \$1 billion and \$1.5 billion per year. Access to electricity is increasing. It is currently 72% but is expected to reach 98% in 2007, with a rapid growth in rural electrification.

6. *Power shortages, lack of investment resources and the private sector:* Power shortages and a desire to control public spending have led the Moroccan government to call more on the private sector to meet the country's power needs. The sector is being restructured to introduce competition and private sector participation. Several institutions will be created, including a regulatory authority. The national utility (O.N.E.) will be transformed into a shareholding company and broken down into several affiliated companies to cater to different segments of the market (regulated and non-regulated). O.N.E. will continue to be solely responsible for the transmission and distribution networks it owns.

7. *Develop international market integration in electricity and gas:* Morocco is gradually integrating its electrical grid with those of its neighbors in Africa and Europe. The electricity grids in North Africa are interconnected as follows: Egypt-Libya-Tunisia-Algeria-Morocco. A Libya-Egypt 220 kV connection came into operation in 1998. The Libya-Tunisia 220kV link was completed in 2001. The Tunisia-Algeria-Morocco 220 kV link has been in operation with the European system since October 1997 through a Morocco-Spain submarine cable. This means that the East and Southern Mediterranean countries, stretching from Turkey to Morocco are connected with the European system via the existing Spain-Morocco link or the connections with Turkey and Greece or Bulgaria. These links will form the basis for a Mediterranean Power Pool (MPP) and enhance regional power trade in North Africa and the Mediterranean Basin. Morocco should take full advantage of existing arrangements in electricity and gas to lessen dependence and vulnerability and secure supplies at least cost. The Tunisia, Algeria, and Morocco interconnection is being upgraded to 400 Kw.

8. Morocco is a transit country for Algerian gas exports to Spain and Portugal. The Algerian gas is transported across the Strait of Gibraltar via the 300-350 Bcf/year Maghreb-Europe Gas (MEG) pipeline. Morocco receives royalties (in cash or in kind) from the pipeline as payment for passage through its territory and is increasingly turning to natural gas to meet increasing domestic energy demand. Gas from the MEG pipeline is used to power Morocco's third independent power project (IPP) in Tahaddart, near Tangiers. It will also be used in the Solar thermal power station of Ain Beni Mathar now being proposed to GEF for financing (The Board of Directors of the AfDB has already approved a loan of about \$165 million towards the financing of this project). It is forecast that many other power plants in ONE's least-cost expansion plan will also be gas fired.

9. *Monitor progress in hydrocarbon sector:* According to some estimates, Morocco has proven oil reserves of 2 million barrels and gas reserves of 43 billion cubic feet (Bcf). The Moroccan Office of hydrocarbon research (ONAREP) is hopeful about finding additional reserves - particularly offshore - following discoveries in neighboring Mauritania. Currently, Morocco produces small volumes of natural gas and oil in the Essaouira Basin and small amounts of gas from the Gharb Basin. In March 2000, Morocco modified its hydrocarbons law to offer a 10-year tax break to offshore oil production firms and reduce the government's stake in future oil concessions (to a maximum of 25%). The sector is due to be liberalized by 2007.

10. *Promote renewable energy and energy efficiency:* Renewable energy plays a key role in O.N.E.'s energy development plan. The goal is to provide 80% of rural areas with electricity by 2008, while increasing the share of renewables from 0.24% in 2003 to 10% in 2011. The plan calls for two new wind projects. One of the wind power facilities (60 MW) will be located in Essaouira, while the other (140 MW) will be located near Tangiers. The Essaouira facility is scheduled to come on-line in 2006. There is also a good potential for solar energy. In addition, although electricity prices are high there is still a large scope for energy efficiency and energy conservation in the domestic and industrial sectors and ESMAP is working with the Ministry of Energy and Mines and the Centre de Développement des Energies Renouvelables (CDER) to develop a strategy for encouraging both. The CDER is responsible for undertaking studies and research promoting the utilization of mini-hydro, solar, and wind technologies. At the same time, it plays an important role in the implementation of measures promoting efficiency in energy use and the reduction of greenhouse gas emissions.

Annex 2: Major Related Projects Financed by the Bank and/or other Agencies
MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

The Bank has not been active in the power sector in Morocco for the last ten years. The only operation now under supervision is a GEF medium-size project: *The Energy and Environment Upgrading of the Industrial Park of Sidi Bernoussi* due to close in December 31, 2006 and whose objective is to promote energy efficiency in the industry.

Other lenders such as EIB, KfW, JBIC and AfDB support the development of the power sector in Morocco. Their most recent projects are shown below:

Agency	Project	Target Issue (s)
African Development Bank - Integrated Solar Combined Cycle Power Plant (to be co-financed with GEF) - Network Interconnection	Generation	Increase supply of electricity
	Transmission	Increase transfer capacity and enhance security of supply
EIB, FADES, Kuwait Fund - Pumped Storage	Generation	Increase transfer capacity and enhance security of supply
KfW - Essaouira wind farm	Renewable energy	Increase the share of renewable energy in the energy mix and reduce GHG emissions
AFD, JBIC, KfW, EU and IsDB	Rural electrification	Improve access

Annex 3: Results Framework and Monitoring

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

Results Framework

PDO / Global Environmental Objective	Project Outcome Indicators	Use of Project Outcome Information
<p>1. Increase contribution of renewable energy in Morocco's energy mix and provide more capacity to meet demand</p> <p>2. Reduction of CO₂ emissions, which contribute to global climate change, relative to continued reliance on fossil fuels.</p> <p>3. The long-term costs of low greenhouse gas emitting technologies is reduced.</p>	<p>1. More capacity and more renewable energy Solar</p> <p>2. Reduction of annual CO₂ emissions (a minimum of 20kt of CO₂/year).</p> <p>3. Thermal Power Plant costs in ¢ / kWh</p>	<p>Lessons learned will serve in the design of future ISCC power plants</p> <p>Monitor CO₂ emission reduction and adjust operation/equipment as necessary to meet objective</p> <p>Monitor solar generation cost and determine if change in operation of the ISCC plant is necessary to maximize solar output.</p>
Intermediate Outcomes	Intermediate Outcome Indicators	Use of Intermediate Outcome Monitoring
<p>Component One:</p> <p>The operational viability of solar thermal power generation is demonstrated in Morocco.</p>	<p>Component One:</p> <p>1. Yearly global production of electricity of the ISCC plant</p> <p>2. Share of ISCC energy in total energy production (%)</p> <p>3. Yearly contribution of solar electricity</p> <p>4. Solar output as a percentage of total energy produced by the ISCC power plant.</p>	<p>Component One:</p> <p>Show that solar thermal plant – a high-end technology - can be constructed and operated efficiently in a developing country context</p> <p>Low generation from the solar component or from the ISCC as a whole is symptomatic of management, incentives and operational problems that need immediate resolution</p>

Arrangements for results monitoring

Outcome Indicators	Baseline	Target Values					Data Collection and Reporting		
		YR1	YR2	YR3	YR4	YR5	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
Reductions in main air pollutants emissions (tons/yr) for CO2.	0	0	0	10,000	22,000	22,500	Quarterly	Continuous monitoring by O.N.E and the EPC contractor	O.N.E/EPC contractor
Solar thermal Power Plant costs in ¢/kWh	0	0	0	17.5	15	14	Quarterly		
As a % of natural gas price									
Dissemination									
<ul style="list-style-type: none"> Number of visitors to and information requests about the plant 	0							O.N.E.	O.N.E.
<ul style="list-style-type: none"> Number of workshops and conferences in which the experience about the construction and operation of the plant is presented 	0							O.N.E.	O.N.E.
<ul style="list-style-type: none"> Information about the plant posted on ONE's external web site 	None			Done				O.N.E.	O.N.E.
Results Indicators for Each Component									
Component One :									
ISCC's yearly production of electricity (GWh)	0	0	0	700	1500	1572	Quarterly	Continuous monitoring by O.N.E. and the EPC contractor	O.N.E/EPC contractor
ESCC's yearly generation of solar electricity (GWh)	0	0	0	16	35	37.5	Quarterly		

ONE staff trained in various aspects of ISCC power technology	0	0	10	4	4	2	Semester		
Solar output as a percentage of total energy produced by the ISCC power plant	0	0	0	1	2.3	2.4	Quarterly		O.N.E/EPC Contractor
Share of ISCC energy in total energy production (%)	0	0	0	2.8	5.6	5.4	Quarterly		O.N.E/EPC Contractor

Other qualitative indicators:

- Lessons learned during the pre-construction phase (feasibility study and bidding process, environmental and social safeguards and financing.)
- Lessons learned during the construction of the plant; and
- Lessons learned from the operation of the plant and initial assessment of the viability of the technology after three years of operation of the ISCC power plant

Annex 4: Detailed Project Description ⁷

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

The main components of the proposed project are:

1. The design, construction and operation of an Integrated Solar Combined Cycle power plant;
2. The construction of 225kV and 60kV transmission lines;
3. The construction of High Voltage and Very High Voltage substations;
4. The construction of an access road;
5. The drilling of boreholes;
6. Land acquisition;
7. The construction of a gas pipeline to supply the plant;
8. Environmental and Social Development and Management; and
9. Consulting services for project management and supervision.

Project Component 1 - Design, Construction and Operation of an Integrated Solar Combined Cycle Power Plant - US\$185.39 million (including US\$43.2 million from GEF)

The gross capacity of the Integrated Solar Combined Cycle (ISCC) plant will be 227 MWe (at 20°C) and will consist of gas turbine(s), a steam turbine, and a parabolic trough solar field with a capacity of about 20 MWe plus ancillary facilities for the proper operation of the power plant (backup power plant, etc.). The solar field will cover a total reflective area of 151,000 m². It includes the space between rows of collectors for cleaning and other maintenance (17.3 m between rows).

The total net energy produced by the plant would be 1,572 GWh per year, which includes the solar contribution of 37.5 GWh per year. This corresponds to a solar share of 2.4 percent of the total annual energy produced by the plant operating at a full load. An ISCC with cooling tower and without storage is anticipated to be the preferred choice within the technical design options. The primary fuel for the gas turbine will be natural gas supplied via a spur from the Maghreb-Europe gas pipeline.

Following the construction, a 5-year O&M contract will be put in place to ensure proper operation of the newly constructed plant. The O&M contract will be extended to the same firm in charge of the construction of the plant.

Project Component 2 – Construction of 225kV and 60kV power lines- US\$11.24 million (US\$8.90 million financed by the AfDB, and US\$2.34 million by ONE)

This component will cover the construction of two 225kV and one 60kV transmission lines. The electricity produced by the ISCC plant will be evacuated by two 225kV transmission lines to the Oujda (110 km) and Jerada (45 km) substations.

⁷ The cost of components include physical and price contingencies. (Physical contingencies of 10% and price contingencies of 2% for foreign and 3% for local costs).

The 60kV line will be constructed to provide a backup power supply to the auxiliaries of the ISCC plant in case of emergency. This line, of about 10 km, will connect the 60/225 kV substation of Ain Beni Mathar to the ISCC power plant.

Project Component 3 – Construction of a 225 kV substation - US\$9.04 million (US\$7.15 million AfDB, and US\$1.89 million ONE)

This component covers the construction of one 225 kV substation.

Project Component 4 – Construction of an access road- US\$3.8 million (ONE)

To link the power plant to the main road (Route principale 19), which links Oujda to Bouarfa, an access road of about 6km will be constructed. As part of the access road, two bridges over the Charef and Tabouda rivers will also be constructed. The infrastructure will be designed to support the heavy equipment necessary for the construction of the ISCC power plant.

Project Component 5 – Boreholes - US\$0.35 million (ONE)

The operation and maintenance of the power plant, in particular the cleaning of the solar collectors and the cooling of the plant, require the drilling of at least two boreholes. Water will be pumped from the aquifer located below the site of Ain Beni Mathar. Water reserves equivalent to one day consumption will be maintained. The extracted water will be treated before use and the site wastewater will be collected and treated in a two-hectare stabilization pond.

The implementing agency for the construction of the boreholes will be the Agence de Bassin de Moulouya (the Moulouya Watershed Agency) which is legally mandated to undertake this work.

Project Component 6 – Land acquisition- US\$0.87 million (ONE)

203 hectares of land will be acquired by ONE for the construction and operation of the plant. 160 hectares will be for the power plant (including 88 ha for the solar field), 6 hectares for the boreholes and water distribution, 31 hectares for the gas spur from the Maghreb-Europe Pipeline to supply the power plant and the transmission lines, and 6 hectares for the access road.

Project Component 7 – Gas pipeline - US\$1.51 million (ONE)

The gas supply will be ensured via the construction of a 13 km gas spur from the Maghreb-Europe gas pipeline.

Project Component 8 – Environmental and Social Development and Management US\$2.31 million (ONE)

This component will include a comprehensive monitoring and evaluation program to disseminate the results and the lessons learned from the project in all its phases (pre-construction,

construction and operation) to increase the overall global benefits. It also includes: (a) the implementation of the Environmental Management Plan which mitigates the potential environmental impacts associated with the construction of the power plant, the substations, the access road, the transmission lines and the gas pipeline; (b) a capacity building program to strengthen the capacities of the ONE for the follow-up and monitoring of the implementation of the overall EMP, which is the responsibility of the EPC Contractor and its sub-contractors.

The details of the environmental and social mitigation measures to be adopted during the construction and operation of the plant, as per the Bank's procedures and safeguards requirements, and as defined in the Environmental Management Plan are presented in Annex 10.

The Environment and Quality Department of the ONE has responsibility for the coordination of the studies and the monitoring of the environmental and social development and management component; and for liaising with the ADB.

Project Component 9 – Consulting services for project management and supervision US\$5.09 million (US\$4.55 million AfDB, and US\$0.54million ONE)

This component will finance the services of the consulting engineer during construction, testing and operation of the plant for the two-year guarantee period. The main mission of the consulting engineer is to: (i) critically review all detailed engineering designs; (ii) supervise the construction of the plant; (iii) supervise the testing and delivery of equipment in factory and on-site; (iv); supervise the testing of the plant; and (v) provide assistance during the two-year guarantee period. The consulting engineer will make sure that the data for the monitoring of the performance indicators is collected and supplied by the EPC contractor. The consulting engineer will make these data available in his periodic report to ONE.

Annex 5: Project Costs

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

Project Cost By Component and/or Activity	Local US \$million	Foreign US \$million	Total US \$million
1. Design, Construction and Operation of an Integrated Solar Combined Cycle Power Plant	17.53	147.53	165.06
- <i>civil works</i>	8.48	5.66	14.14
- <i>solar component</i>	3.52	29.44	32.96
- <i>mechanical and electrical equipment</i>	5.52	112.44	117.96
2. Transmission Lines	2.00	8.00	10.00
3. Substations	1.60	6.44	8.04
4. Access Road	2.02	1.35	3.37
5. Boreholes	0.19	0.12	0.31
6. Land acquisition	0.84	-	0.84
7. Gas pipeline	-	1.35	1.35
8. Environmental and Social Development and Management	2.25	-	2.25
	1.00	3.98	4.98
9. Consultancy services			
Total Baseline Cost	27.43	168.77	196.20
Physical Contingencies	2.33	16.48	18.81
Price Contingencies	0.89	3.70	4.60
Total Project Costs¹	30.65	188.95	219.61

¹ Project cost excluding financial charges, customs duties and value added tax. Price contingencies are on the base cost and physical contingencies.

Annex 6: Implementation Arrangements

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

Partnership arrangements

The project is co-financed by O.N.E., the GEF and the African Development Bank. Their respective contribution to the financing of the project is respectively of 7%, 20% and 73%.

Institutional and implementation arrangements

Consultants partially financed under a GEF PDF C grant, now closed, have assisted O.N.E. in the preparation of bidding documents, draft EPC and O&M contracts and will advise O.N.E. during the evaluation of proposals. This phase, which is still ongoing, is being carried out by O.N.E.'s Directorate of Development following an agreed timetable.

The construction and operation of the ISCC power plant will be implemented by an EPC cum O&M arrangement to be secured through international competitive bidding. The Production Department of O.N.E. will have the responsibility for overall project management. The Production Department will ensure the coordination, and the technical and administrative management of the project. It will work in close collaboration with the Supply and Markets Department of the procurement aspects, with the Environment and Quality Department for the coordination of the studies and the monitoring of environmental measures, and with the Technical Department for controls and oversight. The Financial Department will be in charge of the project financial management, and coordination with various loan/grant providers. The Production department will be assisted by the consulting engineer to be recruited under the project and financed by AfDB and ONE.

The World Bank will supervise and monitor the implementation of the activities through regional and specialized staff as required.

Annex 7: Financial Management and Disbursement Arrangements

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

Assessment of the Financial Management System

1. An assessment of the financial management system in place at O.N.E. (Office National de l'Electricité), the project executing agency, was carried out to determine if it complies with the Bank requirements for the project management in respect to the OP/BP10.02.

Accounting system

2. The accounting function at O.N.E. is performed by the central accounting division in the financial department. The accounting of the office is governed by the rules applicable to the autonomous public entities (decree of November 10, 1989). O.N.E. maintains an accrual accounting system, managed on an Integrated Information System (IIS) since year 2000, and held according to rules related to the “obligations comptables des commerçants” and the Moroccan chart of accounts. The operations related to the financed projects are registered in the accounting records of O.N.E. in accordance with the accounting procedures applicable within the office.

Internal control system

3. The State financial oversight, to which ONE is subject according to provisions of Dahir of April 14, 1960, guarantees the separation of the functions through several levels of independent controls involving (a) the State controller for the control a priori of the expenditure at the stage of their commitment and (b) the treasurer payer who jointly signs with the director of O.N.E. all the payment orders. In addition, the internal audit function is performed by the audit and organization department, directly attached to the general manager's office.

External audit

4. The financial statements of O.N.E. are subjected to an annual external audit. The financial statements of the last three exercises, audited by an international audit firm, were certified with qualifications. These are mainly the result of the upgrade of the accounting system and do not suggest the existence of accountability issues. The audit of a GEF Grant (Grant GEF 22942) did not raise issues likely to question the use of the funds of the grant.

5. Bank policies require that an annual external audit of the project accounts, established in accordance with acceptable accounting standards, be carried out in accordance with acceptable auditing standards and terms of reference and that the auditor is acceptable to the Bank. The project financial statements including all sources and use of funds must be audited each year in accordance with Bank guidelines. The project audited financial statements must be transmitted to the Bank no later than six months after the end of each fiscal year.

Financial reporting and information system

6. The financial monitoring of projects is ensured by the service for long and medium term financing within the finance and treasury division (financial department), in coordination with the concerned technical departments. O.N.E. acquired a substantial knowledge in management of projects financed by international donors (BIRD, BAD, EIB, INSIPID, BID, KFW...). The existing human resource capacity is adequate to carry out the financial management tasks of the project. There is no need for change in quantity and quality of the existing staff to meet Bank and O.N.E. financial reporting requirement. The integrated information system (IIS) allows a follow-up of outstanding debt in foreign currency and in dirhams (module loan) but it does not automatically provide a sufficient level of information for the financial monitoring of the project in term of allocation and use of funds by component and category of expenditure. O.N.E. elaborates project financial statements according to the format agreed with the donors based on the existing information adapted for the needs of the project.

Project monitoring

7. O.N.E. will submit to the Bank a half yearly Financial Monitoring Report (FMR) 45 days after the end of each period. These reports will be established in accordance with Bank guidelines. The FMR will provide, for all the sources of funds for the project:

- a summary cash-flow table showing received funds by sources and expenditures by category for the past semester and the accumulated amount up to the date of the report, as well as projection for the next six months,
- a summary of the use of funds showing payments by project component/activity for the past semester and the amounts accumulated as of the date of the report,
- a summary of procurement processes and procedures,
- a summary of the physical progress by project component/activity.

8. Insofar as the existing information system of O.N.E. does not automatically provide a sufficient level of detail required by the Bank for the production of the FMR, a project financial information system will be produced in term of resources and use of funds, by component and category of project expenditures and sources of financing. The financial tables will be produced manually based on the reprocessing of the data provided by the existing information system. The formats of the reports were agreed with O.N.E. during project preparation.

Evaluation of the system in use

9. The financial management system of the project is in line with the minima conditions required by the Bank taking into account the management system of O.N.E. and the experience acquired in financial project management.

Flow of funds

10. The project is co-financed by GEF, AfDB and O.N.E. Financial flows will come from GEF funds via the Bank, the loan funds from the AfDB, and counterpart funds financed by

O.N.E. Flows of funds between the World Bank, O.N.E. and the recipients will be organized according to traditional disbursement procedures of the Bank.

Disbursement

11. Method of disbursements. The proceeds of the grant will be disbursed first and once the grant funds are fully disbursed, the AfDB loan will take over. The proceeds of the Grant would be disbursed in accordance with the traditional Disbursement procedures of the Bank and will be used to finance project activities through the disbursement procedures currently in use: i.e. Withdrawal Applications (WAs) for direct payment, for Special Commitments and/or reimbursement accompanied by appropriate supporting documentation or. The Project Management Unit (Office National de l'Electricité) will be responsible for submitting the appropriate supporting documentation for activities implemented so that payments can be made from the Special Account opened for that purpose, or to submit WAs for direct payment to the Bank accompanied by the necessary supporting documentation. As projected by Bank's standard disbursement profiles, disbursements would be completed four (4) months after Project closure.

12. Special account. To facilitate disbursement of eligible expenditures O.N.E. will open and establish at a Commercial Bank a Special Account in Dirhams with an initial authorized allocation equivalent to \$5 million to cover Grant's share of eligible Project expenditures. The Authorized allocation of the SA would be the equivalent of an estimated four (4) months' of eligible expenditures financed by the Grant. ONE will be responsible for submitting monthly replenishment WAs with appropriate supporting documentation for expenditures incurred and will retain and make the documents available for review by the Bank supervision mission and project auditors. The supporting documentation will include reconciled bank statements and other documents as may be required.

13. Use of Statement of Expenditure. Activities to be financed under the grant funds should not require the use of statement of expenditures as a disbursement method.

14. Allocation of grant proceeds.

Category of expenditure	Amount of the grant allocated (US\$)	Percentage of expenditures to be financed
1. Goods, works, including installation works and services for the EPC/O&M Contract.	43,200,000	100%
Total	43,200,000	

15. Planning of supervision. Financial supervision activities will include, a review of half yearly FMRs, review of annual audited financial statements and management letters. There will be about two financial management supervision missions per year.

Annex 8: Procurement Arrangements

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

A. General

All procurement activities under the project will be carried out by Office National de L'Electricité (O.N.E.). Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004; and the provisions stipulated in the Legal Agreement. The Grant will finance a single contract which had its procurement process advanced and is actually at the stage of bid evaluation for contract award recommendation. This contract is jointly financed with the African Development Bank. Consequently, no Procurement Plan is required. A general procurement notice was published in UN Development Business and on d-g Market on April 6, 2004. Such contract consists in the supply and installation (single responsibility contract) of the ISCC Power Plant at Ain Beni Mathar estimated at about 185 million dollars of which the GEF grant will finance up to US\$43.2 million. The borrower has carried out a prequalification process under Bank's supervision and no objection. Prequalified contractors have been invited to submit bids for this contract. Procurement is being conducted using the Bank's Standard Bidding Documents (SBD). Procurement for non-bank financed contracts will be conducted using AfDB and national SBD satisfactory to the Bank. The supply and installation of the transmission lines and substations for the evacuation of the power from the power plant will be financed by the AfDB and O.N.E.

Selection of Consultants: Consulting services for the supervision and management of the ISCC Power Plant will be financed by AfDB and ONE and consultants will be selected in accordance with AfDB procedures.

B. Assessment of the agency's capacity to implement procurement

An assessment of the capacity of O.N.E. to implement procurement actions for the project was carried out during the pre-appraisal mission in September 2005 and updated during the appraisal mission in June 2006. The assessment reviewed the organizational structure for implementing the project. The main findings are as follows:

The Direction Production of O.N.E. would be responsible for the construction of the ISCC Power Plant. A project manager within the Direction Production has been appointed. The Project Manager reports directly to the Director of Production and will liaise with and rely for support from the following Departments: Direction Approvisionnement et Marches for procurement matters; Direction Technique et Ingenierie for technical matters; and Direction Financiere for financial management and audit matters.

O.N.E. has substantial project management experience including familiarity with standard bidding documents for projects financed by international financial agencies, such as the EIB, AfDB, Islamic Bank and others. The Direction Production will manage the procurement, erection of equipment/materials and commissioning, and will closely coordinate with the other

relevant departments. The consulting firm Fichtner (financed by the AfDB) is assisting O.N.E. in the preparation of prequalification document and evaluation, bidding documents and evaluation of bids, and assisting in contract negotiation. A source of possible risk is that O.N.E.'s staff may not be fully updated on the Bank procurement/contract management procedures. To minimize this risk, during project launch, training to O.N.E. procurement specialists will be provided to update the procurement skills including familiarization with new Bank procurement guidelines. **The overall project risk for procurement is Average.**

C. Procurement Plan and Advanced Procurement

Procurement Plan:

This project involves the financing of only one contract under International Competitive Bidding (ICB) which had its procurement process advanced and is nearly completed. Consequently, a procurement plan is not required. For the overall project, Attachment 1 shows the procurement actions.

Advanced Procurement:

The single contract being financed by the GEF Grant had its procurement actions advanced. It is a Two Stages bidding process with prequalification. The contract is for a combined cycle thermo-power plant jointly financed by the Bank and AfDB. It includes a solar component funded by a GEF grant. The Borrower has the help of a consulting engineer (Fichtner Solar who is also working on a similar project in Egypt).

Prequalification -- The borrower has issued prequalification documents, received and analyzed applications and finally prequalified four potential bidders. The Bank supervised all steps of the process and has issued the corresponding no objections (OPRC cleared the no objection to the list of prequalified potential bidders). The number of bidders in this case was low because the solar component restricts the number of qualified bidders.

First Stage of Bidding -- The borrower issued bidding documents for the first stage of bidding for the four prequalified bidders and received technical bids submitted by only 3 bidders because one excused himself⁸. The borrower carried out clarification meetings with bidders, cleared their minutes with the Bank and sent it to bidders. The borrower (with Bank's no objection) issued final bidding documents

Second Stage of Bidding -- The borrower received final proposals from only two bidders since the third excused himself⁹. In accordance with the bidding documents the Borrower has opened

⁸ The bidder indicated that *"In fact we are not in the condition to submit a bid for this bidding process being responsive to all the requirements included in the bidding documents because the conditions and guarantees required are very strong and we do not find interest in the contract resulting from such bidding documents."*

⁹ After having participated in the technical discussions this bidder sent a letter indicating that was not in conditions for submitting a bid for this contract. This bidder was contacted again (even for the possibility of higher capacity possibility) and reaffirmed again his lack of interest in participating in this bidding process.

the technical proposals and has kept sealed and safeguarded the price proposals submitted by the two bidders for both options of solar capacity (20 MW and 30MW solar). O.N.E. will evaluate the commercial proposals for the 20MW solar component option to define the winning bidder. Then, O.N.E. will invite the winning bidder for the opening of commercial proposal for the 30Mw solar component option. O.N.E. will analyze this proposal and will submit to the Bank a final recommendation on the option of its choice (20 MW or 30MW) for contract signature¹⁰.

D. Frequency of Procurement Supervision

In addition to the prior review supervision the Bank has been carrying out of the advanced procurement process, the capacity assessment of the Implementing Agency has recommended one field supervision mission to carry out post review of procurement actions.

2. Consulting Services

No consultant contract will be financed under this Bank project. All Consultancy services for project management for the ISCC Power Plant will be financed by the AfDB and O.N.E.

¹⁰ O.N.E. is considering the possibility of issuing an amendment to the bidding documents asking bidders who offered commercial bids to submit additional bids for a higher capacity solution by doubling the capacity of gas turbines and increasing the capacity of the boiler and steam turbine/power generator accordingly. Bidders would be required to submit bids for the two options for solar component (20 MW and 30MW), continuing the 20 MW option as the basis for selecting the winner. In this case the already received commercial proposals would not be opened and would be kept sealed and safeguarded until the end of the analysis of the higher capacity solution. They would be opened only if the higher capacity solution is not used or cancelled.

ATTACHMENT 1

Procurement schedule for the overall project including non-Bank financing

Component No	Description of Package	Number of slices (Lots)	Type of Procurement	Lending Agency and Procurement Method	Estimated Cost (million US\$)	Procurement Schedule				
						Prequalification 1. Invitation 2. Opening 3. Evaluation Report	Preparation of Tender Documents	Tender 1. Invitation 2. Opening 3. Evaluation Report	Contract Signing	Contract Completion
Financing from the IBRD/AfDB loan proceeds										
Construction of the Solar thermal Plant										
1.	Turn-key Construction Contract	1	S&I	GEF/AfDB (World Bank guidelines)	185.39 of which 43.2 from GEF ONE 2.66 and AfDB 139.53	05.26.04 09.01.04 10.24.04	02.09.05	(1) 07.26.05 (2) 12.21.05 (first stage) 10.05.06(second stage) (3) 01.05.07 (evaluation)	03.09.07	03.15.10
Total GEF/AfDB loan/NE					185.39 of which 43.2 from GEF and ONE 2.66					
Financing from the AfDB/ONE loan proceeds										
2.	Construction of 225kV and 60kV lines	1	Works	AfDB/O.N.E. (AfDB guidelines)	11.24 of which 2.34 from ONE		05.05.05	06/16/06 10.26.06 02.19.07	03.12.07	12.15.09
3.	Construction of a 225kV substation	1	Works	AfDB/O.N.E. (AfDB guidelines)	9.04 of which 1.89 from ONE		01.05.06	08.16.06 09.30.06 12.28.06	03.26.07	10.01.07
9.	Consulting Services for project management of the power plant	1	CS	AfDB/O.N.E. (AfDB guidelines)	5.09 of which 0.54 from ONE		03.06.06	07..19.06 09.15.06 10.15.06	01.03.07	03.15.09
Total AfDB loan/ONE					25.37 of which 4.77 from ONE					

Financing from ONE loan proceeds										
4.	Construction of access road	1	Works	O.N.E. (Moroccan Procurement Law)	3.80		08.01.06	09.01.06 11.02.06 12.18.06	01.15.07	11.12.07
5.	Boreholes for water supply to the plant	1	Works	O.N.E. (Moroccan Procurement Law)	0.35		03.01.06	07.01.06 10.02.06 11.03.06	01.03.07	09.12.07
6.	Land acquisition for the power plant	1	Works	O.N.E.	0.87					Completed – land purchased in June 06
7.	Gas pipeline connector from the power plant to the main pipeline	1	Works	O.N.E. (Moroccan procurement Law)	1.51		02.01.06	01.08.07 03.05.07 03.26.07	04.09.07	01.26.07
8.	Social and Environmental mitigation measures	1	CS	O.N.E.	2.31					Study Completed in December 06
Total for ONE co-financing					16.28					
Total for project					219.61					
Of which from AfDB					153.33					
Of which from GEF					43.2					
Of Which from O.N.E.					16.28					

Annex 9: Economic and Financial Analysis

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

A. Project Economic Analysis

Method

1. The proposed project forms an integral part of O.N.E.'s least-cost expansion plan and, therefore, cost-benefit analysis needs to be carried out on the whole expansion plan rather than on the project taken in isolation. O.N.E.'s investment program for the period 2005-2015 has therefore been analyzed. Incremental capital costs, operation and maintenance costs, and benefit streams (all in 2005 prices) are shown in Table 1 of this Annex. Assumptions underlying these figures are detailed below.

Capital Costs

2. Anticipated capital expenditures on generation (from WASP-III generation planning model), transmission and distribution at financial prices are converted to economic prices by: (i) expressing the import content at c.i.f. prices; and (ii) applying the standard conversion factor of 0.85 to local costs.

Operation and Maintenance (O&M)

3. Incremental operation and maintenance costs are derived from O.N.E.'s financial projections where O&M costs are projected to amount to the following percentages of gross fixed assets in use:

Generation:	data from WASP
Transmission:	3.0%
Distribution:	5.0%

Fuel Costs

4. Fuel costs are based on the thermal generation requirements derived from energy balance projections and projected crude oil price projections, and are taken from WASP

Economic Benefits

5. Economic benefits associated with incremental electricity supply to consumers are calculated using average tariffs. Although benefits in this case are more a reflection of the adequacy of tariffs than the true value of the benefits of the project, calculations using consumers' willingness to pay as proxies of benefits are unnecessary. As tariffs, particularly for domestic consumers, are subsidized, WTP is likely to be greater than average tariffs. Therefore if the investment program is justified using average tariffs, it is, a fortiori, justified using WTP.

Other assumptions: are shown in the table below

Results of the Analysis The results of the analysis are summarized the following table.

**MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PLANT OF AIN BENI MATHAR
ECONOMIC ANALYSIS
(US\$ Million)**

Year	Capital Cost (*)				Total			Oper. & Maintenance			Total		Cost of Fuel		Total	Sales	Gross	Nets
	Generation (1)		Transmission (2)		Distribution (3)		Total	Gen.	Trans.	Distrib.	Total	(7)		Costs	(GWh)	Benefits	Benefits	
	Foreign	Local	Foreign	Local	Foreign	Local						Foreign	Local					Foreign
2006	274.57	51.09	86.12	21.53	32.94	8.24	474.48	103.60	3.23	2.06	108.89	468.50	61.10	1112.97	18597.00	1301.79	188.82	
2007	150.59	26.47	56.47	14.12	32.94	8.24	288.82	107.20	2.12	2.06	111.38	443.40	43.80	887.40	19733.00	1381.31	493.91	
2008	177.73	31.17	71.06	17.76	32.94	8.24	338.90	111.70	2.66	2.06	116.42	468.40	48.90	972.62	20937.00	1465.59	492.97	
2009	188.97	33.29	75.29	18.82	42.35	10.59	369.32	121.60	2.82	2.65	127.07	486.80	50.40	1033.59	22209.00	1554.63	521.04	
2010	249.13	43.89	84.71	21.18	47.06	11.76	457.73	129.60	3.18	2.94	135.72	529.80	59.10	1182.34	23546.00	1648.22	465.88	
2011	156.20	27.45	84.71	21.18	47.06	11.76	348.36	140.20	3.18	2.94	146.32	557.10	56.70	1108.47	23560.36	1649.23	540.75	
2012	179.49	31.48	84.71	21.18	47.06	11.76	375.68	149.20	3.18	2.94	155.32	586.70	55.20	1172.89	23574.73	1650.23	477.34	
2013	235.22	41.41	84.71	21.18	47.06	11.76	441.34	159.40	3.18	2.94	165.52	619.40	60.00	1286.25	23589.12	1651.24	364.98	
2014	370.24	65.08	84.71	21.18	47.06	11.76	600.03	169.50	3.18	2.94	175.62	666.40	69.30	1511.34	23603.50	1652.25	140.90	
2015	125.38	22.09	84.71	21.18	47.06	11.76	312.18	178.80	3.18	2.94	184.92	702.30	74.40	1273.79	23617.90	1653.25	379.46	
2016	262.20	46.23	84.71	21.18	47.06	11.76	473.14	195.00	3.18	2.94	201.12	729.90	68.40	1472.55	23632.31	1654.26	181.71	
2017	394.52	69.52	84.71	21.18	47.06	11.76	628.75	209.80	3.18	2.94	215.92	783.40	79.10	1707.16	23646.73	1655.27	-51.89	
2018	330.34	58.21	84.71	21.18	47.06	11.76	553.26	221.10	3.18	2.94	227.22	827.70	80.60	1688.77	23661.15	1656.28	-32.49	
2019	164.65	28.94	84.71	21.18	47.06	11.76	358.30	233.40	3.18	2.94	239.52	876.50	83.10	1557.41	23675.58	1657.29	99.88	
2020	243.00	42.62	84.71	21.18	47.06	11.76	450.33	252.70	3.18	2.94	258.82	913.00	78.60	1700.74	23690.03	1658.30	-42.44	
2021	275.53	48.34	84.71	21.18	47.06	11.76	488.58	269.10	3.18	2.94	275.22	965.30	87.50	1816.59	23704.48	1659.31	-157.28	
2022	483.88	85.14	84.71	21.18	47.06	11.76	733.73	282.00	3.18	2.94	288.12	1018.80	96.10	2136.74	23718.94	1660.33	-476.42	
2023	388.57	68.49	84.71	21.18	47.06	11.76	621.77	293.70	3.18	2.94	299.82	1075.80	106.00	2103.38	23733.40	1661.34	-442.05	
2024	330.50	58.28	84.71	21.18	47.06	11.76	553.49	303.00	3.18	2.94	309.12	1136.20	111.40	2110.20	23747.88	1662.35	-447.85	
2025	208.22	36.65	84.71	21.18	47.06	11.76	409.58	333.20	3.18	2.94	339.32	1189.40	112.50	2050.79	23762.37	1663.37	-387.43	
2026	295.33	51.86	84.71	21.18	47.06	11.76	511.90	347.50	3.18	2.94	353.62	1256.40	119.60	2241.51	23776.86	1664.38	-577.13	
2027	414.71	72.89	84.71	21.18	47.06	11.76	652.31	361.50	3.18	2.94	367.62	1324.60	132.10	2476.62	23791.37	1665.40	-811.23	
2028	562.85	99.05	84.71	21.18	47.06	11.76	826.61	368.20	3.18	2.94	374.32	1394.30	144.50	2739.72	23805.88	1666.41	-1073.31	
2029	481.94	84.92	84.71	21.18	47.06	11.76	731.57	389.30	3.18	2.94	395.42	1469.70	159.20	2755.88	23820.40	1667.43	-1088.46	
2030	458.18	80.73	84.71	21.18	47.06	11.76	703.62	415.20	3.18	2.94	421.32	1535.10	160.70	2820.73	23834.93	1668.45	-1152.29	

NPV@10% 1722.58

- (*) ONE's investment program in generation, transmission and distribution for the period 2006-2030
- (**) Total costs = investment costs in generation, transmission and distribution + operation and maintenance costs (incl. cost of energy not served + fuel cost)
- (1) Data from the least-cost generation planning model (WASP)
- (2) Transmission investment program associated with the least-cost generation program
- (3) Distribution Investment program for the period 2006-2030
- (4) O&M generation (including the cost of unserved energy [estimated at \$2/kWh]) from WASP
- (5) O&M transmission 0.03 of the transmission investment program
- (6) O&M distribution 0.05 of the distribution investment program
- (7) The cost of fuel is based on thermal generation as derived from WASP and on fuel price projections for natural gas, coal, diesel and fuel oil). with an annual real increase of 0.05 per year
- (8) Growth of demand estimated on average at 0.061 per year over the entire period
- (9) Benefits are those associated with incremental sales made possible by ONE's investment program (including the proposed project) multiplied by the average 2004 electricity tariff: 0.08 \$/kWh
- (10) Net benefits are simply total benefits minus total costs

Switching Values: The switching value of a variable is that value at which the project's NPV becomes zero (or the IRR equals the discount rate). The switching values for the ISCC project are given in the table below in terms of the percentage change in the value of the variable needed to turn the project's NPV equal to zero. Switching values are useful in identifying which variables most affect project outcome and are presented in order of declining sensitivity.

Switching Values

Variable	Switching value
Sales	-12%
Average tariff	-14%
Fuel Costs	25%
Total Investment Costs	43%

The most two critical variables are the level of sales and the average tariff. While sales may drop, it is unlikely, given past experience and the growth of the economy, that they will drop by the required level of 12% to bring the NPV to zero. Things are, however, different for the average tariff. It can easily drop by 14% or less unless it is kept under continuous review over the life of the program (2006-2030) and measures to adjust it taken in a timely manner. The project's worth is also sensitive to fuel costs. This is also an area of concern for the future. Beyond converting its power stations to use cheaper fuels and operating them efficiently, this variable is beyond the control of O.N.E. As suggested earlier, should fuel prices increase beyond the level projected in these calculations tariffs would have to be adjusted accordingly (if the reforms take place, the adjustment would concern the regulated market, the non-regulated or competitive market will automatically adjust). Finally, the project's worth is also sensitive to changes in total investment costs, but a 43% increase in total investment costs is considered quite unlikely.

Simulations on the level of sales, average tariff, fuel and construction costs indicate that there is about 70% chance that the NPV of O.N.E.'s investment program (2006-2030) will be positive as indicated by the following percentile table.

Percentile	US\$Million
0%	-4,287.53
10%	-778.69
20%	-30.31
30%	542.99
40%	1,061.67
50%	1,572.01
60%	2,092.89
70%	2,689.16
80%	3,382.76
90%	4,438.84

B. Financial Analysis:

Table 1 : O.N.E. financial performance (2003-2005)

	2003	2004	2005
	<u>Actual</u>	<u>Actual</u>	<u>Actual</u>
<u>Income Statement Items</u>			
Unit Volume (GWh)	15,215	16,295	17,698
Revenues (operating)	12,339	12,442	14,478
Operating Income	598	599	(68)
Fuel, Coal and Gaz	1,666	1,849	3,198
Power purchase	5,034	5,003	5,760
Labor costs	1,462	1,571	1,672
EBITA	1,374	3,242	2,975
Net Income	69	(39)	(241)
<u>Funds Statement Items</u>			
Internal Sources	2,934	2,802	5,400
Borrowings	1,448	2,023	1,956
Equity Investments	797	694	482
Total Sources	5,179	5,518	7,838
Capital Expenditures	3,442	4,662	7,130
Working Capital Increase (Decrease)	1,028	(1,525)	(170)
Debt Service	1,275	1,055	821
Cash Variation	(565)	1,326	57
Total Uses	5,179	5,518	7,838
<u>Balance Sheet Items</u>			
Current Assets	8,132	9,409	11,376
Net Fixed Assets	40,370	42,690	46,736
Total Assets	48,502	52,098	58,112
Current Liabilities	7,701	9,337	11,533
Long-term Liabilities	21,872	24,916	26,687
Equity	18,929	17,846	19,893
Total Liabilities and Equity	48,502	52,098	58,112
<u>Financial Ratios</u>			
Operating Income as a % of Revenue	4.8	4.8	-0.5
Net Income as a % of Revenue	0.56	-0.32	-1.66
Return on Net Fixed Assets	0.2	-0.1	-0.5
Debt Service Coverage	2.3	2.7	6.6
% Investment self financed	44%	36%	33%
Current Ratio	1.1	1.0	1.0
Debt as a % of Total Capitalization	53.6	58.3	57.3

Table 2 Summary of ONE financial performance under the Base case scenario

	2006	2007	2008	2009	2010	2011	Growth (%)
<u>Income Statement Items</u>							
Unit Volume (GWh)	19,114	20,452	21,883	23,372	24,961	26,738	7.12%
Revenues (operating)	15,505	16,482	17,485	18,304	19,523	20,913	6.16%
Operating Income	970	711	1,237	1,472	1,252	1,341	6.58%
Fuel, Coal and Gas	3,562	3,597	3,846	3,088	4,251	4,553	5.85%
Power purchase	5,499	6,375	5,909	6,504	6,346	6,798	1.96%
Labor costs	1,566	1,637	1,710	1,787	1,868	2,001	2.24%
EBITA	2,478	3,682	3,663	4,855	6,066	6,220	15.32%
Net Income	(4,696)	483	497	859	682	720	
<u>Cash flow Statement Items</u>							
Internal Sources	3,272	3,247	3,975	4,863	5,040	6,611	
Borrowings	13,181	2,506	7,283	1,200	1,029	1,200	
Equity Investments	804	1,036	908	965	897	600	
Total Sources	17,257	6,789	12,166	7,028	6,967	8,411	
Capital Expenditures	5,483	5,794	8,484	8,743	3,410	3,910	
Working Capital Increase (Decrease)	1,431	(445)	344	631	462	530	
Debt Service	1,087	1,171	7,163	2,207	2,463	2,680	
Cash Variation	9,257	269	(3,824)	(4,552)	632	1,290	
Total Uses	17,257	6,789	12,166	7,028	6,967	8,411	
<u>Balance Sheet Items</u>							
Current Assets	7,915	7,703	7,970	8,256	8,560	8,730	
Net Fixed Assets	44,730	47,111	49,291	48,500	46,874	47,427	
Total Assets	52,645	54,813	57,262	56,756	55,435	56,155	
Current Liabilities	7,425	7,365	8,723	8,095	7,315	7,288	
Long-term Liabilities	29,050	30,503	30,835	29,921	28,584	28,469	
Equity	16,170	16,945	17,703	18,740	19,536	20,398	
Total Liabilities and Equity	52,645	54,813	57,262	56,756	55,435	56,155	
<u>Financial Ratios</u>							
Operating Income as a % of Revenue	6.3	4.3	7.1	8.0	6.4	6.4	
Net Income as a % of Revenue	-30.29	2.93	2.84	4.69	3.49	3.44	
Return on Net Fixed Assets	-10.5	1.0	1.0	1.8	1.5	1.5	
Debt Service Coverage	3.0	2.8	1.3	2.2	2.0	2.3	
% Investment self financed	40%	36%	27%	30%	75%	74%	
Current Ratio	1.1	1.0	0.9	1.0	1.2	1.2	
Debt as a % of Total Capitalization	64.2	64.3	63.5	61.5	59.4		

Annex 10: Safeguard Policy Issues

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

In accordance with the World Bank Safeguards policies on environment, the project has been classified as a “Category B” Project. The project has also been classified under the “Environmental Category II” of the African Development Bank, which means the impacts are site specific and that measures to minimize or mitigate these impacts can easily be identified and recommended. The rating is based on the conclusions of the preliminary assessment at the concept stage and reconfirmed after the Environmental Impact Assessment was done. The two safeguard policies to be triggered under this project are OP 4.01: Environmental Assessment and OP 4.12: Involuntary Resettlement.

The Bank’s Safeguard Policies have been made available to the implementing agency, O.N.E., which on its side shared it with the consultancy consortium, Burgéap and Phénixa, which conducted the EIA. The first draft presented to the Bank did not follow the directives and the operational procedures of the Bank with respect to environmental and social assessment, and ONE was asked to re-submit a revised EIA, which was found to be acceptable to the team and the Environmental and Social Safeguards reviewers.

In addition to the Bank’s guidelines, the assessment took into consideration the requirements of various national environmental laws and regulation of direct relevance to the project, namely Law 11-03 on the protection of the Environment, Law 12-03 on EIA, Law 13-03 on Air Pollution, despite the fact that no Executive Regulations have been issued to-date to operationalize the enforcement of these laws. Other regulation of relevance, such as Law 10-95 on Water and the 1914 Decree governing the establishment of hazardous, unsanitary and disagreeable establishments.

Environmental Aspects

Several alternatives were considered as part of the Environmental Impact Assessment, including siting and technology alternatives. A pre-feasibility study conducted in 1994 has considered 2 alternative sites for the solar-thermal power plant: Ouarzazate and Taroudant. In 1996, the search for a more suitable site on the basis of various environmental factors, the proximity to the water resources needed for the cooling system, and the proximity to the Maghreb-Europe natural gas network led to the selection of the Beni-Mathar site, in Jerada, because of its proximity to the transmission and distribution network and the land availability.

The electricity produced by the proposed plant will be evacuated through two 225kV transmission lines and one 60 kV transmission line. The two 225 kV lines will go to the Oujda substation (110 km) and to the Jerada substation (45 km) while the 60kV line will be constructed to provide a backup power supply to the auxiliaries of the plant in case of emergency. This line, of about 10 km, will connect the 60/22 kV substation of Ain Beni Mathar to the power plant.

In its identification of the path of the high voltage transmission lines, the Office National de l'Electricite has taken into consideration to generally avoid inhabited areas and protected areas of ecological importance.

The operation of the solar thermal power plant does not lead to negative impacts with respect to its air emissions, as CO₂ and NO₂ emissions associated with the use of natural gas are much less than in the case of any other fossil fuel, and there are no SO₂ emissions. The main risks that could exist would be due to accidental contamination of the site by a spill of the heat transfer fluid during operation as well as during transportation to the site in the construction phase. Such risks will however be largely reduced and properly managed through the inclusion of a retention and biological treatment system to be included in the detailed design of the project, and by following the safety measures for proper handling and transportation of hazardous substances.

Due consideration should also be given to avoid exceeding the allowable volumes of cooling water to be pumped from the aquifer in order to maintain the current balance of the resource.

Other important impacts, for which mitigation measures have been identified, and that should be included in the terms of reference (TORs) and contracts of the construction firms are related to solid waste and the final disposal of such waste in pre-identified controlled landfills, in case they cannot be re-used or recycled on site.

Environmental Management Plan

Following the guidelines of the Bank and the Pollution Prevention and Abatement Handbook, an Environmental Management and Monitoring Plan has been developed. The Government of Morocco is in general familiar with the Bank's safeguard policies and its requirements, and specifically the Quality and Environment Division of O.N.E. has acquired very important experience during the preparation of the TORs for the EIA and the supervision of the EIA consultant's work, in close collaboration with the project's environmental and social safeguards team.

The implementation of the Environmental Management Plan will be the responsibility of the EPC Contractor and its sub-contractors, as clearly specified in bidding documents that should take into consideration the recommended mitigation measures. Monitoring the implementation of the Environmental Management Plan will be the responsibility of the Quality and Environment Division of O.N.E. The cost of implementation and monitoring of the EMP is covered in the cost of the project.

Public Consultation and Disclosure

A day of public consultations was organized by O.N.E. on December 29, 2005 in the Municipality of Ain Beni Mathar. The objective was to provide information to the general public on the power plant, to raise awareness among the invited participants, and to answer their questions and concerns while sharing the results of the Environmental Impact Assessment. The

participants comprised of over 120 individuals, included the local residents, elected officials, NGO representatives from the region and economic operators.

Social Aspects

Background

The project triggered the Involuntary Resettlement Policy (OP/BP 4.12) as it has been determined that land acquisition will be required for the construction site of the power plant, the gas pipelines, the access road and the electric lines. Specifically, the project requires the acquisition of:

- 159 ha 97 are 50 ca for the power plant,
- 6 ha 17 are 11 ca where the gas pipelines will be laid and 12 ha 35 are 20 ca will be temporarily occupied/used during the construction phase;
- As for the access road and the electric lines, a study is being undertaken to determine the exact land size requirements.

This Annex presents the summaries of (i) the Resettlement Action Plan and (ii) the Resettlement Policy Framework (RPF) that have been prepared under the project. The Resettlement Action Plan applies to the power plant site and the gas pipelines because the project-affected people have been identified and land acquisition procedures have been launched. Since the exact nature and extent of land acquisition for the access roads and electric lines has not yet been determined, a Resettlement Policy Framework has been formulated, which will be followed with a Resettlement Action Plan downstream once the feasibility study has been completed. Both the RPF and RAP documents have been based on the findings of the project feasibility study, the Environmental and Social Impact Assessments, the site visits conducted and consultations held with the project-affected people.

The RPF and RAP have been disclosed at the World Bank's Infoshop and made available at the local commune level, a place accessible to the public concerned in Morocco (i.e. relevant municipalities) prior to project appraisal.

I. Summary of the Resettlement Action Plan

A. Potential Impacts of Land Acquisition

The land acquisition for the power plant site and the gas pipelines does not lead to involuntary resettlement, either residential or commercial, of local inhabitants, nor does it pose any threats to incomes or livelihoods, or create/intensify poverty or vulnerability.

The acquisition, which directly affects 8 and 21 persons, respectively, involves minor reduction in agricultural plot area, none of which would require the physical relocation of these persons.

B. Census Survey & Social Assessment

A social assessment was conducted at the project site with all the acquisition-affected people in June 2006. A series of intensive consultations were conducted with 8 persons whose land and/or assets will be affected by the power plant construction and 21 persons affected by the gas

pipelines. The people were informed about the project and the compensation procedures for their loss. In addition the consultations touched upon the implications of the project in terms of employment generation. The assessment further improved the local communities' understandings of the project and its implications, and confirmed that the populations are awaiting the employment opportunities which the project will likely offer.

Equally, elected representatives of the local commune of Béni Mathar as well as three public agencies that will be affected by the land acquisition for the gas pipeline, including *l'Office National des Chemins de Fer (ONCF)*; *la Direction Régionale du Ministère de l'Équipement et l'Agence du Bassin Hydraulique du Moulouya* have been consulted in this regard.

C. Legal Framework Governing Land Acquisition

The compensation for the land acquisition can be done either on mutually agreed terms or through expropriation in the public interest, which is stipulated in law n°7-81 issued by *dahir* n°1-81-254 dated 6 May 1982.

This law supersedes previous dahirs dated April 3, 1951, June 25 1929, and August 22, 1938 respectively as well as the vizirial order dated October 20, 1954. (Refer to RAP for details).

D. Eligibility Criteria

The persons and government agencies affected by the land acquisition can be classified as follows:

- **Public land:** For the power plant site, the *Office Nationale de l'Électricité (O.N.E.)* has proceeded with the purchase of land from the Ministry of Interior, the custodian of public collective land. Two land parcels for the gas pipelines will also be acquired in the same manner.
- **Collective land owned by the Commune of Beni Mathar - *Collectivité Ethnique de Béni Mathar*:** O.N.E. has compensated the collective land users who are actually farming on the site selected for the power plant for the loss of their crops/harvest.
- **Private land:** For the gas pipelines, 21 land owners will be compensated for their land and any eventual loss of crops/harvest. As for the power plant site, there are no private land owners whose land will be acquired.
- **Land owned by public Agencies (*Office Nationale de Chemin de Fer, Direction Régionale de l'Équipement, et l'Agence du Bassin Hydraulique de Moulouya*):** O.N.E. is preparing and processing a request letter for the permission of temporary occupation of these lands owned by public entity agencies during the construction phase of the gas pipelines.

E. Valuation of, and Compensation for Losses

Description of the compensation

The compensation levels are determined by a Commission of Experts comprised of the following members:

- Representative of the local authority of Ain Béni Mathar ;
- President of the Rural Commune of Béni Mathar ;
- Two community representatives of the *Collectivité Ethnique* of Béni Mathar.
- The representative of the *Service de l'Enregistrement de la Direction Régionale des Impôts* ;
- A representative of the *Direction Régionale des Domaines*.

This Commission has fixed the compensation based on the current land value in the region and also on the basis of negotiations between its members among whom are local community representatives: the President of the Rural Commune and the representatives of the Local Commune - *Collectivité Ethnique of Béni Mathar*.

Land acquisition procedure

The taking of land and related assets/crops may take place only after full compensation has been made to all affected people.

The procedures applied by O.N.E. for land acquisition are as follows:

- Address a letter to the Governor of the concerned Province to call for a meeting with the Commission of Experts;
- Participate as observers in the two meetings of the Commission of Experts, who are in charge of validating the list of affected persons and agencies as well as fixing the land value;
- Undertake Social Assessment and census;
- Compensate the land users and/or land owners, in conformity with the validated list and agreed prices.

F. Community Participation

In June 2006, a series of intensive consultations were conducted with local project affected people as part of the social and land acquisition assessment. The assessment was conducted by a local consultant. The study consulted with individuals whose land and/or assets will be affected by the construction of the power plant and the gas pipelines and they were informed about the project and the land compensation procedures. In addition, the consultations touched upon the implications of the project in terms of employment generation. The assessment further improved

the local communities understandings of the project and its implications and confirmed that the populations are awaiting the employment opportunities which the project will likely offer.

Equally, elected representatives of the local commune of Béni Mathar as well as three public agencies that will be affected by the land acquisition for the gas pipeline, including *l'Office National des Chemins de Fer (ONCF)*; *la Direction Régionale du Ministère de l'Équipement et l'Agence du Bassin Hydraulique du Moulouya* have been consulted on this regards.

Additionally,

- In October 2005 the project team conducted a series of informal consultations with pastoralists in the immediate vicinity of the proposed plant. The local pastoralists viewed the plant as an asset to the region given its employment generation potential and improved availability of electricity.
- On December 29, 2005 and as part of the Environmental Management Plan (EMP), a day of public consultations was organized by ONE in the Municipality of Ain Beni Mathar. The objective was to provide information to the general public on the power plant and to raise awareness, among the participants, and to answer their questions and concerns while sharing the results of the Environmental Impact Assessment (EIA). The participants, over 120 individuals, included: the local population, elected officials, NGO representatives from the region and economic operators.

G. Grievance Procedures

In case of litigation or conflict, the concerned populations can directly address their complaints and concerns to the two local representatives of the *Collectivité Ethnique* and the *Commune Rurale*.

Additionally, the land owners and/or land users who would like to contest the proposed/fixed compensation can call upon the tribunal for a revised valuation of the land/assets. Any affected person may appeal to the court for redress. The court has the power to hear submissions, review the process, and make such provisions as it deems necessary. These include ordering compensation to be paid, halting works, etc.

H. Organizational Responsibilities

O.N.E., which is the grant recipient for the project, will be responsible for ensuring that the land acquisition procedures will be undertaken in compliance with the Moroccan law on Expropriation and Land Acquisition as well as the World Bank's operational policy OP 4.12. The main Unit in O.N.E. who will be in charge of the implementation of these procedures is the *Division de la Gestion du Patrimoine et des Affaires Immobilières*.

I. Implementation Schedule

In June 2004, the land acquisition for the Power Plant site was finalized: the list of affected people and /or entities and the compensations for their loss were validated and approved by the

Commission of Experts. The required public land has been purchased, and the compensations to the communal land users for the loss of use of the land and/or loss of crops have been granted by O.N.E.

In February 2006, the Commission of Experts completed validating the list of land owners/users, the size of the land and other characteristics and valued the land/assets to fix the compensations for the land acquisition entailed by the construction of the gas pipelines. Due compensation will be granted to the affected people prior to the start of the work on the gas pipeline.

O.N.E. is officially requesting authorization from the concerned parties/agencies for the temporary occupation/usage of their lands for the construction of the gas pipeline. O.N.E. expects to obtain the official permission by November 2006.

J. Cost and Budget

For the power plant site:

- 7 998 750,00 Dhs has been transferred/paid to the Ministry of Interior for the acquisition of communal land; and
- 192 877,08 Dhs has been paid to the 7 communal land users for their loss of crops/assets.

For the gas pipelines,

- 687895,00 Dhs has been allocated for the private and public land acquisitions; and
- 19 024,00 Dhs for the temporary occupation/ of land parcels.

The land acquisition costs (including compensation, land purchase, etc.) are being financed from O.N.E.'s budget. This cost remains negligible/much lower in comparison with the overall project cost.

K. Monitoring and Evaluation

O.N.E. will be in charge of monitoring the implementation of this RAP to ensure that the project-affected people are adequately compensated. For every operation and any type of land acquisition (private, public or communal land), the table in annex 3 will be filled out and submitted to the Bank for non-objection. This table will allow O.N.E. to inform the Bank of the progress made on the Plan and will be used as a monitoring and evaluation tool to document accomplishments, identify the dates for specific activities, delays, if any etc.

In addition to the internal supervision by O.N.E., the implementation of the Resettlement Action Plan should be followed up by a third party entity such as a local NGO/ consultant who is specialized in Land acquisition and Social Development related issues. Performance indicators should be used to measure progress.

II. Summary of the Resettlement Policy Framework

A. Principles and Objectives Governing Resettlement

Minimization of expropriation of land. The expropriation of private land is minimized in accordance with Moroccan law, which requires public utility projects of any nature to make maximum use of public land, and only to resort to expropriation when there is no alternative. Minimal expropriation of private land also serves the interest of O.N.E. and the concerned municipalities which are obliged to pay compensation awarded by independent assessment as explained below. Preference is always given to transfer of government or public land from other agencies where this is available, but even in this case compensation is payable. Also provisions will be taken by O.N.E. to avoid disturbing existing structures, in particular residences, farms, areas of religious or cultural heritage value, parks or other areas of public value.

Legal process is obligatory. All expropriations must be carried out according to the provisions of Moroccan law. The law of expropriation defines the procedures to be followed and protects the rights of all parties involved. Wrongs committed during expropriation may be redressed by the courts with provision for payment of damages and punishment of offenders.

Compensation and eligibility principles. Whenever expropriation of private land is unavoidable, Moroccan law clearly indicates that land should be expropriated through full compensation at market value, independently determined, with advance public notice, negotiation and right of appeal. Rights to compensation extend to owners, tenants, workers, or any person who can demonstrate any interest lost as a result of expropriation.

B. Description of Procedures for Preparing and Approving A Resettlement Action Plan

The procedure for the land acquisition for the access road and the electric lines is as follows:

- Address a letter to the Governor of the concerned Province to call for a meeting with the Commission of Experts;
- The Commission of Experts meets to fix the land value and compensation ;
- The local Authorities validate the list of land owners/users to be compensated based on the Commission's valuation.

Finally, O.N.E. pays the fixed compensation according to the validated list. Compensate the land users and/or land owners, in conformity with the validated list and agreed prices.

As per the World Bank's safeguard policy on Involuntary Resettlement OP/BP 4.12, a Land Acquisition and Resettlement Plan (LARP) will be formulated and implemented by O.N.E., and will encompass the following.:

- Project description
- Potential impacts of Land Acquisition
- Objectives of the Resettlement program
- Socio-economic studies
- Legal Framework

- Institutional Framework
- Eligibility for compensation
- Valuation of, and compensation for Losses
- Resettlement measures
- Community Participation
- Grievance procedures
- Organizational responsibilities
- Implementation schedule
- Costs and Budget
- Monitoring & Evaluation

The taking of land and related assets/crops may take place only after full compensation has been made to all affected people.

C. Estimated Population Displacement

At the present state, no physical displacement of persons, residences or commercial enterprises is expected, and any such instances will be fully detailed in the RAP.

The completion of the feasibility study will determine the exact location and size of land required for the access road and the electric lines. A census will be conducted to identify the people that will be affected by this land acquisition.

D. Eligibility Criteria

The following main categories are entitled to compensation where land/assets loss is established.

- (a) Owners
- (b) Tenants with and without occupancy rights
- (c) Usufruct users
- (d) Owners of trees or other permanent improvements
- (e) People who use the land for commercial purposes
- (f) People who have made or maintained improvements of any nature, including caretakers, guardians, etc.

E. Legal Framework Governing Land Acquisition

The same legal procedures will apply as in the RAP (See above).

F. Methods of Valuing Affected Assets;

The same procedures will apply as in the RAP (See above).

G. Grievance Redress Mechanisms;

The same procedures will apply as in the RAP (See above).

H. Arrangements for Funding Compensation

The land acquisition costs (including compensation, land purchase, etc.) will be financed through

O.N.E.'s budgetary provisions. This cost remains negligible in comparison to the overall project cost.

I. Mechanisms for Consultations with, and Participation of, Project Affected Persons

A Census and a Social Assessment to inform and consult with the persons that will be affected by the project, and specifically by land acquisition for the access road and electric lines construction, will be undertaken once the feasibility study is completed and all relevant information on the land size to be acquired and ownership of the land have been obtained.

J. Monitoring of Implementation

O.N.E. will be responsible for the formulation and monitoring of a Resettlement Action Plan which will need to be prepared following the procedures described in section C.

In each case, when any type of land acquisition and compensation is involved the following timetable is prepared. This timetable serves as a monitoring device showing all actions involved, the responsible agency, expected completion date, the reason(s) for any delay and new expected completion date. This table shall be submitted to the Bank for non objection.

Action (full description)	Agency(s) involved	Expected completion date	Reason(s) for delay and new expected completion date
---------------------------	--------------------	--------------------------	--

Morocco Solar Power Project - Status of land Acquisition

Land to be acquired	Amount of land to be acquired	Land Ownership Status	State of advancement / Timeline	Instrument Developed
<p>*Site of Solar Thermal Power Plant</p>	<ul style="list-style-type: none"> • 159 ha 97 ares 50 ca purchased. 	<ul style="list-style-type: none"> • <i>Collective land (terres collectives) owned by the Ministry of the Interior and conferred to the Commune/ Municipality of Ain Beni Mathar.</i> • <i>8 persons (members of the collectivité ethnique) who have been exploiting the land are directly affected by this land acquisition.</i> 	<ul style="list-style-type: none"> • Land size and ownership status determined. • Purchase of land completed in June 2005. O.N.E purchased 160 ha from the Ministry of the Interior for 7 998 750, 00 DH. (Copy of said contract sent to the Bank). • Compensation for loss of crops paid by O.N.E to 8 ‘exploitants’ /members of the “collectivité ethnique” - 5.000 dh/ha for loss of agricultural land. • In June 2004, the land acquisition for the Power Plant site was finalized: the list of affected people and /or entities and the compensation for their loss were validated and approved by the Commission of Experts in charge of land/asset valuation. The required public land has been purchased, and the compensation to the communal land users for the loss of land usage right and/or loss of crops have been granted by O.N.E. 	<p>RAP</p> <p>Resettlement Action Plan / Land Acquisition Plan</p>

			<ul style="list-style-type: none"> • "Bank has asked for certificates of the said compensation certifying that the people affected by the land acquisition for the power plant have received full compensation, that they are leaving voluntarily and are satisfied with the compensation granted by O.N.E. (i.e.have no other claim). • Bank has asked for proof of land title to reconfirm ownership of land. 	
*Gas Pipelines	<ul style="list-style-type: none"> • <i>6 ha 17 ares 11 ca will be purchased</i> • <i>12 ha 35 ares 20 will be rented for the duration of construction.</i> 	<ul style="list-style-type: none"> • Land is owned by both private and public entities: a) PRIVATE - 21 private individuals will have land acquired from them.; b) PUBLIC - 3 agencies are affected by land acquisition: l'Office National des Chemins de Fer (ONCF); la Direction Régionale du Ministère de l'Equipement et l'Agence du Bassin Hydraulique du Moulouya. La Collectivité Ethnique de Béni Mathar. 	<ul style="list-style-type: none"> • Land size and ownership status determined in February 2006. • Land price fixed by the Commission of expertise (Terre Bour : 10 dh/m² = sale price and et 0,15 dh/m² for temporary rent during construction phase: Terre irriguée : 35 dh/m² = sale price and 0,35 dh/m² for rent during construction phase. • By Bank's request, O.N.E. is in the process of preparing a request letter of temporary occupation authorization from the three public agencies. • During consultation the agencies have confirmed that they have agreed, in principle, to the temporary use of their land by ONE during the construction phase. • O.N.E. anticipates finalizing 	<p>RAP</p> <p>Resettlement Action Plan / Land Acquisition Plan</p>

Name/location of site/land to be acquired	Amount of land to be acquired (if known)	Land Ownership Status	State of advancement / Timeline	Instrument Developed
**Access Road	<i>Studies are underway to determine the:</i> <ul style="list-style-type: none"> • <i>Surface area to be acquired</i> • <i>Ownership status of the land</i> • <i>Number of persons requiring compensation</i> 	<ul style="list-style-type: none"> • Ownership status to be determined by ongoing study. 	<ul style="list-style-type: none"> • Study to determine the exact surface area and number of affected persons expected to be completed by end of November 2006. 	<p>RPF</p> <p>Resettlement policy Framework developed.</p> <p>RAP will be developed when studies finalized</p>
**Electricity lines	<i>Studies are underway to determine the:</i> <ul style="list-style-type: none"> • <i>Surface area to be acquired</i> • <i>Ownership status of the land</i> • <i>Number of persons requiring compensation</i> 	<ul style="list-style-type: none"> • Ownership status to be determined by ongoing study. 	<ul style="list-style-type: none"> • Study to determine the exact surface area and number of affected persons launched in February 2006 for a duration of 16 months (expected in June 2007). 	<p>RPF</p> <p>Resettlement policy Framework</p> <p>RAP will be developed when studies finalized</p>

All land parcels to be acquired are relatively small and uninhabited and none of the land constitutes the sole source of revenue for the affected persons. No population displacement is entailed.

* Les terres objet de vente ou de location pour le projet sont des terres collectives, c'est-à-dire des terres données par l'Etat en exploitation à des ayants droits qui font partie de la Collectivité

Ethnique ou à la Collectivité Ethnique dans sa globalité. Ces terres sont utilisées pour la céréaliculture, la luzerne et/ou l'élevage, aucune parcelle n'est habitée.

** Le choix du site pour la route d'accès et les lignes électriques sera basé sur une étude de faisabilité qui prendra en compte le niveau d'ensoleillement, la proximité du gazoduc, la disponibilité de l'eau, la proximité du réseau électrique ainsi que l'aspect social à la suite de la fermeture de la mine de Jerada.

Annex 11: Project Preparation and Supervision

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

	Planned	Actual
PCN review	07/30/1998	08/05/1998
Initial PID to PIC	06/01/1999	04/14/1999
Initial ISDS to PIC	09/25/2003	09/25/2003
GEF Council Approval	10/15/2004	10/15/2004
Appraisal	June 2006	06/30/2006
Negotiations	July 2006	09/11/2006
GEF CEO Endorsement	July 2006	
Board Approval	October 2006	
Planned date of effectiveness	December 2006	
Planned date of mid-term review	December 2007	
Planned closing date	December 2012	

Key institution responsible for preparation of the project:
Office National de l'Electricite (O.N.E.)

Bank staff and consultants who worked on the project included:

Name	Title	Unit
Noureddine Bouzaher	Task Leader	MNSIF
Rachid Bouhamidi	Financial Analyst	MNSIF
Rene Mendonca	Power Engineer (Consultant)	Consultant
Meryem Benchemsi/Siaka	Financial Management Specialists	MNACS
Bakayoko/Moez		
Makhlouf/Samia Msadek		
Armando Araujo Ribeiro	Procurement Specialist (Consultant)	MNSIF
Dominique Bichara	Senior Counsel	LEGMS
Khalid Boukantar	Project assistant	MNSIF
Sophie Jablonski	Junior Professional (JPA)	MNSIF
Charles Sterling	Financial analyst	Consultant
Dahlia Lotayef	Environmental Specialist	MNSRE
Yaa Oppong and Tiguist	Social Safeguards Specialists	MNSRE
Fisseha		
Fanny Missfeldt-Ringius	Environmental Economist	AFTEG

Estimated Approval and Supervision costs:

1. Remaining costs to approval: \$150,000
2. Estimated annual supervision cost: \$120,000

Annex 12: Documents in the Project File

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

References:

- Description sommaire de la centrale de Ain Béni Mathar
- Evaluation de la capacité d'un organisme à procéder à la passation de marchés pour les projets, fixation des seuils d'examen préalable et plan de supervision de la passation des marchés.
- Bilan énergétique 2004
- Evolution de la puissance installée 2004 – 2012
- Satisfaction de l'énergie appelée nette (GWh) – Scénario fort et scénario faible
- Satisfaction de la puissance appelée à la pointe (MW)
- Projections de la demande 2004 – 2012 (Scénarios moyen, fort et faible)
- Bilan, compte d'exploitation, compte de gestion et tableau de financement 2004
- Perspectives financières 2005 – 2010
- Projections 2004 - 2010: (i) Indicateurs financiers ; (ii) Comptes charges et produits ; (iii) état des soldes de gestion ; (iv) tableau de financement ; (v) emplois et ressources
- Coûts estimatifs du projet du projet de Ain Béni Mathar
- Calendrier prévisionnel d'exécution
- Etat d'avancement des composantes
- WASP computer output for generation planning 2004 – 2033
- Draft procurement plan
- Lettre du Premier Ministre au Ministre de l'Energie marquant son accord pour l'approvisionnement de la centrale de Ain Béni Mathar en gaz naturel à prélever sur la redevance perçue par le Maroc au titre du transit par le Gazoduc Maghreb Europe.
- WASP computer simulations on least-cost generation (October 2005)
- International Energy Agency (IEA) (2003). Renewables for Power Generation: Status and Prospects. 2003 Edition, Paris

Annex 13: Statement of Loans and Credits
MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

Kingdom of Morocco

As of August 22, 2006

Active Projects							Difference Between Expected and Actual Disbursements^{a/}	
Original Amount in US\$ Millions								
Project ID	FY	Project Name	IBRD	Grant	Cancel.	Undisb.	Orig. Frm	Rev'd
P075808	2003	Adult Literacy (Alpha Maroc)	4.1		1.80	2.41	3.16	-0.21
P043412	2005	Basic Education Reform Support	80.0			61.29	30.92	
P088243	2006	Financial Sector DPL	200.0			72.64	1.39	
P005525	1999	Health Management	66.0		26.42	16.69	36.15	6.77
P083746	2005	Housing Sector DPL	150.0			57.62	4.36	
P056978	2001	Irrigation-Based Community Dev.	32.6			24.38	21.36	
P048314	2000	GEF-Protection Areas Management		10.5		6.22	6.22	0.09
P082754	2004	Rural Roads	36.9			36.68	7.72	7.15
P094007	2006	Rural Roads II	60.0			62.83		
P069124	2003	Rainfed Agriculture Development	26.8			29.82	5.67	
P086877	2006	Rural Water Supply and Sanitation	60.0			62.04	1.19	
P073531	2002	Social Development Agency	5.0			3.85	1.20	0.62
Overall Result			721.3	10.5	28.22	436.47	119.35	14.42

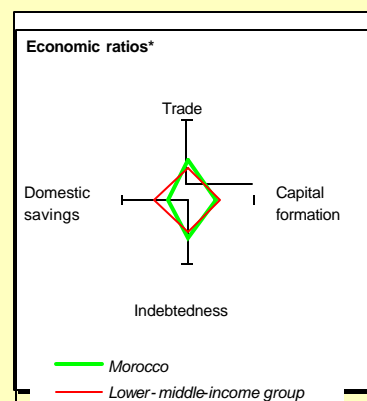
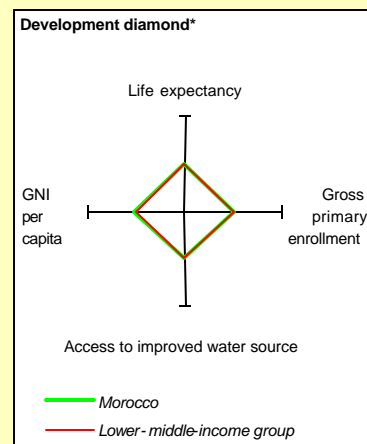
Morocco
Statement of IFC's
Held and Disbursed Portfolio
As of 07/31/2006
(In US Dollars Millions)

FY Approval	Company	IFC Held					IFC Disbursed				
		Loan	Equity	Quasi	Guarantee	Partic	Loan	Equity	Quasi	Guarantee	Partic
2006	FONDEP	0	0	0	3.45	0	0	0	0	0	0
2006	Veolia Water AMI	0	15.93	0	22.31	0	0	0	0	0	0
2000	Maghreb Inv. Mgt	0	0.02	0	0	0	0	0.02	0	0	0
2000	Maghreb Invest P	0	2.30	0	0	0	0	2.30	0	0	0
Total Portfolio:		0	18.25	0	25.76	0	0	2.32	0	0	0

Annex 14: Country at Glance

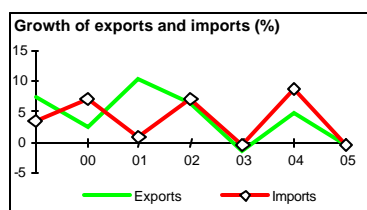
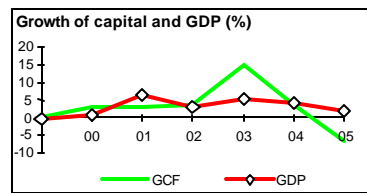
7/13/06

POVERTY and SOCIAL	Morocco	M. East & North Africa	Lower-middle-income		
2005					
Population, mid-year (millions)	30.1	300	2,442		
GNI per capita (Atlas method, US\$)	1,750	1,970	1,690		
GNI (Atlas method, US\$ billions)	52.8	592	4,116		
Average annual growth, 1999-05					
Population (%)	1.2	1.9	0.9		
Labor force (%)	1.0	3.5	1.4		
Most recent estimate (latest year available, 1999-05)					
Poverty (% of population below national poverty line)	15		
Urban population (% of total population)	55	57	50		
Life expectancy at birth (years)	71	70	71		
Infant mortality (per 1,000 live births)	40	44	32		
Child malnutrition (% of children under 5)	10	..	11		
Access to an improved water source (% of population)	81	88	81		
Literacy (% of population age 15+)	53	70	89		
Gross primary enrollment (% of school-age population)	112	104	112		
Male	..	107	113		
Female	..	100	111		
KEY ECONOMIC RATIOS and LONG-TERM TRENDS					
	1985	1995	2004	2005	
GDP (US\$ billions)	12.9	33.0	50.0	51.9	
Gross capital formation/GDP	25.0	20.7	25.0	25.6	
Exports of goods and services/GDP	25.3	27.4	33.2	36.2	
Gross domestic savings/GDP	17.0	14.1	18.3	19.0	
Gross national savings/GDP	22.1	17.3	26.7	28.8	
Current account balance/GDP	-6.7	-3.6	1.9	2.4	
Interest payments/GDP	5.8	4.2	1.2	1.5	
Total debt/GDP	124.8	72.2	37.4	38.0	
Total debt service/exports	33.7	33.4	13.9	15.1	
Present value of debt/GDP	
Present value of debt/exports	
	1985-95	1995-05	2004	2005	2005-09
<i>(average annual growth)</i>					
GDP	2.9	3.6	4.2	1.8	4.2
GDP per capita	0.9	2.2	3.1	0.8	3.2
Exports of goods and services	7.5	4.8	4.7	-0.4	5.5



STRUCTURE of the ECONOMY

	1985	1995	2004	2005
<i>(% of GDP)</i>				
Agriculture	16.6	14.6	15.9	13.1
Industry	33.4	33.0	30.4	31.8
Manufacturing	18.6	18.4	18.6	18.7
Services	50.0	52.4	53.7	55.1
Household final consumption expenditure	67.1	68.5	60.7	58.3
General gov't final consumption expenditure	15.8	17.4	21.0	22.7
Imports of goods and services	33.4	34.0	40.0	42.7
	1985-95	1995-05	2004	2005
<i>(average annual growth)</i>				
Agriculture	-0.4	3.4	1.9	-15.0
Industry	2.9	3.6	4.9	5.6
Manufacturing	3.5	3.2	3.0	2.6
Services	3.8	3.6	4.5	4.5
Household final consumption expenditure	2.9	2.4	8.1	2.3
General gov't final consumption expenditure	4.2	4.0	1.5	8.7
Gross capital formation	1.8	5.3	3.7	-6.3
Imports of goods and services	7.1	3.9	8.8	-0.3



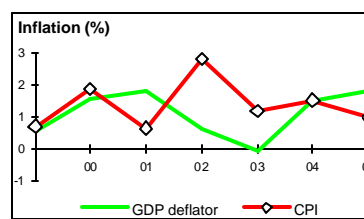
Note: 2005 data are preliminary estimates. Group data are to 2004.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

Morocco

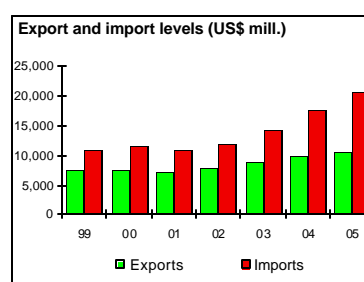
PRICES and GOVERNMENT FINANCE

	1985	1995	2004	2005
Domestic prices (% change)				
Consumer prices	7.7	6.1	1.5	1.0
Implicit GDP deflator	8.4	8.0	1.5	1.8
Government finance (% of GDP, includes current grants)				
Current revenue	16.0	23.9	25.3	27.1
Current budget balance	-6.6	0.1	-0.4	-2.5
Overall surplus/deficit inc Privatization receipts	-8.8	-3.9	-3.4	-4.3



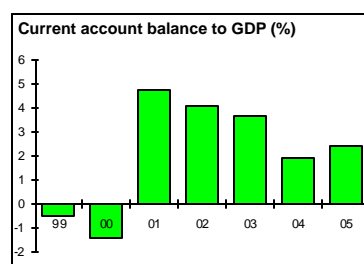
TRADE

	1985	1995	2004	2005
<i>(US\$ millions)</i>				
Total exports (fob)	2,268	6,871	9,912	10,644
Agriculture	546	1,469	1,757	2,106
Phosphorus rock	479	284	420	514
Manufactures	477	3,754	5,839	5,794
Total imports (cif)	3,921	10,011	17,808	20,884
Food	507	1,373	1,534	1,793
Fuel and energv	1,074	1,177	2,956	4,549
Capital goods	649	2,186	3,936	4,261
Export price index (2000=100)	61	100	117	127
Import price index (2000=100)	82	122	124	128
Terms of trade (2000=100)	75	82	94	99



BALANCE of PAYMENTS

	1985	1995	2004	2005
<i>(US\$ millions)</i>				
Exports of goods and services	3,263	9,045	16,619	18,758
Imports of goods and services	4,419	11,243	19,843	22,567
Resource balance	-1,157	-2,199	-3,223	-3,809
Net income	-766	-1,318	-676	-321
Net current transfers	1,064	2,330	4,864	5,387
Current account balance	-859	-1,186	964	1,257
Financing items (net)	976	204	929	1,105
Changes in net reserves	-117	982	-1,893	-2,361

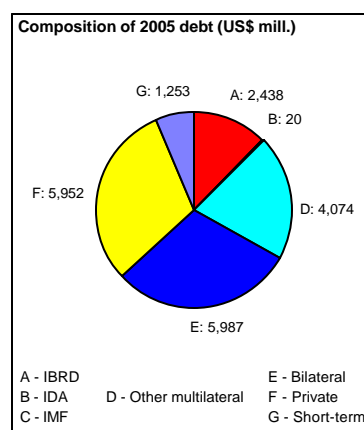


Memo:

Reserves including gold (US\$ millions)	115	3,870	17,577	17,936
Conversion rate (DEC. local/US\$)	10.1	8.5	8.9	8.9

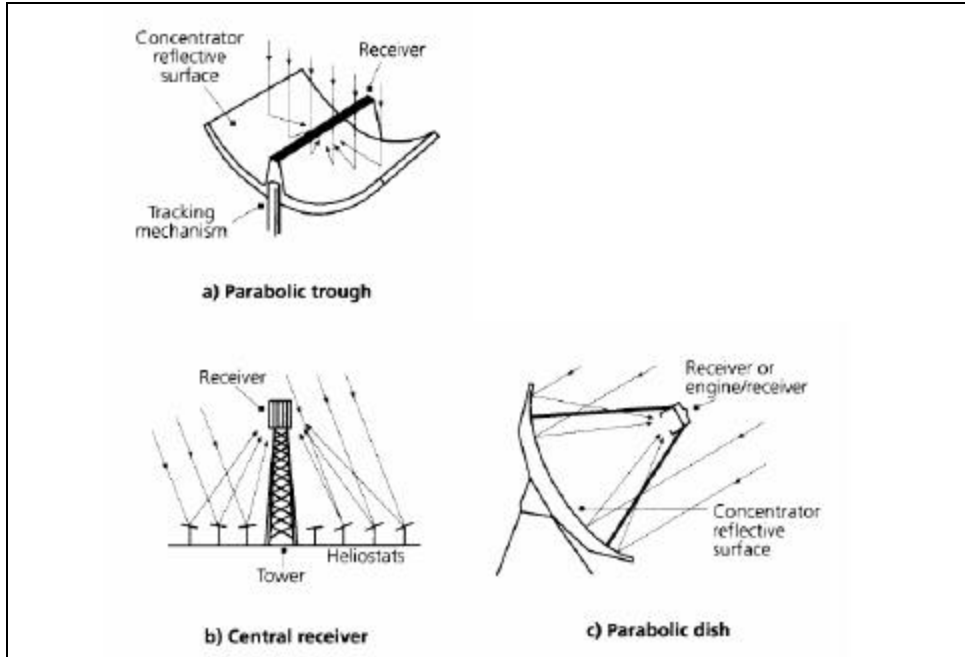
EXTERNAL DEBT and RESOURCE FLOWS

	1985	1995	2004	2005
<i>(US\$ millions)</i>				
Total debt outstanding and disbursed	16,056	23,828	18,710	19,724
IBRD	1,288	3,966	2,524	2,438
IDA	43	33	21	20
Total debt service	1,429	3,760	2,970	3,617
IBRD	167	630	572	582
IDA	1	2	1	1
Composition of net resource flows				
Official grants	416	100
Official creditors	391	-66	-297	..
Private creditors	216	158	309	..
Foreign direct investment (net inflows)	20	332	1,071	3,030
Portfolio equity (net inflows)	0	20	619	133
World Bank program				
Commitments	379	433	349	700
Disbursements	307	426	129	350
Principal repayments	87	350	469	437
Net flows	220	76	-340	-87
Interest payments	81	282	104	146
Net transfers	139	-206	-444	-233

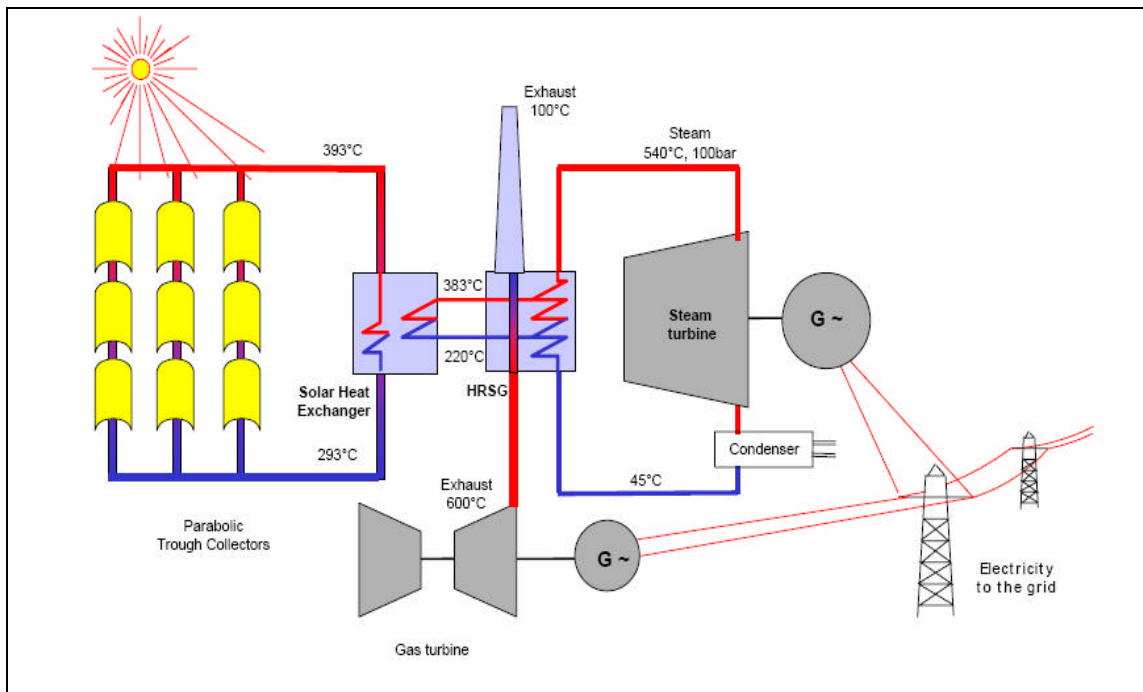


ANNEX 15 – Solar Thermal Technologies and Integration

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT



Source: Fichtner Solar GmbH



Source: Fichtner Solar GmbH

Annex 16: Incremental Cost

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

Incremental Cost Analysis

1. Total incremental costs are estimated at about US\$ 49.6 million. The project configuration and arrangements have been optimized in the selection process for the EPC cum O&M contract through the utilization of open competitive bidding. US\$43.2 million will be borne by GEF and US\$6.4 million will be covered by the AfDB loan already in place.

Sector Background

2. Moroccan energy demand grew about 5 to 7 % per year on average over the last decade, and it is expected to continue growing at this pace for the foreseeable future. To meet the growing demand, some 2,837 MW of additional generation capacity will be needed over the next eight years. The connection to the grid of the solar thermal power plant in the Moroccan expansion plan is scheduled for the end of 2008. The Government of Morocco (GOM) has embarked on a power sector reform program and has undertaken important steps to secure private investors to operate the sector's power generating and distribution facilities. As early as 1994 the electricity law was amended to permit the operation of Independent Power Producers (IPPs). GOM intends to have the future generating capacity mostly financed and owned by the private sector (see the system expansion plan in Table 1).

3. In 2004 a total of 4,621 MW capacity was installed in Morocco, of which 3,069 MW was thermal power (of which 1,665 MW are coal-fired), 1,265 hydropower, 54 MW wind power, and 233 MW pumped storage. Several IPPs are operating in Morocco, including the coal-fired power plant of Jorf Lasfar. The latter contributes about 10,000 GWh or almost 55% of Morocco's electricity demand. Substantial amounts of electricity are also being imported from Spain. In 2004, the net import from Spain amounted to 1,554 GWh or 8% of electricity generation.

4. In 2004, electricity generated from coal accounted for about 70% of generation. The second major fuel was HFO with 1,881 GWh produced in 2004. In 2005, natural gas became the second major fuel with the completion of the 400 MW combined cycle power plant at Tahardart. Morocco is beneficiary of a natural gas wheeling arrangement whereby the country can extract up to 7% of all gas wheeled from Algeria via Morocco to Spain from the Euro-Maghreb gas pipeline. Additional gas can be purchased at international market prices.

5. The GOM is committed to developing renewable energy resources such as mini-hydro, solar, and wind. The most visible sign of the GOM's commitment to renewables is the construction of the 50 MW wind farm at Koudia Al Baïda. The addition of further capacity is planned for 2006 at Cap Sim (60 MW) and for 2008 at an area near Tangiers (150 MW). Power generated from wind is around 200 GWh annually or 1% of power generated.

Year	Plant addition	Capacity (MW)
2006	Windpark at Cap Sim	60
2007	Solar thermal power plant Ain Beni Mathar (236 MW); hydropower at Tanafnit-El Borj (38.1 MW)	274.1
2008	First northern CCGT (400 MW); windpark at Tangier (140 MW)	540
2009	Second northern CCGT (400 MW)	400
2011	400 MW LNG or 350 MW coal at Agadir	350 - 400
2012	400 MW LNG or 350 MW coal at Agadir	350 - 400
Total		1974.1

Source: ONE (2005).

6. In 2004, total sales of electricity amounted to 16,384 GWh, an increase of 7% compared to 2003. The total number of customers is at 2,654,222 up by 10.6% due to the ongoing rural electrification program. Under the rural electrification program some 3,610 villages were connected to the grid, and some 363 villages received individual solar systems. The rate of electrification in rural areas increased from 62% in 2003 to 72% at the end of 2004. The average tariff in 2004 was 0.678 MAD/kWh corresponding to about US¢ 8/kWh.

Global Environmental Objective

7. The Global Environment Facility (GEF) has identified “solar thermal-electric technologies in high insulation regions, initially emphasizing the proven parabolic trough variant for electric power generation”¹¹, as one of the renewable energy technologies it supports through its operational program number 7. The project, with other thermal power projects now being developed worldwide (e.g. Algeria, Spain, etc.) including two planned GEF solar thermal projects in Egypt and Mexico, will contribute to building a critical mass to bring down the production costs of the ISCC technology.

8. A direct global benefit of the project is the carbon abatement achieved by substituting solar energy for fossil fuels. Assuming the 20 MW solar field will be operating about 35% of the time (compared to 67% for the gas turbine), the solar contribution to the overall generation of the power plant will be about 2.4% or about 37.5 GWh per year. This translates into carbon savings of about 22,500 tons of CO₂ per year or 450,000 tons of CO₂ over the 20 year lifetime of the plant.

Baseline

9. An analysis of Morocco’s system expansion plan, fuel supply and availability, and potential candidate plants (table 1) suggests that the least-cost baseline course of action will be the commissioning of further gas-fired combined cycle capacity. The baseline plant is therefore assumed to be a combined cycle gas turbine (CCGT) fueled with natural gas capable of producing the same output as the proposed GEF alternative.

¹¹ GEF: Operational Program Number 7: Reducing the Long-Term Costs of Low Greenhouse Gas-Emitting Energy Technologies.

GEF Alternative

10. The proposed alternative foresees the construction of a solar thermal - fossil fuel hybrid power plant of a total capacity of 227 MW (The gross capacity of this plant is about 227 MW with plant-own consumption of about 8 MW). The plant is to be located in Aïn Beni Mathar, which is about 86 km south of Oujda. In the context of Morocco, Aïn Beni Mathar is a least cost site with excellent levels of solar insolation 2,290 kWh/m²/year,¹² direct access to natural gas (close vicinity to the Euro-Maghreb pipeline), water supply, and close access to the national grid.

11. Based on a feasibility study prepared by Fichtner Solar (2005) the proposed solar thermal power station would have the characteristics as shown in table 1.

Table 1: Characteristics of the Solar Thermal Power Plant	
Plant type	Integrated Solar Combined Cycle System (ISCC)
Gross Plant Capacity (MW)	227
of which solar field	23
Electricity output (GWh/yr)	1,572
Solar share (GWh/yr)	37.5
Solar share (% of energy output)	2.4
Investment/Total Installed Costs (US\$ million)	187
Levelized electricity costs w/ grant (US¢/kWh)	5.6

Scope of the Analysis

System boundary

12. The analysis is based on the direct comparison of the proposed solar thermal plant with the least-cost conventional solution in the same annual output range. It is recognized that the introduction of solar-thermal capacity to the national grid might require further adjustments in the system expansion plan, not least because the proposed plant is relatively small compared to the conventional power stations that might be built in the baseline. These system-wide effects are ignored in the current analysis. While they could be captured in a broader study of the entire system expansion plan, a simple plant-by-plant comparison was preferred, for the following reasons:

- The Moroccan power system is growing relatively fast, with planned capacity additions of around 2,837 MW over the next eight years. Relative to this expansion (which includes a number of smaller units) and the overall size of the system, the proposed addition is relatively minor and can be absorbed without major repercussions;
- There is a trade-off between spatial and temporal system boundary: A plant-by-plant comparison ignores systemic effects, but allows the analysis of the entire plant lifetime. A system expansion analysis, on the other hand, has a wide spatial system boundary, but usually covers no more than about 10 years of plant life. In the current context - where systemic effects are assumed to be small, and the time horizon of the expansion plan is relatively short - covering the entire plant life was considered more important.

¹² A site of 1,900 kWh/m²/year is generally qualified as sufficient for solar thermal technology (IEA,2003).

Additional domestic benefits

13. The GEF alternative will result in improvements in domestic air quality. Morocco has already initiated and implemented important actions dealing with local air pollution, including measures on promoting renewable energy (e.g. the Koudia Al Baïda windfarm), utilizing cleaner fuels (in particular natural gas), and improving efficiency in energy production and usage (e.g. at Jorf Lasfar I and II, which are under private management).

Key Assumptions

Key assumptions are summarized in Table 2 below.

Table 2: Key Assumptions	
Parameter	Value
<u>Technical:</u>	
Plant lifetime	20 years
Construction time	3 years
<u>Economics:</u>	
ISCC	\$826/kW
CCGT	\$ 632/kW
Solar field	\$ 2,160/kW
Economic cost of gas	\$6/mmBTU
Gas cost escalation (annual)	1%
O&M cost escalation (annual)	1%
ISCC fossil part fixed O&M costs	\$1,980,000
ISCC solar field part fixed O&M costs	\$770,000
ISCC variable O&M costs	0.05 ¢/kWh
CCGT fixed O&M costs	\$1,840,000
CCGT variable O&M costs	0.05 ¢/kWh
Discount rate	6%
Note: 20°C corresponds to the annual average temperature on site.	

Costs

Capital costs

14. The cost for the baseline CCGT is estimated at US\$632/kW and that of the GEF alternative at \$826/kW. Solar power entails substantially higher capital costs than conventional generation and the kW installed costs an estimated \$2,160. A more detailed cost breakdown - based on the findings of the feasibility study and project appraisal - is shown in table 2 above. Capital costs include physical contingencies. The comparison of cost estimates between the baseline and the GEF alternative focuses on the costs of design, construction, and operation alone as the costs for the required transmission lines, substation, access road, boreholes, gas pipeline connection, environmental mitigation and consultancy services are assumed to be roughly the same in both cases. A detailed breakdown of Project costs is included in Annex 5 above.

Recurrent costs

15. The main recurrent cost elements concern fuel purchases and operation and maintenance (O&M). Good O&M data for solar power are available for the nine solar thermal plants that have been operating in California since the 1990s. Over the years, operators have succeeded in substantially reducing O&M costs by increasing the efficiency and lifetime of solar field components, improving the effectiveness of the solar field - power block interface and other measures. As a result, the typical variable O&M costs for a solar field have come down to about 0.05 US\$/kWh, in line with about 0.05 US\$/kWh for a typical CCGT. The economic cost of natural gas from the Maghreb-Europe pipeline is US\$ 6 per MMBTU.

Incremental costs

16. The above considerations result in an incremental cost estimate of US\$ 43.2 million, as shown in table 4.

Table 4: Investment, O&M and Incremental Costs (US\$ million unless otherwise stated)			
	PV (discounted)	Capital	Recurrent (annual)
Baseline (CCGT) [costs scaled to ISCS generation]			
Capital costs	125.05	125.05	
Fuel costs	688.01		688.01
O&M costs	28.45		28.45
Total	841.51	125.05	716.46
Levelized Costs (Million \$/year)	85.9	13.1	72.8
Levelized electricity costs (\$/MWh)	52.6	7.8	44.8
Alternative (ISCS)			
Capital costs	176.78	176.78	
Fuel costs (gas turbine)	674.19		674.19
O&M costs	40.13		40.13
Total	891.1	176.78	714.32
Levelized Costs (Million \$/year)	87.3	17.3	69.9
Levelized electricity costs (\$/MWh)	55.5	11	44.5
Increment			
Incremental capital costs	51.73	51.73	
Incremental fuel costs	-13.82		-13.82
Incremental O&M costs	11.68		11.68
Total incremental costs	49.6	51.73	-2.14
Levelized Costs (Million \$/year)	1.4	4.2	-2.9
Incremental levelized costs (\$/MWh)	2.9	3.2	-0.3
Note: Figure may not add up due to rounding. * Discounted at 6% above inflation, which is assumed at 4% (total discount rate 10%) over the 20 year plant life.			

Summary: Incremental Cost Matrix

17. The results of the incremental cost analysis can be summarized in the incremental cost matrix shown in table 5.

Table 5: Incremental Cost Matrix			
	Baseline	Alternative	Increment
Domestic Benefit			
a) physical	1534 GWh per year of electricity	1572 GWh per year of electricity (37.5 GWh are produced through the solar field)	37.5 GWh
b) programmatic	Limited O.N.E .institutional capacity to develop complex renewable -based generation projects.	Demonstrated practical viability of utility-based solar-thermal technology. Participating in planning, preliminary design of technical and financial requirements, preparation of bidding documents for hybrid plant.	Reduction of perceived risks in renewable-based power; gain in operational experience. Up to 20 O.N.E. staff at various levels trained in solar/hybrid technology.
Global Benefits			
a) environmental			450,000 tons of CO ₂ abated over 20 years of project life.
b) programmatic	No hybrid solar thermal power plant in operation; high risk perceived by investors. Solar thermal industry dormant with little future prospects; high costs.	20 MW(e) solar thermal capacity installed and operating. Demonstration effect. Revived interest/market opportunities for solar thermal industry.	20 MW(e) of solar thermal capacity installed and operating. More countries and investors globally willing to consider solar thermal power options. Creation of new opportunities for solar thermal power industry as a result of cost reductions.

Costs (\$M)			
Capital Costs	125.05	176.78	51.73
Fuel Costs	688.01	674.19	-13.82
O&M	28.45	40.13	11.68
	-----	-----	-----
Total	841.51	891.1	49.6

Process of Agreement

18. The current incremental cost estimate is based on the findings of the feasibility study and information gathered at appraisal. The results of the report were extensively discussed with O.N.E. and Fichtner Solar (O.N.E.'s consultant) during the pre-appraisal mission in November 2005 and the appraisal mission of June 2006. Final agreement on the technical, economic, financial, environmental and social aspects of the project has been reached with O.N.E during the appraisal mission of June 2006. The method outlined in this annex by which incremental costs are determined has also been agreed. The incremental costs will be financed as follows: GEF will contribute US\$ 43.2 million and the rest (i.e. US\$6.4 million) will be covered by the AfDB loan already in place.

MOROCCO
INTEGRATED SOLAR COMBINED CYCLE POWER PLANT OF AIN BENI MATHAR
INCREMENTAL COSTS CALCULATIONS - TECHNICAL DATA

Required Grant		mIn \$	43.2	
LEC of total generation		\$/ MWh	55.5	
Solar Generation		GWh/a	37.5	
LEC of solar generation		\$/ MWh	173.5	
Summary Technical Data				
			ISCC	Ref-CC
Gas turbines considered in base line design			2 * Fr6FA	
Solar field size	67%	1000m2	151	
DNI (Annual direct normal irradiation)		kWh/m2/a	2290	
Thermal storage capacity		MWh		
Gas turbine capacity (at ISO)		MWe	138	138
Gas turbine capacity (at av. temperature)		MWe	124	131
Steam turbine capacity (av. temperature, max solar heat)	solar	MWe	103	87
no solar heat	no solar	MWe	80	87
Gross capacity (av. temp., max solar heat)		MWe	227	218
Own consumption		MWe	8	8
Net capacity (av. temp., max solar heat)		MWe	218	210
Capacity Increase of Ref-CC due to Altitude	5.65%			
Heat Rate Decrease of Ref-CC due to Altitude	0.0%			
Design Net Electric Energy		GWhe/a	1572	1625
Solar Generation (GWh/a) (at design)		GWhe/a	37.5	
Solar Generation (as percent of design value)	100%	GWhe/a	37.5	
Net Electric Energy		GWhe/a	1572	1625
Fuel gas consumption (at av. amb. temp.) (LCV)		MW-LCV	366	387
Annual fuel gas consumption (LCV)		GWh/a-LCV	2898	3068
Energy of Solar Heat (GWh/a)		GWh/a	131	0
Ratio electric to fossil fuel			54.3%	53.0%
Ratio electric to (fossil fuel + Solar heat)			51.9%	53.0%
Solar Generation (GWh/a)		GWhe/a	37.5	
Solar Share			2.4%	
Specific CO2 emission of comparable generation	0.60	kgCO2/kWhe	0.60	0.60
Annual CO2 emission reduction		kt/CO2/a	22.5	0.0
Total CO2 emission reduction	in years	20	mIn t/CO2	0.45
Type of Cooling			Cooling Tower	
Raw water requirement		m3/hr	327	236

Annex 17: Scientific and Technical Advisory Panel (STAP) Review
MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT
Independent Technical Review

1. Introduction

This project will assist the Government of Morocco, through its state-owned Office National de l'Electricité (O.N.E.), to finance and construct an integrated solar thermal combined cycle (ISCC) power plant through an Engineer, Procure and Construct (EPC) cum Operation and Maintenance (O&M) contract. ONE will finance the plant through an African Development Bank (AfDB) loan (already secured for about 64% of the project cost), their own contribution of about 16%, and a grant from the Global Environment Facility (GEF), which will be used to finance the incremental cost of the solar thermal portion of the ISCC power plant (about 20% of total investment costs.) The O&M contract will last 5 years and include appropriate incentives to ensure an efficient operation of the plant, particularly the solar field.

Selection of the EPC/O&M contractor will be through an international bidding process, and details of the plant design and the contractual arrangements can only be defined after the winning bid is selected. As a result, the Project Appraisal Document (PAD) has been written with a limited amount of technical details, based primarily on the feasibility study carried out by Fichtner Solar in 2005. Therefore, this technical review can only address the details provided regarding the project approach, site selection, conceptual design, bidding process, and expected contractual arrangements. It cannot comment on the adequacy of the final plant design or contracts.

The gross capacity of the ISCC power plant is expected to be between 200-250 MWe and the solar thermal parabolic trough collector field is expected to have an equivalent capacity of between 20-30 MWe. Based on the feasibility study, the annual net electricity produced by the plant is expected to be about 1,590 GWh, which includes the solar field contribution of about 56 GWh per year. This corresponds to a solar share of 3.5 percent of the total plant output when operating at a full load. The primary fuel for the gas turbine will be natural gas supplied via a spur from the Maghreb-Europe gas pipeline.

2. GEF Context

The proposed project addresses GEF Operational Program 7 (OP7): reducing the long-term cost of low greenhouse gas-emitting technologies. OP7 aims to accelerate market penetration of several large-scale backstop technologies that are constrained by high capital costs and high commercial risks. The strategy is to identify projects that address national priorities and then finance the incremental costs of investments, capacity building and other activities that reduce market barriers and perceived risks by investors.

Based on the technical success of the 354 MW of solar thermal power plants still operating in California after more than 15 years, this technology can be considered an important large-scale

non-carbon emitting backstop technology. Many of these plants currently operate at solar outputs that exceed their initial design specifications. Also, this reviewer agrees that significant cost reductions and eventual commercial acceptance of this technology can only begin to occur with the implementation of several demonstration projects in carefully selected countries and sites. The proposed project is one of four similar projects (the others being in India, Mexico and Egypt), which have been approved by GEF as part its program to accelerate cost reduction and commercial adoption of this large-scale non-carbon emitting generation technology. In addition, the timing of this project fits well with new installations of solar thermal power technology taking place in industrialized countries. These projects include a 1 MWE solar parabolic trough organic Rankine cycle power plant undergoing start-up in Arizona, a 64 MWe solar thermal power plant under construction in Nevada, and two 50 MWe solar thermal power plants with thermal storage under construction in Spain.

3. Key Issues

a. Project Approach

The reviewer agrees with the Project implementation approach of constructing the plant on the basis of a turnkey EPC contract and a 5-year O&M agreement with the same contractor. First, the ISCCS design integration and the technology selection risks will be borne by the contractor, who will have the expertise to manage those risks. Second, competition among the EPC bidders will help ensure that the most cost-effective combination of technology and local component manufacturing will be selected. Third, the O&M contract should contain appropriate incentive structure for both maximizing the total plant reliability as well as maximizing the utilization of the solar field over the long term. The PAD only discusses the latter issue, but the O&M contract will need to address both issues. As O.N.E .owns the plant, it is assumed that they will control the dispatch of the gas-fired portion of the plant. Finally, the use of only pre-qualified bidders is likely to allow the selected EPC contractor and key suppliers to capture technology and organizational learning effects that are essential to achieving long-term cost reductions for solar thermal power.

One question that this reviewer could not assess from the PAD is whether the bidder prequalification includes the potential manufacturers of the solar collectors and heat collection elements.

3.2 Scientific and Technical Soundness

Nine solar thermal power plants that raise steam to generate power have been successfully operating for over 15 years. The basic concept of integrating a solar thermal steam raising facility with a natural gas combined cycle power plant is sound and has been extensively studied. While such a project has yet to be implemented, a project employing this concept should be completely feasible, as the technical basis for such an integrated system is quite straightforward and both aspects of the plant are technically proven. The reviewer concurs with the decision not to include thermal storage within the plant configuration.

The technical and economic effectiveness of the ISCC power plant will depend on the detailed design and selection of equipment, which will be made at a later stage of project development. Therefore, this review will only list the most important technical issues that will need critical analysis when the detailed design is available.

As the technology selection will be left to the EPC Bidders, who will all be pre-qualified, the bid documents must establish minimum requirements for the solar thermal steam raising component to ensure that the minimum solar share target can be met. Effective integration of the steam systems for the solar thermal field and the gas-fired combined cycle plant is essential to achieving significant cost reductions and proper performance of the power plant. The selection process should review plant designs to ensure that the plant operates effectively in all modes. In particular, integration and control of the system should allow the solar contribution to be consistently maximized. In addition, the system should allow power to be efficiently generated on natural gas only, if required (during nighttime or if the solar field is not operational).

3.3 Adequacy of the Financing Mechanism

The financing approach to this Project is much simpler than the IPP approaches that have been attempted on other GEF solar thermal power projects. In particular, this financing approach avoids the complicated negotiation for power purchase, fuel supply and implementation agreements that can be problematic for IPP projects.

O.N.E.'s funds appear to be available, the AfDB loan is reported as secured, and with approval of the GEF grant, all Project funds will be in hand. In addition to the EPC/O&M contract, the Project includes funds to enable transmission of the power to load centers, provision of natural gas from the Maghreb-Europe pipeline, and supply of water for cooling and collector field washing.

3.4 Identification of Global Environmental Benefits

The project's principal global environment objectives are to contribute to improving the economic attractiveness of non-carbon emitting solar thermal generation technology globally and to demonstrate the operational viability of this hybrid solar thermal power generation system in a developing country. The Project will contribute to the global learning effects that will lead to a reduction in costs for solar thermal technology over the long term. In addition, this Project could be the first solar thermal power plant constructed in a developing country, and will be critical to demonstrating that the technology capacity can be developed to manage these type plants.

With the new solar thermal power plants being constructed in the US and Europe, and the other GEF solar thermal power projects moving towards implementation, the technology has the potential to provide a significant proportion of new electricity generating capacity in the next century on a non-carbon emitting basis. Major markets exist for this technology in other high sunlight regions of the world, many of which are in developing nations.

This project will build an ISCC power plant designed to minimize the cost of buying down the solar technology. As a result, the global benefit from reducing carbon emissions from power

generation, estimated at 570,000 tons of CO₂ over the 25-year lifetime of the plant, are relatively small. They represent only 3.5% reduction of the conventional gas combined cycle power plant emissions. As solar thermal costs decrease the solar fraction of future plants will increase, and so will the global environmental benefits from reducing carbon emissions.

3.5 Fit with GEF Goals

The project has a good fit with the GEF Operational Program #7. The plant itself will have lower CO₂ emissions than a combined cycle power plant of the same annual output. More importantly, it will help revitalize the solar thermal industry, and it will facilitate the technological and organizational learning that are critical to achieving long-term cost reductions.

3.6 Regional Context

The project is a good fit to Morocco's growing electricity demand, its existing commitment to private sector development of new power projects, its excellent solar resource and its current availability of natural gas. The project also meets Morocco's commitment to develop renewable sources of energy.

3.7 Replicability

This project and its companions in Mexico, India and Egypt are not likely to result in immediate cost-competitiveness for solar thermal power plants. However, they are very important steps in that direction. A comprehensive study by Sargent and Lundy¹³, which assessed the viability of long term cost reductions for solar thermal technology, concluded that with cumulative installations of about 1000 MWe, the cost for the technology can be reduced from today's cost of 10 - 11 cents per kWh to a range of 5 - 6 cents per kWh. This report confirms the study¹⁴, commissioned in collaboration with the GEF Secretariat, which concluded that a phased approach should be adopted to support long term cost reductions for solar thermal technology.

These four projects represent the first of three phases, and they will provide an initial opportunity for cost reduction. Achieving the cost reductions identified in the Sargent and Lundy report would create very important opportunities for replication of solar thermal power plants, not only in Morocco, but also throughout the Mediterranean Region, South Asia, and other parts of the world with similar climates. The need for future GEF buydown will most strongly depend on the cost of conventional power, the future benefits that can be achieved through CDM and the valuation (if any) of environmental externalities.

3.8 Sustainability

From the GEF perspective, the main sustainability issue will be to ensure that the plant is operated in a manner that maximizes output from its solar thermal field throughout the lifetime of the plant. As already discussed in Section 3.1, the O&M contract should contain appropriate incentive structure for both maximizing the total plant reliability as well as maximizing the utilization of the solar field over the long term. However, as the owner, ONE will be directly

¹³ Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts, Prepared for the Department of Energy and National Renewable Energy Laboratory, SL-5641, October 2002.

¹⁴ Cost Reduction Study for Solar Thermal Power Plants, Enermodal Engineering, May 1999.

responsible for the Project's long-term success. In addition to data collection on the construction, operation and maintenance of solar thermal power plants in the US and Europe, strong importance needs to be placed on training of ONE power plant staff in the requisite skills for operating and maintaining an ISCC power plant during the construction and initial operation of the plant.

4. SECONDARY ISSUES

4.1 Linkages to Other Focal Areas

No comment.

4.2 Linkages to Other Programs

As already mentioned, this project has linkages to other similar projects in Mexico, India and Egypt, and it forms part of the GEF program on Greenhouse Gas Reduction.

4.3 Degree of Involvement of Stakeholders

According to the Project Brief, there is a high degree of involvement of all the key stakeholders, including the GoM, ONE and the Centre de Développement des Energies Renouvelables (CDER). In addition, local stakeholders, including the elected officials from the Municipality of Ain Beni Mathar, NGO representatives from the region, and the local residents have been consulted regarding the Project.

4.4 Capacity Building Aspects

The proposed project contains specific elements of capacity building that will involve technical, managerial and financial departments within ONE. These are necessary and appropriate. In addition, successful implementation of the Project should provide local manufacturing and job opportunities within the region, and support essential capacity expansion within the international solar thermal component manufacturing sector.

4.5 Innovativeness

No comment.

5. CONCLUSION

This reviewer's overall assessment is that the project is technically feasible, that the proposed approach to project development is sound, and that the project has significant long-term potential to meet GEF goals.

6. SUBSTANTIVE EDITORIAL COMMENTS

Minor editorial comments are provided in a marked-up version of the PAD. However, a few items were significant enough to warrant discussion, and are summarized below.

6.1 GHG Calculation

If the annual production from the solar field is 35 GWh, and the CO₂ emissions from a natural gas combined cycle power plant are 0.65 kg per kWh, then 23,000 tons per year of CO₂ emission reductions is correct, as given on page 24. Then, the 25 year emission reduction total should be 575,000 tons of CO₂ (as stated on page 51), not 200,000 tons of CO₂ as stated on page 5.

6.2 Annual Solar Output

The reviewer can't determine if the expected annual solar output, based on the feasibility study, is 35, 38 or 56 GWh/yr. Page 5, and Table 2 on page 51 use 56 GWh/yr, but page 24 used 35 GWh/yr, and page 51 at the top uses 38 GWh/yr. Correcting this output value will also impact the CO₂ calculation.

6.3 Solar Thermal Power Plant Costs

The second data row of the table on page 24 gives what appear to be costs for the solar thermal portion of the ISCC power plant. There is no basis for these numbers. If the method of calculation is the annualized capital investment in the solar field plus the solar field O&M costs divided by the equivalent solar output, then the initial operating year value appears too high, and the reduction in this value for the second and third years appears too great. Some explanation is needed.

Annex 17: STAP Review

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

Responses to STAP Technical Review

The STAP Reviewer, Mr. Pascal DeLaquil, commented on the project document in March 2006. The following are the responses/comments to the issues raised.

Issue/Comment	Reference in Project Document/Response
<p>“3.1, the O&M contract should contain appropriate incentive structure for both maximizing the total plan reliability as well as maximizing the utilization of the solar field over the long term. The PAD only discusses the latter issue, but the O&M contract will need to address both issues...”</p>	<p>Section B. Para. 4 and 5</p>
<p>“3.1Finally, the use of only pre-qualified bidders is likely to allow the selected EPC contractor and key suppliers to capture technology and organizational learning effects that are essential to achieving long-term cost reductions for solar thermal power.”</p>	<p>Section C. Replicability. Long-term cost reductions in solar thermal power will result from three factors: reduced component costs due to increased manufacturing volume, economies of scale from increased plant size, and technological improvements. The experience gained by one EPC contractor has a minor effect on cost reduction over the long term.</p>
<p>“3.1.....One question that this reviewer could not assess from the PAD is whether the bidder prequalification includes the potential manufacturers of the solar collectors and heat collection elements.”</p>	<p>Section A. Para 2</p>
<p>“3.2....As the technology selection will be left to the EPC Bidders, who will all be pre-qualified, the bid documents must establish minimum requirements for the solar thermal steam raising component to ensure that the minimum solar share target can be met. Effective integration of the steam systems for the solar thermal field and the gas-fired combined cycle plant is essential to achieving significant cost reductions and proper performance of the power plant.”</p>	<p>Section B. Para. 4</p>

<p>“3.2. The selection process should review plant designs to ensure that the plant operates effectively in all modes. In particular, integration and control of the system should allow the solar contribution to be consistently maximized. In addition, the system should allow power to be efficiently generated on natural gas only, if required (during nighttime or if the solar field is not operational). “</p>	<p>Included in the bidding documents and will be included in the EPC and O&M contracts. There are in particular penalties for not meeting minimum solar contribution target<</p>
<p>“3.3 ...The financing approach to this Project is much simpler than the IPP approaches that have been attempted on other GEF solar thermal power projects. In particular, this financing approach avoids the complicated negotiation for power purchase, fuel supply and implementation agreements that can be problematic for IPP projects.</p>	<p>Agree</p>
<p>“3.4. In addition, this Project could be the first solar thermal power plant constructed in a developing country, and will be critical to demonstrating that the technology capacity can be developed to manage these type plants.”</p>	<p>Agree</p>
<p>“3.4..... As solar thermal costs decrease the solar fraction of future plants will increase, and so will the global environmental benefits from reducing carbon emissions.”</p>	<p>Agree</p>
<p>“3.5..... The plant itself will have lower CO₂ emissions than a combined cycle power plant of the same annual output. More importantly, it will help revitalize the solar thermal industry, and it will facilitate the technological and organizational learning that are critical to achieving long-term cost reductions.”</p>	<p>Agree</p>

<p>“3.6. ... The project is a good fit to Morocco’s growing electricity demand, its existing commitment to private sector development of new power projects, its excellent solar resource and its current availability of natural gas. The project also meets Morocco’s commitment to develop renewable sources of energy.”</p>	<p>Agree</p>
<p>“3.8..... the O&M contract should contain appropriate incentive structure for both maximizing the total plant reliability as well as maximizing the utilization of the solar field over the long term. “</p>	<p>Section B. Para. 4 and 5</p>
<p>“3.8.....strong importance needs to be placed on training of O.N.E. power plant staff in the requisite skills for operating and maintaining an ISCC power plant during the construction and initial operation of the plant.”</p>	<p>Section B. Para. 4 and 5 An indicator for O.N.E.’s staff training in various aspects of the ISCC technology has been included in the monitoring and evaluation (M&E) plan</p>
<p>“4.4..... In addition, successful implementation of the Project should provide local manufacturing and job opportunities within the region,”</p>	<p>The project provides jobs and economic activities in the region. The development of local manufacturing should be left to the private sector and is likely to evolve over time.</p>
<p>“6.1. If the annual production from the solar field is 35 GWh, and the CO₂ emissions from a natural gas combined cycle power plant are 0.65 kg per kWh, then 23,000 tons per year of CO₂ emission reductions is correct, as given on page 24. Then, the 25 year emission reduction total should be 575,000 tons of CO₂ (as stated on page 51), not 200,000 tons of CO₂ as stated on page 5.”</p>	<p>Corrected</p>
<p>“6.2..... The reviewer can’t determine if the expected annual solar output, based on the feasibility study, is 35, 38 or 56 GWh/yr. Page 5, and Table 2 on page 51 use 56 GWh/yr, but page 24 used 35 GWh/yr, and page 51 at the top uses 38 GWh/yr. Correcting this output value will also impact the CO₂ calculation.”</p>	<p>Corrected</p>

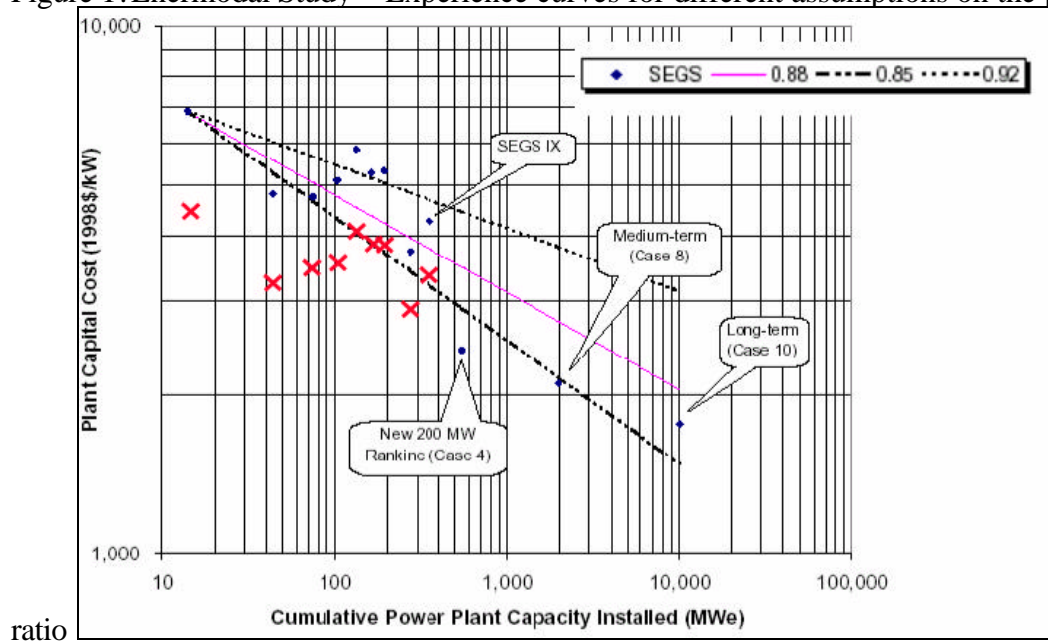
Annex 18: Cost Reduction of Solar Thermal Power Technology¹ MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT

The aim of any electricity producing technology must be to realize competitive electricity generation costs. Several studies have examined the future cost reduction potentials for solar thermal power generation technology. The most important studies in this context are Enermodal (1999), and DLR (2004) which are briefly reviewed below:

Enermodal (1999): Cost Reduction Study for Solar Thermal Power Plants

The Enermodal study uses the specific investment costs per installed capacity (\$/kW) as a reference measure. This reference number does not however seem appropriate to forecast cost reduction for solar thermal power plants because larger solar fields in combination with heat storage can lead to lower levelized electricity costs due to a higher plant capacity factor, even though the specific investment costs increase. The second point of note in the approach used by the Enermodal study is the fact that it uses the cost of the first plant out of the nine existing parabolic trough plants as the starting point of the learning curve instead of using a linear regression function of all reference plants (see Figure 1). Therefore the cost of the first plant determines strongly the cost forecast for future technology deployment.

Figure 1: Enermodal Study – Experience curves for different assumptions on the progress



DLR (2004): Scenario model "Athene"

¹ World Bank: *Assessment of the World Bank/GEF Strategy for the Market Development of Concentrating Solar Thermal Power* - Global Environment Facility Program – The World Bank 2006

This study assumes as a starting point the empirical values from the existing parabolic trough plants. But for the future cost reductions, it is explicitly mentioned that all solar thermal power technologies are included. Technological variants and improvements as well as competition are essential preconditions of the experience curve model.

Cost reduction in this study is split into four categories:

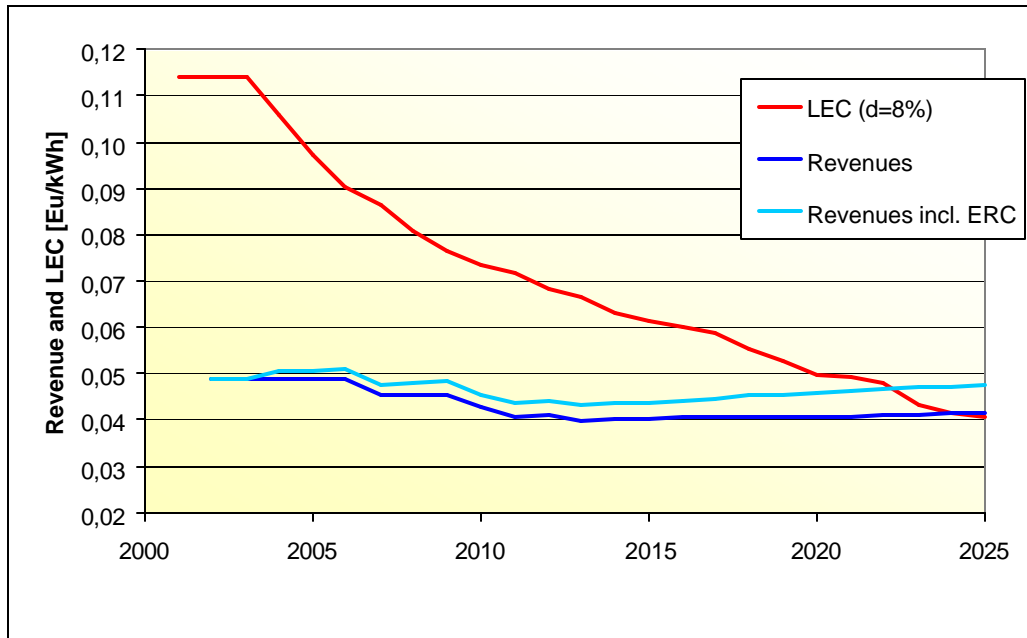
- Improving efficiency (from 13.2 percent today to 17.0 percent in 2025)
- Learning effects due to volume production
 - collector costs, surface-specific progress ration (PR) is 0.9
 - thermal energy storage (up to 12 hrs), capacity-specific PR=0.88
 - steam cycle components from 850 €/kW down to today's conventional plant costs of 740 €/kW, PR=0.94
- Economies of scale due to larger units (up to 200 MW_e): doubling capacity leads to 15 percent cost reduction
- The annual operation and maintenance costs will decrease proportionally to the reduction of investment costs (2.5 percent of investment).

Further assumptions of this model are:

- No CO₂-allowances considered, respectively carbon price increasing from initially 7.5 Euro/t CO₂ to 30 Euro/t CO₂ in 2050
- Plant life time: 25 years
- Internal plant project interest rate: 8 percent (in real terms)
- Solar Resource DNI=2350 kWh/(m²a) (favorable sites for solar thermal power generation range between 1800 and 2900 kWh/(m²a).
- Market growth of 23 percent p.a. (IEA references: wind (1971-2000) 52 percent p.a., PV 32 percent), (implementation of 5000 MW till 2015 corresponds to GMI goal).
- Fossil Reference LEC (IEA) with same number of annual operating hours as STPPs
- Fuel prices increasing by 0.52 percent p.a. (IEA)

As a result of the assumptions given above, the cost reduction forecasts of the Athene study are given in the following graph:

Figure 2: Development of levelized electricity costs and revenues from the power exchange market referred to by LEC of fossil power plants (plant project interest rate 8 percent), the bright blue line includes Emission Reduction Credits (ERC) of initially 7.5 Euro/t CO₂ increasing to 30 Euro/t CO₂ in 2050



Source: DLR (2004)

According to the Athene study, the cost competitiveness of solar thermal power generation will be reached in 2025. The total necessary subsidies account to 12 billion € which corresponds to a total installed capacity of 42 GW_e, not taking into account CO₂ trading. If the above-mentioned carbon prices are included, cost competitiveness will be reached in 2023. The total necessary investment will thereby be significantly reduced to 2.5 billion € respectively 22 GW_e.

The implicit assumption is that the number of full-load hours is constantly increased due to larger thermal energy storages up to 6500 hrs/a (12 hrs thermal storage). However, in some cases it may be more economical to aim at producing only peaking to mid-load-power for the period when power tariffs on the electricity market are highest (smaller energy storage), which in turn could justify lower thermal storage.

The Athene model is a very thorough assessment using many validation points from experienced facts and developments. The assumptions used are generally conservative. In this context, the Athene scenario may be considered as a very conservative scenario for solar thermal power cost and market development.

Cost Reduction – Summary

All studies referenced assumed a conservative global solar thermal power market development. It has also to be stated that many of the countries in the world's sunbelts lack the financial resources to finance solar energy. With present global solar thermal power market movements re-emerging, there is no fundamental reason why technology growth similar to wind energy is not feasible.

The main messages from the comparison of cost projection studies are:

- The technology has the potential to be cost-competitive within 10 to 25 years, and has the potential to be a significant electrical power option for developing countries, which often have abundant solar resources. With hybridization and thermal energy storage, solar thermal power is dispatchable power that helps to support grid stability.
- Should GEF promote solar thermal investments now in developing countries and not once the technology has moved further down the learning curve?

The GEF projects will contribute to OP7's goal of "reducing the long-term costs of low greenhouse gas-emitting energy technologies" if at least two or three are successfully deployed and operated. However, the projects in the current portfolio will not have a significant cost-reduction impact on the underlying cost of the technology. It is difficult to quantify the cost reduction effect of the four projects: In the beginning of the portfolio's history, it seemed that it would be one of the GEF plants that would be the first to be built after the California SEGS plants. However today, with other commercial solar thermal power activities evolving, other projects may perhaps come in first. Therefore the question is, which part of the cost reduction curve will the GEF projects influence? In theory, the cost reduction effect will be largest for the first plants built. In practice, much of the early cost reduction will result from a reduction of the risk premium as design, construction, and O&M experience is gained. The developing countries in particular experience an additional premium due to the perceived added difficulties of carrying out large projects using new technology. This is another cost reduction area that the GEF projects can impact in a positive manner.

Affordable technology and climate protection are goals officially supported by many developing countries with good solar resources. In order to meet these goals, GEF should support the implementation of climate-protecting renewable energy in developing countries. Whereas the OECD countries can afford subsidizing power technologies on a large scale, developing countries usually are not able to do so. By supporting the implementation of the first solar thermal power pilot plants, GEF will help create technology trust and institutional learning and thereby reduce the hurdle for subsequent market entry. The solar fields of solar thermal power plants contain many components that can be locally manufactured, such as concrete foundations or standard steel components or, depending on the solar technology and the project, country, mirrors.

Enermodal. 1999. *Cost Reduction Study for Solar Thermal Power Plants*. Kitchener, Ontario: Enermodal Engineering Limited.

DLR (German Aerospace Center). 2004. 'Financing Instruments for the Market Introduction of STTPs – Scenario Model 'Athene.'" BMU-funded study SOKRATES, December 2001–December 2003, Final Report 2004.

Annex 19: MAP 34713

MOROCCO: INTEGRATED SOLAR COMBINED CYCLE POWER PROJECT