Climate Investment Funds

CTF/TFC.11/6
April 8, 2013

Meeting of the CTF Trust Fund Committee
Washington D.C.
May 2-3, 2013

Agenda Item 7

REVISED CTF INVESTMENT PLAN FOR MENA CSP

PROPOSED DECISION

Recalling its endorsement in December 2009 of the *CTF Investment Plan for MENA CSP* and an update provided in November 2010 (CTF/TFC.6/Inf.2), the Trust Fund Committee reviewed document CTF/TFC.11/6, *Revised CTF Investment Plan for MENA CSP*, submitted by Algeria, Egypt, Jordan, Morocco, and Tunisia, in collaboration with the African Development Bank and the World Bank Group. The Committee takes note of the proposed revisions to the *CTF Investment Plan for MENA CSP* and the reallocation of funding among the participating countries (see table below), including:

a) Algeria's confirmation that it will not request CTF funding;

b) increasing the indicative CTF allocation for Egypt under the plan from USD 95 million to USD 123 million;

c) decreasing the indicative CTF allocation for Jordan under the plan from USD 112 million to USD 50 million;

d) increasing the indicative CTF allocation for Morocco under the plan from USD 197 million to USD 415 million;

e) decreasing the indicative CTF allocation for Tunisia from USD 186 million to USD 62 million; and

f) adding a technical assistance component of USD 10 million in CTF funding to establish a platform for knowledge exchange (USD 2 million) and a competitive grant program (USD 8 million) to support companies in the region to engage in the supply chain in solar thermal technology.

	CTF Financing (USD Million)	
	Endorsed Investment Plan, as updated in November 2010	Revised Investment Plan Proposed for Endorsement in May 2013
Algeria	160	0
Egypt	95	123
Jordan	112	50
Morocco	197	218 (excluding already approved project funding) 415 (including already approved project funding)
Tunisia	186	62
Technical Assistance	0	10
Total	750	463 (excluding already approved project funding for Morocco) 660 (including already approved project funding for Morocco)

The Trust Fund Committee endorses the revised plan as a basis for the further development of the proposed project and program concepts, confirms the calendar for project development, including Trust Fund Committee and MDB approvals, and requests that the proposed projects and programs be submitted to the Trust Fund Committee for funding approval in the proposed timeframes.

The Committee takes note that the total indicative allocation for the plan has decreased by USD 90 million in CTF funding, from USD 750 million in the original plan endorsed in November 2010 to USD 660 million in the revised plan, and reconfirms that the approval of CTF funding by the Committee is dependent on the submission of high quality project or program proposals. The Committee agrees to release USD 90 million in CTF funding from the MENA CSP investment plan so that it can be made available to finance other CTF projects in the pipeline.

The Trust Fund Committee requests the MDBs to work closely with the stakeholders in the participating countries in the MENA region to expedite the development of the proposals for timely submission to the Committee for approval of CTF funding.

CLEAN TECHNOLOGY FUND

MENA CSP INVESTMENT PLAN

Update Note

April 4, 2013

Middle East and North Africa

CLEAN TECHNOLOGY FUND

MENA CSP INVESTMENT PLAN

Update Note

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List of Abbreviations

AFD	French Development Agency
AfDB	African Development Bank Group
CPV	Concentrated Photovoltaic
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
DNI	Direct Normal Irradiation
EIB	European Investment Bank
ESMAP	Energy Sector Management Assistance Program
EU	European Union
GoE	Government of Egypt
GW	Gigawatt
GWh	Gigawatt Hour
IBRD	International Bank for Reconstruction and Development
IP	Investment Program
ISCC	Integrated Solar Combined Cycle
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
LCOE	Levelized cost of energy
MENA	Middle East North Africa
MSP	Mediterranean Solar Plan
MWe	Megawatt (electrical)
NIF	Neighborhood Investment Facility
NREA	New and Renewable Energy Authority
PV	Photo Voltaic
RE	Renewable Energy
TES	Thermal Energy Storage
TFC	Trustfund Committee
WB	World Bank

EXECUTIVE SUMMARY

E1. The Middle East and North Africa (MENA) Concentrated Solar Power (CSP) program of the Clean Technology Fund (CTF) supports the large-scale deployment of solar energy in the MENA region through CTF financing of US$750 million that leverages nearly US$5 billion from other donors and private financing. The MENA CSP CTF Investment Plan (CSP CTF IP) initially proposed to support the development of around 1 gigawatt (GW) of CSP capacity and two related transmission infrastructures projects in five MENA countries. It was endorsed by the CTF Trust Fund Committee (TFC) in December 2009 and updated in November 2010. Participating countries in the program are Algeria, Egypt, Jordan, Morocco, and Tunisia.

E2. The program is at various stages of implementation in the selected countries. However, it is overall somewhat delayed due to (i) the Arab Spring and the uncertainties this has brought about for large infrastructure investments in some countries, (ii) subsidy requirements in excess of what is considered affordable by the participating countries, (iii) specific project-related delays, and (iv) possibly economic difficulties in Europe.

E3. In June 2011, the CTF TFC approved the first project under the MENA CSP CTF IP, the Ouarzazate I 160 MW project (the first phase of the 500 MW Ouarzazate plant), which is considered a success for the following reasons: (i) it attracted significant interest from bidders, indicating that strong competition was present and that there was an appetite in the private sector to participate in this type of project despite the inherent risks. The bid price, at UScts 19/kWh, was 30% below estimates and presents one of the lowest CSP levelised cost of electricity (LCOE) achieved globally to date; (ii) Ouarzazate I is also one of only three infrastructure Public Private Partnerships (PPPs) to reach financial close in North Africa since the Arab Spring. The project established a model in the region for promoting solar energy development and for establishing a partnership between Morocco and the international community for CSP scale-up for both domestic use and exports. Other projects in the original MENA CSP CTF IP are facing delays and have not yet been presented to the CTF TFC.

E4. In accordance with CTF rules, if all projects in an endorsed investment plan are not submitted for funding approval within 24 months of IP endorsement, a review of the progress of implementation of the IP is to be prepared and an IP update is to be submitted to the TFC with a detailed explanation on the reasons for delay, corrective measures, and new delivery targets. To this end, this Investment Program (IP) Update has been prepared.

E5. Given that there are still significant uncertainties with respect to some of the framework conditions in the countries participating in the MENA CSP program, the update is being undertaken in two steps. A first update to realign the pipeline of projects to reflect actual implementation progress is to be presented to the TFC at its May 2013 meeting by means of the enclosed document. Additional analysis will be undertaken and presented to the TFC together with the next project that will be seeking TFC approval. This two-step approach will provide more time to make decisions on a number of projects for which outcomes today are less certain and will allow for incorporating the findings of a strategic issues and options paper for CSP under preparation by AfDB and the World Bank. While some projects might be dropped as a result, other projects could be added if they have been progressing satisfactorily and if the issues and options paper so suggest. Potential for expansion of the program beyond its original definition could lie in the areas of CPV, solar desalination and other MENA countries.

E6. As part of the preparation of the original MENA CSP CTF IP, the participating countries proposed a pipeline of generation projects for 900 MW. Based on an indicative CTF contribution of US$0.725 million/MW for proposed generation projects and allocations for two transmission projects, the resulting allocation by country was: Algeria – US$ 160 million, Morocco – US$ 197 million, Tunisia – US$ 186 million, Egypt – US$ 95 million, and Jordan – US$ 112 million. The November 2010 IP Update had projects amounting to 1,200 MW inscribed, based on the announcement of ambitious solar plans in several countries with CTF amounts by country remaining unchanged. The Table below summarises the pipeline of projects in the December 2009 and November 2010 IPs. It also presents the status of these projects as of February 2013.

Table E1: MENA CTF Indicative Financing Plan Endorsed in December 2009 and November 2010 (in US$million)

Country	CTF Investment Plan Approved December 2, 2009			CTF Investment Plan Update Approved November 2010		Project Status as of February 2013
	Project (Name)	Capacity (MW)	CTF financing (US$ million)	Project (Name)	Capacity (MW)	
Algeria[1]	Megahir	80	58	Megahir	80	Feasibility (Megahir)/pre-feasibility (Naama) studies launched for PPP projects, but Algeria confirmed that it will not use CTF financing for specific projects.
	Naama	70	51	Naama	70	
	Hassi R'mel II	70	51	Hassi R'mel II	70	
Egypt	Kom Ombo	70	51	Kom Ombo	100+	Feasibility study near finalization. ESIA launched using a CTF PPG. Bidding documents in preparation. NIF grant of US$32.5 million
	Marsa Alam	30	44			

[1] Algeria's intentions vis-à-vis CTF financing were unclear at time of IP preparation.

						confirmed. Financing confirmed from KfW, EIB and AFD, in addition to IBRD and AfDB. But overall delay of about one year mostly due to change of site
Jordan	Ma'an Province	100	72	Ma'an	100	Five private investor consortia prequalified for trough or tower CSP projects in July 2011. Two private investor consortia prequalified for CPV projects. Request by GoJ in July 2012 to put entire Jordan allocation on private sector CSP/CPV projects.
	Mashreq CSP Transmission	-	40	Mashreq CSP transmission	-	NIF grant for feasibility study, but no CTF resources requested.
Morocco	Tan Tan	50	35	Ouarzazate	500	Ouarzazate I (160 MW) awarded to a consortium led by ACWA Power on Sept 24, 2012. Commercial close on Nov 19, 2012. Financial close expected in May 2013, with construction starting shortly after. Co-financing by AFD, EIB, KfW, AfDB, and the World Bank. Prequalification launched for Ouarzazate II (340 MW)
	Ain Beni Mathar	125	90			
	Ouarzazate	100	72			
Tunisia				STEG-CSP	50	Feasibility study completed. DNI data collected from April 2012 to March 2013. EPC contract to be awarded in late 2014. Donors including KfW, EIB, and AFD have expressed interest in financing along with IBRD and AfDB. EU/NIF grant. But delays due to political and economic situation in Tunisia.
	ELMED-CSP	100+	73	ELMED-CSP	100+	Prequalification process launched in April 2010, with 11 submissions received by the deadline of July 26. On hold since then.

	IPP-CSP Project	100	73	STEG renouvelables/SITEP	50	Downsized to 5 MW and financed through a grant from Japan. No use of CTF funds.
	Tunisia-Italy transmission	-	40	Tunisia-Italy transmission	-	Was put on hold temporarily until more clarity on legal and institutional framework for export to Italy. New study launched for a public sector project. Unlikely to be able to use CTF resources given timing
Total		**895**	**750**		**1,120**	

E7. In this IP Update, the pipeline of projects is realigned (i) to reflect the specific developments in the program countries, as several projects were delayed by the political turmoil that swept the region since January 2011; (ii) to build on the experience of the first project that has moved forward, the Ouarzazate I 160 MW plant in Morocco; and (iii) to extend technology coverage to CPV. Funds are suggested to be redeployed from those projects that are now unlikely to succeed with the aim of meeting the objectives of the MENA CSP CTF IP as efficiently and rapidly as possible. The proposed IP Update seeks to achieve the objectives, not only by focusing on well performing projects in the pipeline, but also by supporting a variety of CSP and CPV technologies and business models (including public sector, IPP and PPP) and hence generating lessons for the region as well as globally (in particular through the provision of technical assistance).

E8. Morocco is well positioned to leverage the success of Ouarzazate I, which received US$197 million of CTF funds (or US$1230/kW). Ouarzazate II, the project to install the remaining 500 MW of the Ouarzazate plant, is being launched and the most likely to move forward quickly. In line with the indicative allocation in the original investment plan of US$725/kW, it is proposed to allocate an amount of US$218 million to Ouarzazate II.

E9. The only two public sector projects are the 100 MW Kom Ombo plant in Egypt and the 50 MW Akarit plant in Tunisia. Those two projects will receive the same unitary amount of CTF funds as Ouarzazate I US$1230/kW, which implies a total CTF financing of US$62 million for Akarit and US$123 million for Kom Ombo. However, those projects have experienced delays and could be delayed further due to the situation in those two countries; it will have to be confirmed whether they can be approved within the time frame of mid-2014 as sought by the CTF. Given that the difficulty those projects are facing is partly due to insufficient concessional financing, suggestions have been made to increase the per unit contribution of the CTF. Tunisia has requested whether the amount of CTF allocated to the Akarit plant could not be augmented in view of the other Tunisian projects not coming through; this might be taken into consideration at the time of submission for CTF approval if project preparation is progressing satisfactorily.

The Kom Ombo indicative amount has already been slightly increased from US$99 million to US$123 million to reflect a higher per unit CTF amount for the first phase projects as suggested in the present IP Update.

E10. In Jordan, the Ma'an public sector project has been cancelled and replaced by MOUs signed with private sector project developers amounting to 225 MW of trough and tower CSP projects and 20 MW of CPV projects. Algeria indicated that it had no plans to borrow from CTF. On the other hand, Libya, which was not part of the original IP, indicated an interest in participating in the program. None of the original transmission projects seem now likely to progress fast enough within the time frame required by the CTF.

E11. In the short term, projects may mainly produce electricity for local markets. However, reaching an agreement on export would be crucial to reduce need for grant and concessional funding in the medium and long term. If prospects for exports do not improve by the time of submission of the new projects to CTF TFC, and if no additional grant funding is mobilized, it might be necessary to reconsider feasibility of projects and the size CTF allocation. This will be reflected in the second stage of the IP Update.

E12. Finally, it is proposed to add a technical assistance (TA) component, which would complement efforts at project level. The TA would establish a platform for knowledge exchange and support project preparation, with a view of accelerating preparation. It could also support the creation of sustainable financing schemes to increase private sector involvement and regional integration activities. Finally It could support the creation of local small businesses to support projects through local services and manufacturing.

E13. In aggregate, the present IP Update suggests a decrease in the financing envelope from US$750 million to US$660 million. The proposed electric CSP capacity to be installed is reduced from originally 895 MW to 710 MW. The Table below provides the new pipeline of projects after reallocation, excluding the Ouarzazate Phase I project, which has already been approved.

Table E2: MENA CTF Indicative Financing Plan <u>after</u> Reallocation—April 2013 Update (in US$ million)[2]

	Projects/ Capacity (MW)	**CTF financing (US$ million)**
Morocco	OZZ II 300	218
Egypt	Kom Ombo 100	123

[2] The table presents new projects only.

Tunisia	Akarit 50 (possibility to increase to 100)	62 (123 for 100 MW)
Jordan	IFC Up to 100 MW (incl. CPV)	50
Total Projects	550	453
Technical Assistance	NA	10
Total Financing Envelope		463

SECTION I: INTRODUCTION

1. The MENA Concentrated Solar Power (CSP) Investment Plan disposes of US$750 million of financing from the Clean Technology Fund (CTF) to support the MENA CSP scale-up initiative. It aims to leverage nearly US$5billion in co-financing to foster the development of CSP in five MENA countries (Algeria, Egypt, Jordan, Morocco, and Tunisia) through concessional financing to implement 1 GW of CSP capacity. The MENA CSP CTF Investment Plan (MENA CSP IP), endorsed by the CTF Trust Fund Committee (TFC) in December 2009 and updated in November 2010, lays the foundation for a landmark climate change mitigation program with the aim of forging an international partnership, starting with the Ouarzazate 500 MW CSP generation complex in Morocco (the largest one in the world), for demonstration of the CSP technology and cost reduction through economies of scale.

2. As part of the preparation of the original investment plan, the participating countries proposed a pipeline of generation projects for around 900 MW. Based on this pipeline, the indicative CTF contribution was based on a US$0.725 million/MW of generation capacity allocation. It also included two transmission line projects. This resulted in a pipeline of projects amounting to: Algeria – US$ 160 million, Morocco – US$ 197 million, Tunisia – US$ 186 million, Egypt – US$ 95 million, and Jordan – US$ 112 million. However, it was indicated explicitly that these allocations were likely to change depending on the progress of project preparation and justification for support to be made at the time of submission of individual projects for CTF review. Countries could therefore draw more or less funds than originally indicated depending on progress of project development. As expected, projects have been significantly modified since the endorsement of the MENA CSP Investment Plan by the CTF Trust Fund Committee on December 2, 2009.

3. The MENA CSP initiative is motivated by objectives of energy security, climate change mitigation, and regional integration in the Mediterranean. The overall objective is to help bring down the global costs of CSP technology, through economies of scale and learning effects from replication. The MENA CSP initiative also aims at generating much-needed employment through technology transfer and local manufacturing, a need exacerbated by the political transformation underway in the region.

4. The MENA CSP program has strong synergies with other initiatives that seek to develop the renewable potential in MENA, while creating the conditions for a regional market—namely the Mediterranean Solar Plan (MSP), Desertec Industry Initiative (DII), Medgrid, the EU Deep and Comprehensive Free Trade Agreement and the Deauville Partnership. These transformational initiatives demonstrate a clear interest for building an EU-Mediterranean partnership for renewables, in line with the EU's 2050 decarbonization scenario, with a joint approach to ensuring energy security, provided that the right market perspective is created for electricity imports. In the mid- to long-term, this would mean establishing a form of 'EU-Southern Mediterranean Energy Community' starting with the Maghreb countries, which would promote gradual convergence of southern Mediterranean partners' energy policies with EU policy.

5. The development of new CSP plants must be seen in a regional, rather than strictly a country-based, context. Developing a critical mass of CSP plants in the region will create a much more powerful demonstration effect than doing so within one country. In addition, a regional approach will maximize economies of scale by creating substantial manufacturing demand for critical CSP technology components such as mirrors, receiver tubes and control equipment. Finally, enhanced interconnections within the MENA countries and between MENA and the EU are critical to improve the program's operability (as it is easier to integrate significant renewable capacity within a larger system) and its viability in a regional context (through the possibility of maximizing exports to higher paying markets).

6. The program is at various stages of implementation in the selected countries, but is overall somewhat delayed due to (i) the Arab Spring and the uncertainties this has brought about for large investments, (ii) subsidy requirements in excess of what is considered affordable by the participating countries, (iii) specific project-related delays, and (iv) economic difficulties in Europe. The 160 MW CSP power plant in Morocco near Ouarzazate is under active implementation, but other projects in the original MENA CSP IP have encountered some delays[3].

7. At its June 2012 meeting, the CTF Trust Fund Committee (TFC) adopted a document setting milestones and targets to monitor delivery of CTF projects. One of the milestones is that all projects in an endorsed investment plan should be submitted for funding approval within 24 months of IP endorsement. If this milestone is not met for any project or program, the country and the Multilateral Development Banks (MDB) are requested to review the progress of implementation of the IP and to submit an update to the TFC with a detailed explanation on the reasons for delay, corrective measures, and new delivery targets.

8. The purpose of the present report is to provide an update of the MENA CSP CTF IP. Following guidelines from CTF TFC, the report highlights changes since the IP was endorsed. In early 2013, the World Bank commissioned a review of the MENA CSP scale-up initiative, to examine the economic and financial viability of the CSP technology in the current global environment. The CSP review aims to assess the underlying assumptions of the MENA CSP CTF IP. In particular, it is expected to confirm whether the CSP benefits initially identified are still valid, to identify the obstacles and sources of delay to CSP deployment and to find solutions to overcome barriers in the selection and preparation of projects. The findings of the report will be reflected more fully in a subsequent version of this update.

9. Under the broadest possible definition of "Concentrated Solar Power" there are five technologies: four Concentrating Solar Thermal (CST) technologies (parabolic trough, power tower, linear Fresnel and dish/engine systems), and one photovoltaic technology, concentrating photovoltaic (CPV). Both types of CSP technologies require sites with very high levels of direct

[3] In general all programs to develop renewable energy in the MENA regions have experienced delays, including the MSP and Dii, mainly due to political and social unrest in the region and the European economic crisis. This situation has made investors uneasy and resulted in a blockage on the development of markets for the export of CSP-based electricity to Europe. See "Clearing regulatory hurdles to exploit renewable energy in North Africa"Benjamin Gallepe, MEDREG in European Energy Review, January 2013.

normal irradiance (DNI) and that offer flat, wide open spaces. Each of the five technologies relies on solar energy from the sun and offers a level of concentration and active tracking of incident sunlight. Each of these technologies are also currently being developed and deployed for utility-scale applications. The original IP included only CST projects. With this IP Update, it is proposed to include CPV projects, as one country has proposed for CTF financing some CPV projects. The CSP review study will evaluate the current technology and economics of CPV in order to also enable its eventual consideration by the other MENA countries participating in the MENA CSP CTF program.

10. Given that there are still significant uncertainties with respect to some of the framework conditions in the countries participating in the MENA CSP program, the update is being undertaken in two steps. A first partial update will be presented to the TFC at its May 2013 meeting, but will not contain a full updated analysis of the fundamentals and underlying rationale of the MENA CSP program, including on the prospects for exports in the short to mid-term. A fuller analysis will be presented to the CTF TFC together with the next project to seek TFC approval. This two-step approach will provide more time to make decisions on a number of projects that continue to experience significant delays, and on which a decision to proceed must be made, and to include the findings of the CSP issues and options paper, for which the World Bank and the African Development Bank commissioned Mercados and Sun-to-Market-Solutions. The present report presents the first step in the updating process.

11. Section I of this report is this introduction. Section II presents the status of projects under the original IP. Section III reviews circumstances and rationale for the IP update. Section IV presents the proposed projects for the updated IP. Section V analyses the impact of the proposed IP changes. Annex I presents an update of all project concept notes in the program.

SECTION II: STATUS OF ORIGINAL INVESTMENT PLAN IMPLEMENTATION

Approved Project and Launch of New Project in Morocco

12. The first project of the MENA CSP CTF IP to be approved by the TFC was the Ouarzazate I project in Morocco. The Ouarzazate I CSP Project aims at supporting the Moroccan Agency for Solar Energy (MASEN) in the development of the 500 MW Ouarzazate solar power plant by financing the first phase (160 MW) through a public private partnership (PPP). The Project was approved by the CTF TFC on June 22, 2011, by the World Bank Board on November 17, 2011 and by the Board of the African Development Bank (AfDB) on May 31, 2012. Ouarzazate I is supported by a CTF loan of US$197 million[4], a US$200 million loan from IBRD and a Euros 168 million loan from AfDB. Other loans are provided by AFD (Euros 100 million), EIB (Euros 100 million) and KfW (Euros 100 million) and. Grants are provided by the European Neighborhood Investment Facility (NIF) (Euros 30 million) and the German Ministries of Environment (Euros 15 million) and Development Cooperation (through an interest rate subsidy to KfW).

13. After a two-stage bidding process, a winning bidder was announced on September 24, 2012, for a bid price of 19UScts/kWh, which is 30% below cost estimates and presents one of the lowest CSP levelised cost of electricity (LCOE) so far. Negotiations are underway between MASEN and the competitively selected private partner, with loan effectiveness due in May 2013. Construction is expected to start shortly thereafter, and the plant is to be commissioned by the end of 2014. The project presents a model in the region for promoting solar energy development and for establishing a partnership between Morocco and the international community for CSP scale-up. An important outcome of the lower than expected bid price is that the gap to be covered from the government budget (difference between the selling price by MASEN and the purchase price from power plant) is much lower than initially estimated (around US$28 million per year –or US Cents 9/kWh vs an initial estimate of US$ 60 million per year over the 25 year life of the PPA).

14. A specific entity, the Moroccan Agency for Solar Energy (MASEN), was created to implement the Morocco Solar Plan, and is the implementing agency for the CTF project. MASEN was created by Law (Dahir 1-10-18, dated February 11, 2010), as a limited liability company (or Société Anonyme in French-- SA) with the Moroccan State, the national electricity company ONEE, Fonds Hassan II and the Société d'Investissements Energétique (SIE) as equal shareholders. MASEN's missions include conducting technical, economic and financial studies to develop power plants, supporting relevant research, developing local know-how and expertise, raising funds for plant financing and seeking involvement of local industry for each project.

15. Ouarzazate I is also the first plant of the Morocco Solar Plan and the first large-scale CSP plant in MENA. The Morocco Solar Plan, launched in November 2009, is the cornerstone of the country's climate change mitigation strategy. The US$ 9 billion Solar Plan calls for the commissioning of five solar power generation plants between 2015 and 2020, for a total capacity of 2,000 MW, thus helping Morocco achieve higher growth and employment while ensuring sustainability. With this plan, 4,500 GWh annually will be produced from solar energy. This implies a major transformation of not only the energy

[4] This is the full indicative CTF allocation for Morocco in the November 2010 IP Update, implying a per unit CTF funding of US$1230/kW.

sector but the entire economy, as this 'green stimulus plan' will gear industrial development as well as the research community (e.g. through publically financed dedicated research centers) towards renewable energy. In addition to fostering low-carbon development of the energy sector and enhancing energy security, it will stimulate large investments, enhance Morocco's competitiveness and position the country as an 'early mover' on a promising green technology by encouraging the development of domestic manufacturing capacity.

16. Morocco is ideally positioned to initiate the MENA regional scale-up of the CSP technology, given its high solar resource base, favorable investment climate, and proximity to European markets. Europe has committed to clean energy through the 2009 Renewable Energy Directive, which creates an explicit legal basis for imports from third countries. Individual member states have indicated an intention to import renewable energy to achieve emissions reductions targets and to support Mediterranean regional energy integration through the Mediterranean Solar Plan launched in 2008. Morocco is leading discussions to establish an Intergovernmental Agreement between Germany and other EU countries on one hand and Morocco and possibly other North African countries on the other hand.

17. However, the Ouarzazate project is only economically justified if it catalyzes replication. Replication will bring additional revenue, investment and jobs to post-Arab Spring MENA, and it is only with replication that those objectives will be achieved. That replication in turn depends on exports to Europe actually starting on a demonstration and pilot basis from CSP plants in MENA, and on adequate climate financing being available from multilateral and bilateral sources, including the eventual Green Climate Fund. Other CSP projects in the region need to follow suit on the success of Ouarzazate, to ensure replication.

Pathways for Green Electricity from Northern Africa to Europe: Status of Transmission Interconnections

While the CTF has made available US$750 million for the scaling up of CSP in northern Africa, these resources are not sufficient to ensure that the momentum of CSP scale-up can be maintained beyond targeted pilot projects. What is needed in the time period ahead and before the cost of CSP becomes fully cost competitive, is access to the creditworthy green electricity markets of Europe. Transmission projects are key for CSP scale-up in MENA, because they allow for exports of electricity from northern Africa to Europe. The initial CTF IP has included US$80m for two transmission projects, respectively US$40m Mashreq CSP transmission project and US$40m Tunisian-Italy transmission line (200 MW Renewable Energy out of a total capacity of 1000 MW). These two interconnections projects are, however, on hold without clear timetable for their implementation. The only interconnection with Europe is between Morocco and Spain (1400 MW) with a project of interconnecting Spain to France with an additional 1400 MW transmission line (2014). As far as Algeria is concerned, feasibility studies for interconnecting Algeria to Spain and to Italy have been conducted but there is no clear program for their implementation. Therefore, so far, exports of large volumes of renewable energy to Europe could be constrained by the availability of interconnection capacity beyond 2025 if not more projects are being realized; but exports of up to 500 MW are technically possible with no transmission capacity expansion. Additional issues need however to be addressed such as reinforcement of the Spain's electricity grid. The changes in EU regulatory framework (revision of FIT, non-inclusion in national legislation of the EU Renewable Energy Sources Directive 2009/8) is introducing additional uncertainties for private investors for promoting transmission lines between Europe and Maghreb countries in the short-term.

18. In January2013, Morocco launched the process to select a partner for the development, construction and operation of the Ouarzazate II 300 MW CSP plant, to ensure the balance of Ouarzazate is operating by 2015. This is complemented by a separate PV project of around 50 MW. Ouarzazate II

would serve to prove the replicability and sustainability of Ouarzazate I and to establish the business model for a comprehensive national energy strategy and possibly for exports-- pushing for the opening of the European market and having a powerful demonstration effect for the rest of the region. Lessons learnt from Ouarzazate I have been incorporated into project design. Until export arrangements for the sale of electricity from Ouarzazate to Europe are secured, a significant amount of concessional financing and grants will remain necessary. In the short term, Ouarzazate I and II will rely mainly on the local market. However, rapid closure on an export agreement would alleviate the need for grants, including from the CTF, in the long to medium ter, as exports would be priced at European green electricity prices. Exports will not only have a favourable impact on the project financials, but would also contribute to the transformational characteristics of the initiative, and ensure its replicability and sustainability, among other things by allowing the development of capacity at a sufficient scale to help develop a local industry.

Table 1: Status of Approval of CTF Projects

Project Title	TFC Approval Date	MDB Board Approval Date	CTF Funding (US$ million)	Leveraged Funding (US$ million)
OZZ I (IBRD/AfDB)	June 2011	IBRD Nov 17 2011 AfDB May 2012	197	880

Delayed Projects in Other Countries

19. Under the original CTF MENA CSP IP, there were two proposed public sector projects for **Tunisia**. The first project was a 50 - 100 MW CSP plant, which is part of the Tunisian Solar Plan to be located in south-eastern Tunisia near Akarit. It is a project to be implemented by Tunisia's public power utility STEG. The approach pursued by STEG is to select a size and configuration that will minimize technical risks and restrict required subsidies to a bearable level for the Tunisian economy and for STEG, while allowing STEG to gain significant expertise in developing, operating and maintaining CSP plants.

20. Delays in getting the project prepared for presentation to the TFC are mainly due to the Jasmine revolution; preparatory work has now resumed and is progressing at a fast pace at the technical level. The feasibility study was finalized in September 2012, and bidding documents are being prepared. The next step at the technical level will be the recruitment of the Owner's Engineer who would assist in the recruitment of the EPC contractor. The ESIA was somewhat delayed because of lack of financing, and is expected to be finalized by the end of 2013, with public disclosure by May 2013. STEG is currently refining the financing plan of the project considering two main parameters, namely, reducing the storage from 4 hours to 3 hours, and increasing the natural gas contribution from 5% to 15% to assess whether under these revised conditions the project would become more viable against the background of financing constraints in Tunisia's current economic situation. The Tunisian Government is also seeking additional CTF financing for this project.

21. The second public sector project[5] was the ELMED subsea interconnection between Tunisia (Cap Bon) and Sicily (approx. 200 km). The transmission capacity would be 1000 MW, of which 800 MW were to be reserved for the export component of the ELMED generation complex. This interconnection between North Africa and Europe would not only provide an outlet for exporting electricity, including from "green" sources, generated in Tunisia, but would also provide for a second interconnection between the Maghreb region and Europe, in addition to the Gibraltar interconnection between Morocco and Spain. CTF resources were to be used for the part of the interconnector that enables exports of CSP generated electricity. Due to the economic crisis in Europe and a lesser need for imports of green electricity from North Africa in Italy, this project has been put on hold, although it remains a priority project for creation of the Euro-Med electricity market. Work is starting again with a study underway to review the feasibility for a public project. Even if improved economic conditions and export agreements materialize, the project is unlikely to be able to benefit from CTF financing given the objective to have all CTF current pledged resources committed by mid-2014.

22. The IP had two private sector projects, ELMED CSP and SITEP. Although the bidding process was initiated in 2010, the privately developed ELMED generation complex was put on hold, until there was more clarity on the export infrastructure. It is clear that generation and transmission will have to be developed as one package, but the time frame is beyond what is considered for the MENA CSP CTF IP[6]. The SITEP project was downsized to 5 MW and went ahead with a Japanese grant; therefore the Tunisian government is not seeking CTF funds for this project.

23. In **Egypt**, the MENA CSP CTF IP supports the construction and operation of the proposed 100 MW Kom Ombo CSP plant (with 4 hr storage). The plant is proposed as a public sector project to be implemented by the New and Renewable Energy Agency (NREA), which leads the implementation of donor financed public sector renewable energy projects in Egypt. Preparatory studies are progressing well. A feasibility study financed by KfW is near finalization. A draft feasibility report has been prepared in January 2013. The report will be finalized over the course of the next few months based on the feedback received from the project stakeholders. The consultancy services to prepare the ESIA study for the project has been recruited early January 2013. The study is expected to take six months. Accordingly, all preparatory studies are expected to be completed by June 2013, allowing actual project implementation to start subsequently. The Government of Egypt has taken a measured approach to CSP development and maintained that adequate concessional financing should be available for it to go ahead with the project. In the absence of export revenues, concessional financing is all the more important for making the project viable. The World Bank and African Development Bank are in the process of mobilizing concessional financing from European donors and preliminary approval of grant funds from the European Neighborhood Investment Facility (NIF)

[5] This project was initially a private sector project, but was turned into a public sector project, given the difficulties in getting commitment from private investors without better visibility on the ELMED generation part.

[6] Another private generation and transmission project, the 2000 MW Nur project and its associated HVDC cable to Italy mainland, is under development and has expressed interest in accessing CTF. However, the timeline for the development of this project is unlikely to coincide with the timeline for the CTF. Moreover it has not been proposed by the Government of Tunisia.

was received on June 28, 2012. The major reason for the delay in presenting the project for TFC approval is the change in site location, due to difficulties in getting approval for the originally selected site. Donors are working to put in place an effective project structure and capacity building plan to ensure smooth implementation.

24. In **Jordan**, the Ma'an 100MW CSP plant has been changed from a public sector project to an IPP model. Following the launch of a public expression of interest process in May 2011, MOUs were signed between July and September 2011 with five private consortia to develop trough or tower CSP projects by June 2014. Following the requirement of the new renewable energy law to allow direct proposal projects**,** the Ministry of Energy and Mineral Resources (MEMR) had instructed the five prequalified CSP investor groups to submit their proposals in September 2013 (one year following their prequalification). Four trough CSP projects are all 50 MW in size and there is one tower CSP project which is 25 MW. There are also two private developer consortia with CPV projects of 10 MW each which have also received MOUs. Accommodating the process required to launch IPP-type projects has delayed project launch. Constraints on Jordan external borrowing capacity have also been hampering the country from requesting loans for CSP projects, despite reasonably good project economics given the lack of indigenous natural gas supplies and the high price of competing fuel oil based thermal power generation. Some of the amount available from the CTF will now be mobilised by IFC for those private sector projects, and the other public sector project to construct a new transmission line is being removed from the MENA CSP CTF IP.

25. **Algeria** has indicated that it does not plan to borrow neither from IBRD or AfDB nor from the CTF to finance its CSP plants which are part of the Algeria Solar Plan. Algeria is interested in participating in the program to benefit from experience gained by others and knowledge sharing.

Lessons of Experience from the Ouarzazate Project and other CSP Developments Around the World

26. In order to redesign the MENA CSP IP with the aim of enhancing its speed of implementation (both during project preparation and implementation) and of optimizing the use of the CTF resources, it is important to understand the underlying success factors of the Ouarzazate Phase 1 project.

27. The Ouarzazate I project had two overarching objectives:

- To install CSP at a scale that sufficiently tests and demonstrates the storage technology component, contributes to important cost reductions, and initiates a program to foster associated economic benefits, such as local manufacturing industries, social and economic development in the zones of the power plants, improved energy security, and a shift away from fossil fuels;
- To test a business model that could attract and increase private-sector backing and enhance the availability of capital and 'know-how' to support the development of a CSP portfolio.

28. The four characteristics that were essential in developing the Ouarzazate I project are as follows:

- ***Strong public commitment and the close alignment of key public partners***: Morocco established a favorable regulatory and renewable policy framework to encourage private-sector engagement. In particular, it established a specialized entity tasked with realizing CSP projects (MASEN) and financially supports this entity's work to implement the ambitious Moroccan Solar Plan. The Government is committed to covering the gap between CSP generated electricity and conventional generation. A comprehensive reform of the subsidies for conventional energy sources is also underway in Morocco in parallel.

- ***Significant financial and technical contributions from International Financial Institutions (IFIs), together with strong engagement and coordination of donors***: CSP as a technology is still far from commercial viability and the high capital costs meant the project was not viable without high levels of concessional financing. Donors' engagement helped to mitigate private investors' perceived financial risks of the project. Although MASEN succeeded in aligning and coordinating donors to obtain the best financing terms, donor coordination and alignment of conditions, safeguards, and reporting rules were at times time-consuming and challenging due to the scope of the project.

- ***A well-orchestrated competitive bidding process resulting in attractive prices:*** early coordination and agreements with donors allowed MASEN to manage the bidding process in a timely manner and to inform bidders of attractive financing terms. This transparency appears to have supported competition among private investors, resulting in required rate of returns that are in line with other, less risky renewable energy projects in the country. It also appears to have supported bids below estimates and competitive with what is observed around the world.

- ***A carefully designed public-private partnership model***: The public-private partnership model allows the optimal alignment of risk between public and private players. For example, in Ouarzazate I, the private developer bears construction and operational risk while the Government of Morocco bears electricity market risk (revenue risk). MASEN's role in the public-private partnership is innovative: it acts as both equity investor and power purchaser (off-taker) and thus has the ability to align public and private objectives.

29. Finally, the project design was built on lessons learned to the extent possible. Ouarzazate I benefited, to some extent, from exchanges with other large-scale CSP projects that are under development in India and South Africa, as well as experience gained from a hybrid CSP project in Oujda in Northern Morocco supported by the Global Environment Facility ("Ain Beni Mathar"); however the knowledge sharing process could have been more extensive. Going forward, the lessons of Ouarzazate will also be shared. It is expected that CTF would play a key role leveraging the lessons from the MENA scale-up initiative. In addition, the MENA countries would benefit from lessons learnt from solar programs in other parts of the world, such as South Africa, India and China and Saudi Arabia in the region in order to move their projects forward. To this end, a technical assistance component is proposed as part of this IP Update.

30. Over the last two years, several countries outside MENA (or in MENA but not in the CTF IP) have announced ambitious plans to deploy CSP on a large scale: Saudi Arabia (25 GW), India (20 GW), China (21 GW) and South Africa (1 GW); and global installed capacity has increased to 2.4 GW, mostly in Spain and the US. Learning from the design and implementation of other CSP projects should help reduce project costs and increase efficiencies. This in turn will support Morocco and the MENA region to develop a CSP portfolio. Morocco has clearly decided at the highest level to play a leadership role in the development of CSP through the Ouarzazate plant. This leadership role would be reinforced by closer coordination with the other major players in MENA and elsewhere.

SECTION III: CIRCUMSTANCES AND RATIONALE FOR INVESTMENT PLAN UPDATE

31. The need to prepare an investment plan (IP) update is motivated by several factors, which have affected the implementation of the MENA CSP scale-up investment plan as updated and approved in November 2010. These factors are essentially of political and economic nature and have intervened at different levels as follows:

Country Specific Challenges

32. **The Arab Spring has delayed project preparation in Egypt and Tunisia by more than one year.**

33. **The portfolio of CSP projects in Tunisia will be downsized from 200 MW to 50 MW due to political instability and persistent economic fragility.** The Jasmine revolution delayed the decision-making processes among top-level staff in the Tunisian public administration and at the level of the national power utility STEG. The planned 100 MW ELMED-CSP project, which was conceived to partially export renewable energy from Tunisia to Italy through a new interconnection under the Mediterranean, was put on hold even after completing the prequalification phase on October, 2010.

34. Three years ago, Italy had estimated a renewable energy deficit, which would have led the country to miss its national target under the EU RES Directive 2009/28 if imports had not been considered. Italy had planned to import "green" power from neighboring countries, including 0.6 TWh/year from renewable energies from Tunisia starting in 2018[7] through a new ELMED submarine interconnection. Recent developments indicate that Italy may perhaps not have a deficit in terms of its EU 2020 renewable energy target. More specifically, Italy had a surplus in renewable energy in 2009 and 2010 due to a reduction in electricity demand (by 5.7% in 2009 from the previous year) and an increase in production of national renewables. Therefore, Italy has recently communicated that it will not need to import "green" electricity, e.g. from Tunisia, to fulfill its target under the EU Directive, because new forecasts indicate a surplus in production of renewable sources until 2020[8]. Moreover, initial estimates from the CSP issues and options analysis underway indicate that the cheapest solution to cover Italy's deficit, if one develops, would be to import from Greece, and possibly Bulgaria, Hungary, Slovakia or Lithuania.[9] This notwithstanding, Italy does not completely rule out imports under Article 9 of the EU RES Directive 2009/28 as a back-up strategy in case of failing to reach its target.

Regional Challenges

35. **The economic crisis in the European Union (EU) delayed the perspective for MENA CSP exports into European markets.** The sovereign debt crisis struck Spain and Italy, two key European countries in a potential export agreement with Morocco and Tunisia respectively. The

[7] European Commission, Italian National Renewable Energy Action Plan, 30 June 2010.
[8] European Commission, First Italian progress report on Directive 2009/28/EC, December 2011
[9] CSP in the Middle East and North Africa: A Review of Issues and Options, Interim Report, Mercados, February 2013

crisis had ripple effects on electricity consumption in both EU countries. Spain's electricity demand declined by 1.8% in 2012 compared to the previous year, while Italy's electricity demand contracted even further by 2.3% (Sept 2012). In Spain, the Government has been absorbed in day-to-day crisis management, which delayed conversations with other EU countries to put forward a Memorandum of Understanding (MoU) for importing "green power" from Morocco. In the context of this MoU, Spain would be allowing for the transit of green power from MENA countries to northern Europe if use of the transmission network is remunerated adequately, it does not cause stress on its network and the interconnection with France through the Pyrénés is built.

36. **Germany's new energy policy ("Energiewende"), which includes the phase-out from nuclear by 2022 and the reduction of CO_2 emissions by at least 80% by 2050 (compared to 1990) may require imports of CSP generated electricity from MENA countries.** Under the EU RES Directive 2009/28, Germany anticipates to reach a surplus of 1.6% over its national target of 18% energy from renewable sources in gross final energy consumption in 2020 by means of national measures. However, Germany has taken decisive steps to conclude a bilateral agreement with Morocco in the short-term to develop a "pilot" export project under the EU RES Directive 2009/28. The "pilot" project would pave the way to further export arrangements in the long-term, but France and Spain –key transit countries- have not agreed in their participation in the "pilot" yet. Germany has officially acknowledged that it would need imports from third countries in the long term to cover part of its renewable electricity needs, where importing solar power from North African countries can make an important contribution towards future energy supply in Europe. Hence, Germany expressed support for the first reference projects of importing power from renewables from North Africa under the Union for the Mediterranean's Solar Plan.[10] If an interconnection was developed between Tunisia and Italy, then Italy could be a transit country for CSP power to Germany and other countries in Northern Europe. In the absence of the interconnection, Tunisia could still technically export to Europe through the existing Morocco-Spain interconnector.

37. **The European Union (EU) has further engaged in a process of fostering closer economic integration among Maghreb countries and between the Maghreb and the EU.** In response to the Arab Spring protests, all EU institutions adopted a joint communication[11] to set out ways in which the European Union could support closer cooperation between the countries of the Maghreb. The MENA region and the Maghreb in particular, remains one of the least integrated regions in the world. To contribute to intra-Maghreb and Maghreb-EU trade, the EU acknowledged that the timing was appropriate for the development of an "integrated energy area through a deepened partnership starting with renewable energy". The EU proposed several steps for the development of a West-Mediterranean electricity area by 2020-25, such as the establishment of a regional electricity trading platform.

Market and Technical Developments

[10] Federal Republic of Germany, Progress Report under Article 22 of Directive 2009/28/EC on Promotion of the Use of Energy from Renewable Sources, December 31, 2011.

[11] Joint (2012) 36 final, Joint Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 17 December 2012.

38. Although CSP deployment in MENA has been slower than expected, the upward trend has remained steady in the rest of the word. **Since October 2010, the CSP installed capacity has quadrupled and the capacity of plants under construction have tripled worldwide.** Since the last MENA CSP Investment Plan Update (October 2010), CSP total installed capacity worldwide increased by 1.8 GW, from 540 MW (2010) to 2.4 GW (2013).[12] Similarly, the portfolio of CSP plants under construction has increased from 1 GW (2010) to 3.2 GW (2013). Despite the halt in the key Spanish market, emerging markets are taking over by planning new CSP plants, such as South Africa, India or China. In addition, the Kingdom of Saudi Arabia has recently launched under an ambitious plan to install 41 GW of solar energy (25 GW of CSP and 16 GW of PV) by 2032.

39. Under certain scenarios, the International Energy Agency (IEA) estimates that CSP could become competitive with coal-fired base-load power by 2020 and that installed capacity would reach 1,089 GW by 2050.[13] Cost declines are already becoming visible with the Ouarzazate I results and other recently announced projects. Cost reductions in CAPEX of 30% or more are expected over the next 10 years[14], and could even accelerate if the Solar Plans are implemented rapidly. Those cost reductions could make CSP much more attractive than other renewable energies, especially given CSP additional benefits in terms of providing firm and reliable power, as well as load following capabilities and the provision of ancillary services (see Annex II for more details).

Financial Challenges

40. **Some MENA countries hesitate to invest in CSP technology because of the persistent high capital costs and limited availability of grant funding and exports.** Despite the substantial CTF financing and other concessional financing available such as the NIF of the EU, at least Egypt, Morocco, and Tunisia are expected to be needing to provide an additional subsidy during the period of plant operation in order to close the gap between the cost of electricity generation and the cost of an equivalent conventional power plant. The Akarit project in Tunisia is estimated to entail about US$7 million of annual subsidy from government budget for the project. In the case of the Kom'Ombo project in Egypt, subsidy requirements are between US35 and 42 million per year. For Ouarzazate Phase I, this financing gap has been estimated at US$28 million per year after the bid results . For those countries with economies in crisis due to the Arab Spring, providing these subsidies presents a challenge and has given rise to the question of whether and how CTF financing can be augmented in order to reduce the subsidy gap.

41. But as the previous section illustrated, the costs of CSP are declining, reducing the need for a subsidy. Most prominently, the lower-than-expected price in the recently awarded bidding process in Morocco's Ouarzazate I project (UScents 19/kWh) has significantly reduced the direct subsidy burden for the Government to US$28 million. See table 2 in the next section for a comprehensive presentation of subsidy requirements per project given the current financing conditions.

[12] ESTELA and Protermosolar, "The essential role of solar thermal electricity", October 2012.
[13] International Energy Agency (IEA), Technology Roadmap – Concentrating Solar Power, 2010.
[14] CSP in the Middle East and North Africa: A Review of Issues and Options, Interim Report, Mercados, February 2013

42. In addition, the global developments are pointing towards a decline in the price for CSP. A 2010 study[15], estimated potential tariff reductions of 35-50% by 2020 in CSP projects due to economies of scale in larger-size plants and technology improvements. Furthermore, the price references in recently awarded projects in India, South Africa, Morocco and the USA have been lower than expected, ranging from UScents13/kWh to UScents32/kWh.[16]

43. Nevertheless the question of higher levels of CTF support to help reduce the subsidy levels for the power plants in the MENA CSP CTF program remains on the agenda.

Project Specific Issues

44. **Preparation of the 100 MW Kom Ombo project in Egypt has been delayed by change in site location.** Since the adoption of the CSP-MENA Investment Plan Update in November 2010, project specific issues have had significant impact in project preparation. In the case of the proposed 100 MW plant in Egypt, the site originally proposed for the project at Kom Ombo (about 60 km north of Aswan in Upper Egypt) was abandoned because of construction restrictions (building height limit of 7 meters, which is not feasible for CSP). Following visits of the new site by the consultant, the feasibility study financed by the German KfW has recommenced and is expected to be completed soon.

[15] AT Kearney, ESTELA, "Solar Thermal Electricity 2025, Clean Electricity on Demand: attractive STE cost stabilize energy production", June 2010, Figure 25.
[16] European Solar Thermal Electricity Association (ESTELA), "The essential role of solar thermal electricity", October 2012, p. 10.

SECTION IV: PROPOSED CHANGES TO THE INVESTMENT PLAN

45. The objective of the MENA CTF CSP IP remains unchanged. The high level objective is to accelerate global adoption of the CSP technology by supporting the CSP expansion programs of countries in the MENA region, in order to reduce costs to competitive levels through economies of scale in CSP equipment manufacturing. The intermediate objective of the CTF CSP IP is to finance 750-1000 MW of CSP capacity to achieve a demonstration effect that will catalyze replication. The replication is needed on a substantial scale before costs can come down to competitive levels.

46. The purpose of the IP Update is to realign the pipeline of projects to reflect the reality on the ground, as several projects were delayed by several factors, including the political turmoil that swept the region since January 2011, and to build on the experience of the first project to move forward, the Ouarzazate I 160 MW plant in Morocco.

47. Arguably, the success factors in the Ouarzazate I project have been (i) a strong political will by the Government of Morocco to deploy CSP on a large scale in pursuit of energy, climate change and industrial and economic development objectives; (ii) a clear and well established institutional framework, with the creation of an agency fully dedicated to the implementation of the Morocco Solar Plan; (iii) a well designed PPP bidding process that resulted in prices 30% below cost estimates and well below typical; and (iv) a strong backing by a wide range of international actors including all IFIs and initiatives such as the Mediterranean Solar Plan (MSP) and Dii.

48. The long-term vision and the road map also remain unchanged, although the different periods are extended in time. The vision is to develop several hundred GW of installed CSP capacity in MENA by 2020 and several thousand GW longer-term to serve the objectives of energy security, climate change mitigation and industrial development in the home countries, while serving markets in Europe and contributing globally to cost declines for a technology that has the potential to provide a safe, reliable and secure power supply with no carbon.

49. The roadmap can be broken down into four periods where the driving forces of the CSP market (concessional financing, exports, cost reductions and macroecomic and derived industrial benefits) play a different role:

- ***Period 1 (2011-2020)-*** Concessional financing (with a high proportion of grants) is needed to avoid a heavy burden on government budget
- ***Period 2 (2020-2030)-*** Exports are increasingly a source of revenues, thus decreasing the need for grants and alleviating the burden on State budgets
- ***Period 3 (2025-2035)-*** Local services and manufacturing contribute substantially to economic growth and job creation
- ***Period 4 (beyond 2035)-*** CSP provides a low carbon, affordable and reliable form of energy for MENA markets.

50. All projects, except Ouarzazate I, have experienced delays due to the political situation in the host country, the economic crisis in Europe and project specific issues. The question is how

to redeploy funds available from those projects that are now unlikely to succeed within the timeframe required by the CTF to achieve the objectives of the MENA CSP CTF IP as efficiently and rapidly as possible, taking into account the success of Ouarzazate I.

51. As noted in a previous section, **Algeria** has indicated that it does not intend to borrow from CTF, but would like to continue participating in the MENA CSP initiative.

52. **Morocco** remains the country most likely to deploy CSP at a sustained pace in the short to mid-term, and it has so far developed only 32% of the capacity in the pipeline in the original CSP CTF IP. With the second phase of the 500 MW Ouarzazate plant now launched, Morocco is in a unique position to achieve the goals of the CSP CTF IP:

- The political and economic situation provides a stable environment in which to implement a visionary green growth policy. In early 2013, Morocco is one of the best performing economies around the Mediterranean.
- The solar energy resource base is very good.
- Morocco is close to European markets that have pledged to increasingly use green electricity, and also have the ability to pay for it (in particular Germany and possibly later Italy and other EU countries).
- Morocco needs a low carbon energy resource in order to meet its fast growing electricity demand without increasing its reliance on imports, strain on the climate and the environment and threat to supply reliability. CSP is the best renewable energy to provide low carbon firm, safe, reliable and secure power supply.
- Morocco has proven its ability to attract international investors and developers thanks to its legal/regulatory framework and the PPP business model for risk sharing.

53. However, subsidies from the Government will remain necessary, unless costs continue to fall rapidly and exports materialize quickly. If costs do not fall enough, and exports do not materialize, then a higher level of grants will be necessary to keep subsidies at a level that does not weigh on an economy which is already fragile.

54. In a continuation of what was already assumed in the November 2010 IP Update, and to build on the success of the first IP project, the present Update proposes that the CTF continues to support CSP development in Morocco although with a lower contribution per kW than before. CTF resources on the order of US$200 million should successfully support the continued deployment in Morocco, while establishing the base for success elsewhere by acting as a model for global development of large scale projects. If visibility does not improve on exportcontractual agreements by the time of approval of the next new project by the CTF TFC, and if no grant has been mobilized, then it might be necessary to reconsider the complete initiative at the time of the second stage of the IP Update, if the economies of the region remain fragile. A new reallocation might be considered at that time to reflect progress on the export front, in addition to the status of the projects in the pipeline.

55. In **Tunisia**, as discussed in the section “Status of IP implementation”, all projects, except the STEG Akarit project, have been dropped from the CTF pipeline, mostly because they were unlikely to proceed fast enough to fit in the CTF time frame. The STEG project in Akarit, on the other hand has made good progress in terms of technical preparation, even if it is somewhat

delayed. Against the background of the "Jasmine revolution" and the ongoing political uncertainties as well as an increasingly difficult budgetary situation in Tunisia, the Government will not be able to provide subsidies to a CSP project above and beyond the level provided to conventional fuel resources. The fact that arguably the level of CTF financing has been low compared with the subsidy requirements for the plant has made it not possible for the project to be formally endorsed by the Government in terms of going forward. As part of the Update, Tunisia has requested that a larger share of the envelope originally foreseen be re-allocated to the Akarit CSP project. Approximately US$62 million have been requested for this purpose (or US$1230/kW), with the possibility for an upward revision. Against this background it is proposed to keep the project in the pipeline but at a low likelihood rating.

56. In **Egypt**, as discussed in the section "Status of IP implementation", the 100 MW Kom Ombo plant has faced delays due to siting issues and country specific challenges, with the political changes that resulted from the Arab Spring, but is now progressing satisfactorily. The full indicative amount for Egypt of US$97 million has been allocated to Kom Ombo in the IP Update of November 2010. It is proposed to increase the CTF amount to US$123 million (or US$1230/kW as for all first phase projects). As for Tunisia, it is proposed to reassess the desirability to keep the project in the pipeline when the second stage of the IP Update is completed and to consider the possibility of an upward revision of the CTF amount at that time.

57. In **Jordan**, the Ma'an 100 MW power plant will not go ahead as a single project. It has been replaced in the pipeline by five possible CSP projects for development by private sector sponsors for which MOUs have already been issued. In addition, the Ministry of Energy and Mineral Resources (MEMR) also received two proposals for Concentrated Photovoltaic (CPV) projects that are considered eligible for consideration for support under the MENA CSP CTF program. The MEMR has already provided two MOUs for such projects to private sector consortia. Although it will be challenging to finance and develop multiple private sector projects in Jordan, this would provide a good example of use of CTF funding for mobilizing capital to support private sector projects. This would also be useful as most projects benefiting from CTF have been public sector projects. IFC has indicated a need for US$40-50 million of CTF resources for IFC supported CPV and CSP projects. No CTF resources will be sought for the transmission project; as a result the remaining balance will be re-allocated to the overall CTF pool of funds.

58. Table 2 presents the updated pipeline based on the changes discussed above. As noted above the indicative CTF contribution in the original IP and its November 2010 Update was US$725/kW. For Ouarzazate I, the CTF contribution was US$1230/kW. In the indicative pipeline, the contribution is assumed to be US$1230/kW for all first phase projects—the first project in each country participating in the program. Second phase projects (e.g. Ouarzazate II) could get a contribution of the original indicative amount (US$725/kW). In the case of Jordan, the CTF contribution would be only US$500/kW, as the use of funds by IFC is capped. Details of each project including schedules for CTF TFC submission and MDB Board approvals appear in Annex I.

Table 2: MENA CSP CTF Indicative Financing Allocation Plan after Reallocation

	Projects/ Capacity (MW)	CTF financing (US$ million)	CTF financing (US$/kW)	Required annual government subsidy (US$ million/year)	Required annual governmen t subsidy (US$/kW)	Probability of WBG/AfDB Board approval by June 2014
Morocco	OZZI 160	197	1230	60*/28**	375*/140**	
	OZZ II 300	218	725	53***	180***	High (but could be Medium if "gap"does not continue to fall)
Egypt	Kom Ombo 100	123	1230	48	480	Medium
Tunisia	Akarit 50 (possibility to increase to 100)	62 (123 if 100 MW)	1230	10	200	Low
Jordan	IFC Up to 100 MW (incl CPV)	50	500	NA	NA	Medium but to be confirmed when more visibility on GoJ bidding process
Total Projects	710	650	915			
Technical Assistance	NA	10				

*Initial estimate ** Bid results

*** Initial estimate- To be confirmed during project preparation

Note: The differences in value of the subsidy levels are not only attributable to the differences in de facto subsidy needs but also due to the differences in methodology used. See also footnote 22 or Annex II for further explanation.

59. **Technical Assistance:** while project-based activities go some way in bringing down the barriers to the development of CSP in the MENA region, as has been argued on the previous two updates, these are not sufficient instruments in addressing these barriers. In addition, this Update is therefore proposing a technical assistance component, which proposes to (i) establish a network to exchange information among the countries ; and (ii) provide a dedicated grant mechanism for companies in the region that are interested in engaging the supply chain in solar thermal technology. The network is intended to work as a knowledge sharing platform, which among others could show-case the lessons of experience of the Moroccan Ouarzazate project, bring in international experience, and bring in experience from within the broader region such as Saudi Arabia's ambitious CSP program. The grant mechanism would provide for development of business plans and start-up grants as well as capacity building and would be organized along the same principles as the "Market Place" initiatives of the World Bank.

60. Beside the "technical CSP barriers" there are the export institutional framework and infrastructure barriers. The TA program could thus also fund the development of legal/institutional frameworks and financing schemes for private sector involvement that are more sustainable than the current PPP approach, such as feed-in-tariffs, investment funds or guarantee programs. This would strengthen the potential for replication from the successful projects. Finally the program could support regional integration activities, as it is easier to deploy CSP and other renewables on a large scale in a regionally integrated market, than in isolated national markets.

61. More details are provided in Annex III.

SECTION V: POTENTIAL IMPACTS OF PROPOSED CHANGES ON INVESTMENT PLAN OBJECTIVES

Table 3: Assessment of Proposed Changes

CTF Investment Criteria	Original Investment Plan	Updated Investment Plan
Transformational Impact	Would provide the critical mass of investments necessary to attract significant private sector interest, benefit from economies of scale to reduce cost.	No changes.
Potential for GHG Emissions Savings	The proposed project pipeline will avoid or reduce about 1.7 million tons of carbon dioxide per year from the energy sectors of the countries.	The proposed project pipeline will avoid or reduce about 1.4 million tons of carbon dioxide per year from the energy sectors of the countries.
Cost-effectiveness	Accelerating the realization of economies of scale for a technology that could be least-cost over the longer term and be replicated in other countries. Investment of 15 US$ per ton of CO_2 reduced.[17]	Investment of 18 US$ per ton of CO_2 reduced.
Demonstration Potential at Scale	Cost reduction and institutional learning that will be achieved through this program will facilitate faster and greater diffusion of this technology in other countries	No changes. Avoided CO_2 through CSP in these 4 countries could reach 5.6 million tons yearly by 2020.
Development Impact	Increased reliability and security of supply, industrial development potential and improved trade balance through exports of green electricity or freed hydrocarbon resources	No changes.
Implementation Potential	Countries in the region have been developing targets for renewable energy with explicit targets by technology and legal/institutional frameworks	No changes.
CTF Additionality	To mobilize sufficient concessional and carbon finance to complement commercial and MDB lending, as well as sponsor equity, to bring the levelized cost of electricity of CSP power to within the range of wind power	No changes.

Transformational Impact

62. At the regional level, the proposed program is one of the most ambitious regional solar programs worldwide. It combines public and private sector projects. Its success will provide countries in the region with confidence to consider either public schemes, PPP or private IPPs as a reliable means to raise the sizeable funds required for the development of CSP at the regional level. The financial close of the proposed projects will reinforce interest of international developers in the development of local capacity in manufacturing and support services triggered by the MENA CSP IP. Furthermore, most countries of the region have now ambitious solar programs and objectives in place. The motivations behind these plans vary across countries and

[17] Assuming plant lifetime of 30 years.

include energy security, exports potential, willingness to replace high-carbon fuels, and current use of particularly expensive fuels that make CSP use already attractive.

63. At the global level, Ouarzazate is one of the largest CSP project announced to date. It is particularly important because it attracted the developers' attention to the solar potential in the MENA region, particularly after the successful contract signature of Ouarzazate I. The successful completion of the transactions under the proposed projects will show that mitigation of institutional and market risks are possible through adequate contractual arrangements, even in developing countries. The program will contribute to localizing manufacturing capacity in the region to reduce cost and contribute to local value creation.

Potential for GHG Emissions Savings

64. Considering that most of the CSP generation installed will be replacing high carbon content generation of those countries (i.e. in most times thermal plants that often run with fuel oil—or coal in the case of Morocco), the 710 MW of this program are expected to reduce 1.3 million tons of CO_2 yearly. Over the 30 year-lifetime of a CSP plant, the cumulative emissions reduction of CO_2 is estimated to be approximately 40 million tons.

Cost-effectiveness

65. Considering CTF support and the projected emissions savings of about 40 million tons of CO_2 (based on an average load factor for CSP plants of 24%), but could be twice as much as load factors approach 50% in 2020, the cost of each ton of CO_2 saved would amount to approximately US$ 18 of CTF funding.

Demonstration Potential at Scale

66. The increase in installed CSP capacity both in the MENA region and worldwide will keep bringing its costs down. The Ouarzazate I bidding process shows that competitive prices can be reached when the project risks are allocated appropriately. The solar strategies of the four countries call for the installation of 2,500 to 3,000 MW by 2020, approximately four times the size of the capacity to be installed under this investment plan. This would lead to an important increase of emission reductions. If this investment plans numbers were extrapolated for the capacity additions, the potential of GHG emission savings for the governments' targets would reach about 5.6 million tons of CO_2 emission reductions per year in 2020 and about 168 million tons during the lifetime of the program.

Development Impact

67. The development of solar energy will have significant benefits in terms of the reliability and security of electricity supply to consumers in these four countries, which is a high development priority for the Governments. Tapping the MENA countries huge solar resources will help reducing the carbon intensity of power generation.

68. The successful development of the first project through a PPP (Ouarzazate) is also a clear commitment of one of the governments to involve the private sector in its solar program. This will provide confidence not only to foreign investors but also to Moroccan private companies to increase their involvement and invest in goods and services to contribute to increased local industrial integration and job creation.

69. In addition, further development of renewable resources will increase energy security. Supply diversity will also strengthen the resilience of the power sector to future shocks such as fuel price spikes or increased variability of hydro power generation due to climate change. While part of the CSP production will initially be for local consumption, a growing share of the electricity produced will be exported to Europe over the medium term to long-term. In the longer-term, this share is expected to peak, and to decline when the CSP costs go down, therefore making the technology more affordable to serve local markets.

70. With the CSP plan, energy importing countries will develop indigenous resources and improve their energy security; energy exporting countries will free up valuable oil and gas resources for more value added utilization. In addition, exports of renewable energy will generate economic benefits through increased revenues.

71. Several studies show that scale-up of solar development will support industrial development, strengthen the foundation for sustainable development and promote local manufacturing to increase local content of the solar program.[18] The development of the solar subsector in these countries would further strengthen the region's role as a leader in renewable energy development which will be complemented by initiatives such as the Climate Innovation Center in Morocco, a project for which a business plan is currently under preparation.

Implementation Potential

72. Public policies and the institutional set-up in some of these countries are very supportive for this project. Many governments have in recent years undertaken a substantial effort to promote renewable energy, establish an adequate legal framework, set up a dedicated agency for energy efficiency and renewable energy development, and in some of the countries set up an institution specifically dedicated to implementing their solar strategies (e.g. MASEN in Morocco). Some Governments are also undertaking extensive efforts to implement cost-reflective energy pricing and are launching energy conservation programs that will ease the transition to cost reflective pricing by keeping consumer electricity expenditures steady.

73. The World Bank and the African Development Bank, as well as other IFIs, are engaged with many governments of the MENA region to enhance the overall sector policy framework and advance reforms aimed at improving the sector's commercial environment and financial sustainability. There is a general recognition that electricity utilities operate under tight financial

[18] See, for example World Bank, ESMAP, Ernst & Young, Fraunhofer Isi, 2011, MENA region assessment of the local manufacturing potential for CSP projects, or World Bank, TSA, Acenture, 2013, Competitiveness assessment of MENA countries to develop a local solar industry (forthcoming).

constraints and have demonstrated their willingness to gradually increase tariffs toward covering costs, and provide budget and other support in the meantime.

74. However, the specific conditions in the countries as described in Sections I, 2 and IV present limitations to the development of the above-mentioned implementation potential.

CTF Additionality

75. The financial analysis and the sensitivities developed for the analysis of the projects included in this investment plan update show that the CTF contribution will have an impact in bringing down generation costs of the projects, thus diminishing the fiscal burden on the Governments. Beyond its direct financial impact, the CTF will be instrumental in bringing in the other donors. Together with such donors, the CTF will also bring strong reassurance to the private sponsor(s) about the willingness and capability of the countries of interest to subsidize solar electricity over a period of time sufficient to ensure CSP cost declines to grid parity levels. Such reassurance will no doubt be useful, especially in the current political context. It will contribute to keeping the equity rate of return required by the sponsor at a reasonable level.

Risks and Mitigation Measures

76. The overall risk of the MNA Concentrated Solar Power Investment Plan remains high as shown in Table 4 below, which lists the key risk factors to the success of the MENA CSP CTF program.

77. **Energy sector financials:** large government subsidies to fossil-fuels in general are putting the financial viability of the energy sectors in the region under pressure.. Reforms are underway in Egypt and Morocco, but due to their highly political nature and complexity there is a high residual risk that subsidies to fossil-fuels remain high in the near term. This implicitly puts at risk CSP investments, which are also in need of subsidies.

78. **Cost of CSP:** the costs of CSP remain high even if they have dropped significantly. The lowest levelized costs of energy (LCOE) of CSP, i.e. US$17c/kWh is currently comparable to the most expensive LCOE of a gas turbine. Levelized costs of CSP and other renewable energy technologies are forecast to drop significantly[19] by 2035 due to cost and efficiency drivers. The CSP levelized cost of energy is expected to be reduced by 50% in 2035 have dropped significantly. Despite these expected decreases in the long-term, CSP will remain an expensive technology in most countries and market segments in the short-term.

79. **Exporting electricity to Europe:** to ensure financial sustainability and replicability of CSP projects in MENA countries, export options to higher-paying EU markets are being explored. The EU Renewable Energy Sources Directive 2009/29 provides already a general framework for MENA-EU exports, but a bilateral agreement between Germany and Morocco is required as a first step. The two parties are unlikely to move forward without the involvement of

[19] World Bank, AP-MERCADOS-EMI, Sun to Market Solutions, "CSP in MENA region: a review of issues and options", interim draft report, 2013.

France and Spain. Despite substantial progress and commitment from Germany, the risk of not having the four-party agreement remains high.

80. **Lack of available grid infrastructure:** several transmission projects, which could have facilitated exports of "green electricity" from MENA to Europe, have been put on hold (e.g. the ELMED submarine cable), for economic and political reasons. However, exports from Morocco and Tunisia (through Morocco) to the EU are technically feasible up to 500 MW. However, to what extent they are politically feasible is unclear as even exports from Morocco have not yet been formalized. The residual risk of not having available infrastructure capacity for MENA-EU trading is considered high.

81. **Individual country projects dropping out:** the possibility that a MENA country participating in the MENA CSP IP Update decides to finally drop its CSP project has been considered. To mitigate this risk, a new technical assistance component will be put in place to strengthen capacity building in project preparation throughout the region, which could support the implementation of other CSP projects beyond the MENA CSP IP by knowledge exchange activities, feasibility studies, etc. The implementation of CSP projects in new countries in MENA, including for desalination purposes, will also be considered to remedy any potential reduction in the MENA CSP IP pipeline.

82. **Private sector interest:** finally, the residual risk related to the lack of private sector interest in CSP projects is considered moderate in view of the highly successful bidding process of the Ouarzazate I project in Morocco.

Table 4: Risks and Mitigation Measures

Risk	Mitigation Measure	Residual Risk
High energy subsidies	Reforms are underway in Egypt and Morocco to reduce subsidies to fossil-fuels. If successful, these reforms could make investments in solar CSP plants more financially attractive.	high
High CSP capital cost as compared to alternative solutions	MNA CSP investment plan adds around 700 MW or 30% of CSP installed capacity worldwide (2.4 GW). The demand increase is expected to significantly contribute to reduce costs through economies of scale and related technology improvements. The IEA [20] estimated that, under certain scenarios, CSP would become competitive with coal-fired base-load power by 2020.	high
Lack of regulatory framework to support "green" energy trade in both the EU and MENA countries	The EU Renewable Energy Sources Directive 2009/28 already provides a general regulatory framework enabling the "green" energy trade between the EU and MENA. A political agreement between Germany (possibly also involving France and Spain) and Morocco would be needed to underpin the first pilot project. High-level meetings driven by Germany have already been held to discuss this issue.	high

[20] International Energy Agency (IEA), Technology Roadmap – Concentrating Solar Power, 2010.

Lack of available grid infrastructure, interconnections for trading "green" energy	A 1,400 MW Morocco-Spain submarine interconnection already exists (an additional line of 700 MW is being studied). From a technical standpoint, up to 500 MW of « green » power could currently be exported from Morocco to France/Germany. Reinforcements in Spain's electricity grid would, however, be required. In 2014, a new 1,400 MW interconnection line between Spain and France is expected to be operational, further increasing interconnection capacity; but it will not be reserved for green electricity. There is no current interconnection infrastructure between Tunisia and Italy. The planned 1000 MW ELMED submarine cable is on hold and CTF support is not sought. Likewise, the reinforcement of the transmission network in Jordan to facilitate renewable electricity exports from Egypt and Jordan to the north is on hold for political and economic reasons and CTF support is not sought.	high
Reduction in installed capacity in MNA CSP IP due to participating country not pursuing announced CSP project	Some countries participating in the MNA CSP IP face a particularly challenging political economy environment, i.e. Egypt. In case that one of these countries would finally decide to drop from the MNA CSP IP, the total installed capacity of the MNA CSP IP would be below 760 MW thereby reducing the IP's contribution to the technology's cost reduction through global economies of scale. However, the MNA CSP IP update presents a new Technical Assistance, which will enhance and strengthen project preparation in MNA countries, therefore compensating any potential reduction of installed capacity in the MNA CSP IP. Moreover, the potential for implementing CSP projects in Libya, including for desalinization purposes, will be sought in the near future. Any progress in this regard will be reported in next MNA CSP IP update.	high
Lack of private sector interest	CSP companies have shown strong interest in participating in bidding process backed by international finance institutions and strong government support. 19 consortiums applied to the pre-qualification of the 160 MW Ouarzazate I project, which recently awarded the project to the ACWA power consortium. Commercial banks have been closely following the Ouarzazate I process. Risks remain moderate and their involvement is expected in the mid-term to ensure replicability of the MNA CSP IP program.	moderate
Overall risk after mitigation	**High**	

SECTION VI: MONITORING AND EVALUATION

83. Table 5 summarizes the result framework for the MENA CSP IP Update. The total amount of leveraged financing is US$4.6 billion, compared to 5.6 billion in the original MENA CSP IP. This implies a leverage ratio of 6.9 for each CTF dollar, vs 7.5 in the original IP. This amount will serve to finance 710 MW of CSP/CPV power plants. The resulting GHG emission savings are expected to be 1.4 million tons per year

Table 5: Results Framework for CTF Core Indicators for CSP IP Update

Results Indicator	**Target Value** (CTF Plan Update April 2013)
Co-financing of CTF funding (US$ million)	
- IBRD	340
- IFC	50
- AfDB	627
- Other International Financial Institutions	2077
- Grants (mostly NIF)	180
- Public sponsors	432
- Private sponsors and commercial banks	975
GHG Emissions Savings ($mtCO_2e$/year)	1.4
RE Installed Capacity (MW)	710

84. For each project, the monitoring and evaluation framework will be implemented by the implementing agency as part of the monitoring process put in place by the co-financiers of the project. Detailed project level monitoring will be done by teams established within each of the Borrowers and implementing agencies, which may be the same or different depending on the project. Monitoring arrangements and reporting procedures will cover aspects such as eligibility, safeguards compliance, monitoring requirements, etc. The implementing agencies will apply the CTF result framework, which will be used to measure the output, outcome and impact of the projects.

85. Since the projects in this IP are CSP or CPV power plants, the result indicators will include:

- CSP/CPV capacity installed
- GHG emissions saved per year, and cumulative
- Other co-benefits including:
    - Environmental co-benefits
    - Improved energy security and reduced dependency on fossil fuels, measured by the share of renewable energy in total power generation

- Socio-economic benefits, such as local industry development and job creation

ANNEX I: UPDATED/NEW PROJECT CONCEPT NOTES

Kom Ombo CSP Project in Egypt (AfDB/IBRD)

Problem Statement

86. The country has achieved remarkable progress in making electricity almost universally accessible throughout the whole country, serving about 28 million customers. The current installed capacity is close to 30,000 MW, 90% of which is based on fossil fuels, whereas the rest comes from hydropower and wind. All the domestic hydropower resources, primarily at Aswan, have almost been exploited, and as a result, the share of hydropower is continuously shrinking. On the other hand, demand for electricity in Egypt has been growing at about 6 - 7% per annum, and is largely created by the residential, industrial and commercial sectors. This trend continued even when economic growth significantly slowed down over the past two years due to the 2011 revolution. On the contrary, the power system in Egypt has been unable to meet all the demand, especially during the peak summer months, leading to load shedding and interruptions in the power supply.

87. In order to meet the expected demand growth, the government plans on the one hand to add about 1,500 – 2,000 MW of new generation capacity each year, and on the other to improve energy efficiency by 5% over the next five years. So far, most of the new capacity has been developed as fossil-based generation, primarily firing natural gas. Nonetheless, government objectives for the energy sector are to maximize the economic and social value-addition of natural gas through prioritization and diversification of the uses of gas in the various sectors of the economy. Domestic gas consumption is currently dominated by the power sector (56%), followed by the industrial sector (29%), petroleum and petrochemicals (12%), and the residential and transport sectors (3%). There has been recent signs however that gas supply for power generation has not been able to fully meet the demand, thus contributing to the power shortage problem.

Proposed Transformation

88. Cognizant of the various challenges facing the energy sector in Egypt, and in order to improve energy security through resource diversification, the Government of Egypt has set some targets for increasing the share of renewable resources in the energy mix. In this regard, the government targets to reach 12% of the generated electricity from wind energy by the year 2020, which translates into 7,200 MW of wind power capacity to be jointly developed by both the public and private sectors. Furthermore, in July 2012, the government approved the Egyptian Solar Plan which announces a clear target of installing 3,500 MW of solar power by the year 2027, comprising 2,800 MW of CSP and 700 MW of PV. The Kom Ombo project is part of this Plan. In addition, NREA has already taken preparatory steps for development of 2 x 20 MW PV power projects at Hurghada on the Red Sea and at Kom Ombo in Upper Egypt. The PV project at Hurghada is more advanced as all preparatory studies have been completed and preparations of the implementation bidding documents will start. The land required for the PV project at Kom Ombo has now been allocated to NREA, enabling the feasibility studies to commence.

89. Solar energy is not new to Egypt. The first utility-scale application of solar energy was already commercialized in 2011 through the operation of the Kureimat Integrated Solar Combined Cycle (ISCC) power plant, with 20 MW solar contribution to the plant's 140 MW total capacity. The successful implementation and operation of the Kureimat project, and the increasing need for energy diversification were among the main factors contributing to the adoption of an Egyptian Solar Plan. The proposed Kom Ombo project will represent a key milestone on the road toward scaling-up the application of solar energy in Egypt. It will serve as a key step towards moving from hybrid generation technologies, such as the one adopted in Kureimat, to a more primarily solar-based generation where solar energy provides the main source of "fuel". The selection of concentrated solar power (CSP) as the technology proposed for the project fulfills some technical and strategic objectives. From the technical point of view, the New and Renewable Energy Authority (NREA), the main owner and operator of the Kom Ombo project, has gained some experience in the CSP technology through the implementation of the Kureimat project.

90. The staff of NREA has therefore been exposed to a new array of knowledge and skills in this solar technology. The implementation of the Kom Ombo project will provide a good opportunity for NREA to both build on the experience already gained with the CSP technology as well as further enhance and deepen that expertise. From a more strategic perspective, some studies (e.g. by ESMAP) suggest that solar energy, especially the CSP technology in the case of Egypt, offer good opportunities for technology transfer and local manufacturing. Those studies base their conclusions on some real cases that have already demonstrated such a good potential for MENA. For example, in the case of the Kureimat ISCC in Egypt, some elements of the solar field were successfully domestically sourced, manufactured and installed, representing 50% of the total solar field work. In fact, the government of Egypt places high importance on seizing the opportunities that the scaling-up of the various renewable energy technologies, including CSP, could offer in terms of job creation in the more high-value jobs and technology transfer which would further provide for local manufacturing and attraction of foreign direct investment to help revive the economy.

91. Based on the figures announced by the government for the wind and solar energy targets, the new wind and solar energy capacities to be added would be on average 1 GW per year over the next decade or so. This capacity would represent about 50% of the targeted yearly capacity addition required to meet the demand growth, out of which solar energy would represent about 20%. This in turn would translate to a 50% reduction in the emission that would be expected from the new capacity had it been fully based on fossil fuels.

Implementation Readiness

92. The preparatory studies for the Kom Ombo project are well in progress. A feasibility study supported by KfW is near finalization. The site originally proposed for the project (at Kom Ombo, about 60 km north of Aswan in Upper Egypt) was abandoned because of construction restrictions (building height limit of 7 m, which is not feasible for CSP). Accordingly, a new site has been proposed by NREA in the same vicinity. The new site was visited by the feasibility study consultant to assess its suitability for the project. The site could be best described as untouched desert with no vegetation and of no visible use. The site could allow the installation of

a CSP plant several times larger than the proposed 100 MWe, or of several plants of that size. Transmission infrastructure is readily available near the site, with some different options for plant connection. The option proposed for grid connection will be through one of the 220kV overhead transmission lines that passes approximately 12 km from the site. A draft feasibility study report was available early January 2013, to be finalized based on feedback from the various project stakeholders.

93. As ground measured solar (DNI) data for the project site is currently not available, the feasibility study has been carried out using satellite data, and as such entail some relatively high uncertainty. Nonetheless, NREA is now in the process of installing a DNI ground measurement station with support from the enerMENA project. Once the plant is installed and data become available for a reasonable time period, correlation between the ground and satellite data would be carried out in order to improve the accuracy of the expected solar resource at the site.

94. Egypt has received a US$1.0 million project preparation grant from the CTF, through the AfDB, for Kom Ombo. The Grant will support preparation of the ESIA study for the project, and procurement of the EPC contractor. The contract for the ESIA consultancy services has been signed early January 2013. The study is expected to take six months, but the first draft report should be available in four months. Procurement of the consultancy services to support NREA in the preparation of the EPC bidding documents, etc. will start in February 2013, and is expected to take six months to reach consultancy contract signature. Accordingly, all preparatory studies are expected to be completed by June 2013, allowing actual project implementation to start subsequently.

Rationale for CTF Financing

95. Several barriers still restrict the scaling-up of the adoption of solar energy in Egypt. The most significant of those barriers is the relative high cost of solar energy compared to conventional energy or even other renewable energy sources such as wind. The high cost of solar energy not only disadvantages this type of energy compared to others, but also makes rising the necessary larger finance for project development more challenging, especially in times of decreasing credit risk ratings for Egypt and the financial difficulties in Europe.

96. With the slow development of Egypt's natural gas fields and increasing demand for natural gas, the government is considering importing natural gas in the next few years. The solar potential in Egypt is vast; the current high cost of CSP is a barrier to scaling up of CSP generation. Egypt has announced recently a solar energy plan that targets 3500 MW of solar capacity by 2027, including 2800 MW of CSP. Local development and CSP project implementation will enhance the prospects for implementing and scaling up solar power in Egypt.

97. Due to the availability of domestic natural gas in Egypt, the economic least cost of electricity generated from natural gas in Egypt[21] (around 6 US cents per kWh in 2013) is substantially lower than the estimated economic cost of CSP (over 18 US cents per kWh).

[21] Note that the economic least cost of electricity generated from natural gas in Egypt is higher than the subsidized electricity tariff in Egypt, which averaged about 3 US cents per kWh in 2012.

Natural gas is the main fuel for electricity generation, accounting for about 80 percent in 2012. Concessional financing is therefore necessary to help buy down the economic cost of CSP.

98. The estimated *economic subsidies* required for the Kom Ombo CSP plant are not less than US$ 48 million per year (the difference in estimated CSP generation economic cost and that of electricity from natural gas). This translates to about US$ 180 million in present value term for the first five years of CSP operation (when the economic cost of electricity from natural gas is relatively certain).

99. A sensitivity analysis that assumes a higher economic generation cost of electricity from natural gas (at 10 cents per kWh, assuming a blend of Egyptian gas and imported LNG) also indicates a substantial need for economic subsidies for Kom Ombo. For this scenario the required economic subsidies is about US$ 32 million per year, or about US$ 120 million in present value term for the first five years of CSP operation.

Table 6: Estimated Economic Subsidies for Kom Ombo CSP Project Development

Estimated Economic Subsidies	**1st Year of Operation**	**Present Value of Year 1-5 of operation**
Base case	US$ 48 m.	US$ 180 m.
Low case	US$ 32 m.	US$ 120 m.

100. So far, all solar energy projects that have been developed in Egypt were supported by some kind of very concessional financing. The Kureimat ISCC project was supported by a grant from the Global Environment Facility, in addition to a very soft loan from JICA. The estimated high price tag for the Kom Ombo project would require financing from various sources including international financing institutions. Indeed, several development partners such as KfW, EIB, AfD and EU, have expressed interest in the project and indicated their potential support. The role of the concessional CTF financing is very vital in bringing down the energy cost from the project to a reasonable level that would be acceptable to the government. Furthermore, the Kom Ombo project has good potential for growing in size from the technical point of view due to the availability of land and ancillary infrastructure. The government has shown good interest to adopt a larger project size of up to 150 MWe, depending on certain factors the most decisive of which will be the availability of concessional financing. This IP update therefore proposes to increase the CTF allocation to Egypt within the MENA CSP IP in order to capitalize on this opportunity and help the government of Egypt take the decision of increasing the size of the Kom Ombo project.

Results Framework

101. The Kom Ombo project will act as a catalyst for solar energy development in Egypt. The project will help support socio-economic development in the country by generating 450 GWh each year, thus contributing to supplying part of the expected growth in the demand for electricity, while avoiding an average of 6,470 kilo-tons of CO2 emissions per year over its 25

years of useful life. The project itself will create direct employment opportunities estimated as 300 during construction, and 87 during operation.
Project Development Objective Indicators are: (i) installed capacity of CSP power generation; and (ii) annual CSP electricity generation.

102. Intermediate Results Indicators are: (i) procurement progress of the power plant; (ii) power plant construction commencement; (iii) power plant commission completion; and (iv) subsidies for Kom Ombo generation cost provided to NREA by the government.

Financing Plan

103. The following table provides an indicative financing plan for the Kom Ombo project. It is interesting to note that the funds that could potentially be available as indicated by the various sources do in fact exceed the total estimated cost of the project. The government has indicated interest in increasing the size of the project should funding be available, but this would obviously require similar increase in the concessional CTF funding in order to maintain the same level of project feasibility.

Table 7: Project Indicative Financing (US$ million)

Financing Source	Amount
CTF*	124
NREA – equity	[120]
AFD	75
AFDB	170
EIB	70
KFW	180
World Bank – IBRD	170
NIF	37
Total	

 Including US$1.0 million project preparation grant
† Total estimated cost of the project US$745 million

*CTF allocation will be channeled in the equal proportion through AfDB and WB

Project Preparation Timetable

Table 8: Project Preparation Timetable

Milestone	Date
Feasibility assessment completion	April 2013
Environmental and social impact assessment completion	June 2013

CTF TFC approval	October 2013
Appraisal by financiers	October 2013
Hiring of consultant owner's engineer	September 2013
IBRD and AfDB Board presentation	December 2013
Construction start	1Q 2015
Plant commissioning	2Q 2017

Ouarzazate II CSP Project in Morocco (AfDB/IBRD)

Problem Statement

104. Morocco's installed capacity has grown by about 50% in 10 years (2001-2011). The installed capacity at the end of 2011 was 6,377 MW. The technologies with a higher share in the energy mix are thermal coal steam (1,785 MW), hydropower (1,306 MW), and gas turbines and diesel groups (1,118 MW). In addition, 470 MW correspond to the thermo solar plant of Ain Beni Mathar. Electricity demand has been growing at an average of 6.8% annual growth rate since 2000, increasing almost threefold from 1995 to 2011 (from 11 to 28.7 TWh), with a spectacular 8.4% growth for the year 2011. Morocco has had to rely increasingly on imports from Spain to meet national demand as the commissioning of capacity additions has not kept up with the pace of growth in demand. The Government of Morocco is aiming at dramatically diminishing its use of fuel, increase its use of gas, and boost the share of wind from 4 to 15% and of solar from 0 to 14%. The latter will be done in the framework of the Moroccan Solar Plan, which aims at reaching 2,000 MW of thermo solar with five power plant sites by 2020, namely Ouarzazate, Ain Beni Mathar, Foum Al Oued, Boujdour, and Sebkhat Tah.

105. Morocco is the country with the largest proposed capacity in the MENA CSP CTF Investment Plan (IP) and the first to launch the development of one of the world's largest CSP plants with private sector involvement, the Ouarzazate Solar Complex. Among the MENA countries, Morocco is arguably the best placed for pursuing the development of CSP technology: (i) Morocco has already experience with the CSP technology through the operation of a 20 MW CSP plant at Ain Beni Mathar; (ii) Morocco has a transmission interconnection with Europe, which makes exports of solar electricity technically immediately possible; (iii) PPP engagements in the power sector have a long tradition in Morocco; and (iv) Morocco has an overall low country risk relative to the remainder of MENA and is open to integration with Europe.

106. Morocco has decided to take on a leadership role in the development of solar energy. Following commitments made during the Cancun and Durban Conferences of Parties (COPs) to the United Nations Framework Convention on Climate Change (UNFCCC) and under the Union for the Mediterranean, Morocco moved forward with a first tranche of 160 MW of the proposed 500 MW plant Solar Complex planned to be constructed in Ouarzazate in southern Morocco. While on January 2012 a new Government came into power, it has continued to pursue the implementation of the Morocco Solar Plan as launched by Morocco's King on February 2009.

107. The first phase of the Ouarzazate project consisted of 160 MW of CSP parabolic trough. From the original CSP MENA Investment Plan, this has been the project in which most progress has been done. Moreover, the contract for the Ouarzazate Phase I project was awarded in 2012 at a more competitive price than originally planned, and the works are due to start in mid-2013. This first phase was supported by the World Bank, AfDB, EIB, KfW and AFD. The project benefitted from concessional financing from CTF and grants from the European Union and the German Government. By June 2012, the first phase had been approved by the Boards of all co-financiers, following approval by the CTF Trust Fund Committee (TFC) in June 2011. The selection process for a private partner for Ouarzazate Phase I is complete, and the contract with the winning bid was signed in November 2012.

108. This second phase will consist in around 300 MW of CSP, which will be composed of approximately 200 MW of parabolic trough and 100 MW of solar tower technology. A market sounding exercise was conducted by the implementing agency for the project, the Moroccan Agency for Solar Energy (MASEN), in 2012, and a Request for Prequalification has been published in February 2013 by them.

Proposed Transformation

109. The proposed project aims to increase production of solar-based electricity in Morocco, to reduce carbon dioxide emissions, and to test the electricity export concept. The project will also contribute to Morocco's objective of reducing electricity import dependency. A global and regional objective is the mitigation of climate change (through the reduction of carbon dioxide emissions).

110. In addition to fostering low-carbon development of the energy sector and enhancing energy security, the Moroccan Solar Plan aims to stimulate large investments, enhance Morocco's competitiveness and position the country as an 'early mover' in the context of green technology by encouraging the development of domestic manufacturing capacity. In order to spur the development of a local manufacturing industry, Morocco has been using a combination of push and pull measures. Instruments such as (i) encouraging local content in Requests for Proposals (RFPs) for the plants of the Morocco Solar Plan; (ii) devising a communications strategy for the projects in the pipeline; and (iii) developing local R&D facilities and training programs, have been used to develop an conducive market environment for developing local manufacturing facilities in support of the construction of CSP plant. The World Bank supported these efforts through studies such as the ESMAP study on local manufacturing and its follow-up study on the competitiveness of the CSP industry in different manufacturing locations, and the creation of a Climate Innovation Center in Morocco.

Implementation Readiness

111. The project is ready for implementation. A consultant has been recruited and the market sounding for the two CSP technologies considered has taken place. The Request for Prequalification has been launched by MASEN in February 2013, and the launch of the request for proposals stage is scheduled to start by mid-2013. The launch of the second stage of the request for proposals will take place at the end of 2013, and the preferred bidder would be awarded the contract early 2014.

112. As far as the World Bank pipeline is concerned, the Concept Review took place in July 2012. The appraisal and negotiations are envisaged for the first quarter of 2014, and the Bank approval by mid-2014.

Table 9: Project Preparation Timetable

Milestone	Date
Recruitment of	

Financial advisors **Technical advisors** **Legal advisors**	April 2012 September 2012 November 2012
Market sounding	August-October 2012
Preparation of RFQ documents	December 2012
IFIs non objection	March 2013
Launch of the RFQ process	February 2013
RFQ submission	April 2013
Bids evaluation	May 2013
IFIs non objection	June 2013
RFQ results	June 2013
Launch of the RFP second stage	September 2013
Preferred bidder selection after IFIs non objection	December 2013
CTF TFC approval	December 2013
PPP Award	February 2014
IBRD and AfDB Board Approval	March2014

Rationale for CTF Financing

113. CSP capital costs remain high, even if they are expected to decline by between 40-50% in the next ten years. Any project inscribing itself in supporting the development of CSP technology is therefore expensive and high risk, and hence needs substantial financial support. As for all nascent technologies, the targeted use of policy instruments, including subsidies, is needed for scale up if the technology is to realize these cost reductions over the medium term.

114. In addition, exports of electricity generated by CSP from the MENA region to the EU could also help ensure cost recovery in the medium to long run. This way, benefits of CSP electricity trade accrue on both shores of the Mediterranean.

115. Finally, one should take into consideration that the first part of this CSP power plant is already underway, that its implementation has been successful so far, and that not developing the second part of Ouarzazate would impede harnessing the economies of scale of the proposed 500 MW optimal size of the plant.

Results Framework

116. The key results indicators are (i) installed CSP power generation capacity, (ii) electricity production in kWh by Ouarzazate Phase II, and (iii) avoided CO2 emissions.

Financing Plan

117. A number of partners have already expressed a firm interest in co-financing Ouarzazate II, as can be seen in the table below.

Table 10: Project Indicative Financing (US$ million)

Financing Source	Amount
Borrower (MASEN/PPP)	300
IBRD	150
CTF*	218
AfDB	168
EIB	115
AFD	75
KfW	818
NIF	56
Total	1900

***CTF allocation will be channeled in the equal proportion through AfDB and WB**

Akarit CSP Project in Tunisia (AfDB/IBRD)

Problem Statement

118. In 2011, electricity consumption in Tunisia reached 12,900 GWh as compared to 10,868 GWh in 2006 with an average growth rate of 4.5% per year. Generation installed capacity was 4,025 MW in 2011 with 39% in combined cycle Gas turbines, 31% in single cycle gas turbines, 27% in steam turbines, and 3% in renewable energy (of which 52% hydro, 46% wind and 2% solar). Electricity generation was 15,200 GWh with natural gas as main fuel for producing electricity (99.9%).

119. As far as primary energy supply is concerned, the energy deficit has reached one million toe in 2011, equivalent to 13% of national energy consumption. This is mainly due to the decrease of oil production.

120. It is expected that natural gas resources (indigenous production, existing import contracts) will show not be sufficient to cover demand by 2020. In order to achieve security of supply, the Tunisian Government has adopted an energy policy consisting in diversifying energy supply sources and increasing the renewable energy share within the national energy mix.

121. This was translated by the adoption of the Tunisian Solar Plan (TSP) in 2009 with the following objectives by 2016 for wind and solar energy:

- Wind: additional capacity of 429 MW by 2016 (including the 215 MW already installed in 2011),
- Thermo-Solar: three projects of 140 MW total to be combined with gas power plants,
- Solar PV: eight projects with a total capacity of 57 MW including for electricity generation.

122. In relation with this TSP, the CTF considered in 2009 (with an update in 2010) to contribute to the following projects:

- 50 MW CSP power plant to be developed by STEG,
- 100 MW CSP power plant to be developed within the framework of the ELMED Project (1,200 MW IPP Project - including 100 MW from renewable energy - aiming at exporting 800 MW to Italy and allocating 400 MW to STEG),
- 5 MW CSP as part of a 50 MW power plant to be developed by SITEP (Société Italo-Tunisienne d'Exploitation Pétrolière) as an IPP in collaboration with STEG-Energies Renouvelables, a subsidiary of STEG.
- A transmission line (within the framework of ELMED Project) connecting Tunisia to Italy (1,000 MW capacity with 100 MW to be devoted to exporting renewable energy to Europe).

Proposed Transformation

123. As of today, allocating CTF funding is only considered for the 50 MW CSP project to be developed at Akarit site by STEG (with an option of upgrading it to 100 MW). The other projects are not moving and are not ready for absorbing this source of funding: (i) the ELMED generation project is on hold, (ii) the SITEP project is now financed under a Japanese grant.

Currently the use of the existing gas turbine versus a coupling CSP component to new gas turbines is still being debated, (iii) regarding the ELMED transmission line project, a study is being conducted with financing from the Robert Schuman Institute on how to mitigate the economic risk of this project by reformulating it from merchant/private project to a public interconnection project.

124. The proposed 50 MW Akarit CSP project in south-eastern Tunisia This project will increase power generation from solar energy and mitigate greenhouse gas emissions and local environmental impacts. A feasibility study has been conducted with KfW with a financing from the EU/NIF. Some fine tuning of the technical specifications is being conducted with the aim of reducing the costs of the project. The two main parameters considered for reducing the project costs are the storage duration and energy back up through natural gas. The option of reducing storage duration from the initial option of 4 hours to 2-3 hours is being evaluated in addition to the option of raising the level of natural gas back up from 5% initially to 15%.

125. STEG intends to discuss the results of this analysis and the related funding schemes options during a workshop to be organized mid-2013 with the Ministry of Industry and Technology in view of finalizing the government position regarding submitting this project to next CTF IP.

Implementation Readiness

126. The preparatory studies for the Akarit project are well in progress. A feasibility study supported by KfW is near finalization. The Akarit site has been selected and can accommodate 50 to 100 MW of parabolic trough. Transmission infrastructure is readily available near the site, with some different options for plant connection. The collection of ground measured solar data (DNI) for the project site started in April 2012 and is expected to be completed by April 2013. It indicates that solar insolation levels exceed the previous extimates.

127. The EPC bidding documents of the project are being prepared and are expected bto be completed by June 2013. The selection of the contractor is scheduled for 2014 and the commissioning of the project for the end of 2016. The ToRs for the ESIA consultancy services have been validated by the World Bank. However, there have been delays in the bidding process of the study, which is now expected to be completed by the end of calendar year 2013. Pending the final approval by the client, the project is ready to be implemented following the timetable indicated in the table below.

Table 11: Project Preparation Timetable

Milestone	**Date**
Feasibility study finished	September 2012
CTF TFC approval	May 2014
WB and AfDB Board Approval	July 2014
Selection of contractor	2014

Construction	2015-2017
Commissioning	2017

Rationale for CTF Financing

128. CSP capital costs remain high, even if they are expected to decline by between 40-50% in the next ten years. Any project inscribing itself in supporting the development of CSP technology is therefore expensive and high risk, and hence needs substantial financial support. As for all nascent technologies, the targeted use of policy instruments, including subsidies, is needed for scale up if the technology is to realize these cost reductions over the medium term.

129. Against the background that CSP technology is promising as a component of the energy mix in the medium and long term, Tunisia is willing to prepare itself to integrate this technology into its power system. To that end, STEG is considering promoting, as a pilot project, the 50 MW CSP Akarit project with option to expand it to 100 MW. However, some barriers still restrict the scaling-up of the adoption of solar energy in Tunisia. The most significant of those barriers is the relative high cost of CSP as compared to conventional energy or even to other renewable energy sources such as wind. For the same amount of investment, the country could purchase about four times of the installed capacity of CSP in conventional energy.

130. Given the financial situation of STEG, the high cost of solar energy makes raising the necessary larger finance for project development more challenging, especially in times of decreasing credit risk ratings for Tunisia. So far, all renewable energy projects that have been developed in Tunisia were supported by very concessional financing. The estimated high price tag for the Akarit project would require financing from various sources including international financing institutions. Indeed, several development partners such as the IBRD, AfDB, AfD, EIB, KfW, and EU/NIF have expressed interest in the project and indicated their potential support. The role of the concessional CTF financing is vital in bringing down the energy cost from the project to a reasonable level that would be acceptable to the Government. This IP update therefore proposes to confirm the CTF allocation to Tunisia within the MENA CSP IP in order to capitalize on this opportunity and help the Government of Tunisia take the decision of contributing to the promotion of Akarit project.

Results Framework

131. The Akarit project is meant to be a demonstration project for facilitating CSP development in Tunisia. The project will contribute to achieving the TSP target for renewable energy by 2030, since CSP technology is expected to be a major component if its investment cost is reduced to a comparable level of alternative solutions. The project is expected to produce 132,4 GWh each year, thus contributing to supplying part of the expected growth in the demand for electricity, while avoiding 2,180,715 t of CO_2 over its lifetime of 25 years. In the case of the Akarit project, direct employment by the project itself will be modest. However, the scaling-up of solar power in Tunisia will eventually create more direct jobs by 2030. Other benefits include creation of new business opportunities for the existing local manufacturing of medium and low voltage equipment and cables, in addition to the possible introduction/strengthening of new

industries for providing components of the solar fields for CSP plants such as the support steel structures, tracking systems, heat exchangers, and eventually the mirrors. A discussion is also taking place within the framework of COMELEC on adopting a regional strategy for developing RE technologies and the related impact on local industry.

Financing Plan

132. Various financing scenarios are being evaluated and a financing plan is expected to be adopted in the coming weeks at a workshop to be attended by the concerned stakeholders including the Ministry of Industry and Technology.

Table 12: Project Indicative Financing (US$ million)

Financing Source	Amount
CTF*	123
KfW	92
EIB	66
AFD	26
NIF	20
IBRD	20
AfDB	20
Total	**367**

***CTF allocation will be channeled in the equal proportion through AfDB and WB**

CSP/CPV Projects in Jordan (IFC)

Problem Statement

133. Guided by the 2010 Update on the CSP-MNA Investment Plan, Jordan and the two implementing MDBs—The World Bank and the International Finance Corporation—have had several discussions with the Government of Jordan (GoJ) on its indicative allocation of US$112 million for Jordan's concentrated solar power (CSP) program.

134. The GoJ has made a decision to request CTF Trust Fund Committee's support to allocate the US$112 million of CTF financing for Jordan to eligible private sector CSP and CPV generation projects. In parallel, the GoJ will take the lead in obtaining financing for other associated infrastructure for the Jordan's CSP program.

135. The Ministry of Energy and Mineral Resources (MEMR) is entrusted by the Renewable Energy and Energy Efficiency Law No (13) 2012 with the development of renewable energy sources for power generation through a direct proposal submission process. In May 2011, the GoJ, acting through MEMR, launched a Request for Expression of Interest (REOI) process for private sector renewable energy projects, under the new Renewable Energy Law. Following receipt of EOIs in July 2011, MEMR entered into five Memoranda of Understanding (MOUs) with private sector sponsors for the possible development of CSP projects. Moreover, MEMR also executed two MOUs for Concentrated Photovoltaic (CPV) projects in response to the REOI. It is proposed to confirm with the CTF TFC that CPV technology is considered a type of concentrated solar power (CSP) technology and therefore is eligible for CTF support. A technical note to support this presentation to the TFC will also be prepared shortly. An IFC led financing of a private sector CPV project in Jordan utilizing CTF resources for co-financing would be considered as a pilot for the entire MENA region.

136. The next step in the process is the submission of a direct proposal (both technical and financial), by the MOU holders. The CPV MOU holders are expected to submit their proposals to the government by the end of March 2013. The CSP MOU holders who are proposing solar thermal power plants (either parabolic trough or tower technology) are due to submit generation proposals by the end of 2013. IFC remains interested in supporting both CPV and CSP projects depending on their meeting IFC financing criteria, individual project finance needs, project readiness, and consistent with any CTF MNA Update approved by the CTF Trust Fund Committee. Following discussions with project developers, IFC estimates a prospective need to retain about US$50M of the US$112M. IFC has held extensive discussions with the government, along with the World Bank. IFC has also engaged in discussions with the EBRD, which has only recently become active in Jordan and was not a party to the original MENA CSP Scale-up Program. EBRD has also indicated an interest in working with private CSP developers on a best efforts basis to identify additional sources of concessional financing to achieve a financially viable project structure. Subject to additional funds being available, EBRD is prepared to act as a direct channel for CTF funds. If successful, further details will be provided in the next IP Update Update Update.

Implementation Readiness

137. **CPV/CSP Projects:** IFC aims to target and apply CTF funds to support 1-2 private sector CPV and CSP projects. IFC's RE program will seek to retain flexibility (in terms of approach, project selection, and application of CTF funds) in structuring the best way to accelerate the implementation of these renewable energy investments with minimum concessionality on a project-by-project basis. One of the key risks in the sector is that NEPCO (the national power utility) will not be able to accommodate all requests to connect selected projects to its Transmission Network due to existing network technical constraints in the short-term. However, NEPCO is working to address these constraints through network upgrade in the medium- and long-term. There are also uncertainties about the credit-worthiness of the Power Purchase Agreements (PPAs) due to fiscal indebtedness and the ability to secure long-term land leases for adequate land parcels from the Ma'an Development Company where a number of prospective CSP projects will be located. If MEMR is able to decide on the selection of one or both of the CPV projects, which is expected within the first half of 2013, IFC should be able to address these issues in the project development phase, and Program Proposals for the CPV project or projects will be able to be submitted to the Trust Fund Committee by the end of 2013. In the case of the CSP projects since the proposals are not due until [end of December 2013], it will likely not be possible to present them to the Trust Fund Committee before mid-2014.

Rationale for CTF Financing

138. **CPV/CSP Projects:** The estimated cost of CSP based power in Jordan is 19-24 US$ cents per kWh and CPV power is 17 US$ cents per kWh. In the case of CSP, the cost is at least 20% higher than the average cost of power in 2011 for NEPCO at 16 US$ cents per kWh and significantly higher than gas-fired and wind power for which the generation cost is about 7 US$ cents per kWh and 12 US$ cents per kWh respectively. Concessional financing from CTF is therefore necessary to help buy down the higher economic cost of both CSP and CPV. Moreover, the market remains relatively nascent for these technologies, and long-term financing remains difficult for private project developers to mobilize. CTF funds can be used to help support and overcome these financing gaps. Blended with other commercial financing, CTF funds can provide a concession to the overall financing package that will improve the risk-reward profile so that the project becomes attractive to private sector first movers who are prepared to be active in the Jordanian power market. The tables below assume that CPV is considered to be an eligible CSP technology for the CTF by the TFC and is deployed on a pilot project basis.

Results Framework

Results Indicator	**Target Value** (CTF Plan Endorsed November 2009)	**Target Value** (CTF Plan Update May 2013)
Co-financing of CTF funding (US$ million)	72	40-50

GHG Emissions Savings (tCO_2e/year)	n.a.	.TBD
RE Installed Capacity (MW)	n.a	TBD
CTF Cost Effectiveness (CTF US$/$tCO_2e$ reduction over 20 years)	n.a.	TBD

Financing Plan

Financing Source	**Amount** (US$ million)
CTF	40-50
IFC Financing	40-50
Other Private Sector [1]	120-150
Total	200-250

[1] Sponsor, commercial bank and other co-financing

Project Preparation Timetable

Milestone	**Date**
CTF TFC Approval (CPV project)	September 2013
MDB Board Approval (CPV project)	March 2014
TFC Approval (CSP project)	TBD*
MDB Board Approval (CSP project)	TBD*

*Timeline on CSP projects can only be made after the RFPs are shared with IFC which will be late in 2013/early 2014.

ANNEX II- VALUATION OF CSP PROJECTS

139. This Annex reviews the **costs and benefits of concentrated solar power (CSP) technologies**. Indeed Table 2 of section IV above provides evidence that the projects proposed in this investment plan do represent a fiscal burden for the Governments of the MENA region, by providing approximations of required annual Governments' subsidies (in US$ million per year). In most of the cases, these subsidies are calculated by multiplying the expected annual electricity production by the differential between the levelized cost of energy (LCOE) of the CSP project and an alternative generation possibility.[22]

140. This Annex explains (a) why the LCOE may only represent an approximation for comparing the economic attractiveness of different types of generation technologies, and then lays down some of the (b) energy benefits and (c) socioeconomic benefits that should also be considered when considering investments in CSP. Currently analytical work is underway to capture these benefits in the context of the MENA CSP IP.

(a) Financial Costs of CSP and Subsidy Needs

141. Unlike for conventional generation, **cost analysis for renewable energy sources technologies is not straightforward** to perform, as technologies usually present larger variability in investment, operation and maintenance costs due to a limited number of suppliers and great regional disparities. The CAPEX of CSP has the highest price variability among available generation technologies, followed by other renewable energy options such as small hydro, biomass, or wind offshore. The variability of conventional technologies as well as the one of PV and wind onshore is much smaller. However, for O&M costs, the variability for CSP is much closer to the ones observed in conventional technologies.

142. The **levelized cost of electricity (LCOE) represents the cost of generating electricity** (often expressed in US$ cents per kWh) and includes the initial capital, discount rate, as well as the costs of continuous operation and maintenance (including fuel). When the CSP LCOE is computed (taking into account concessional financing that may be part of the project) and it is then compared to the LCOE of the generation technology that the newly constructed CSP plant is replacing, one gets an amount in US$ c/kWh of subsidy that the Government – i.e. taxpayers - must provide. This figure multiplied by the overall production gives an amount of annual subsidies that the Government will need to provide during the lifetime of the plant. For example, for Ouarzazate I (160 MW), this figure was estimated at yearly US$ 60 million during project preparation, but went down to US$ 28 million after the signature of the construction contract (9 US Cents/kWh).

143. The LCOE is a useful tool because it represents the private cost for investors and it can be used to determine the level of financial support according to the cost born by investors. However, it **does not capture other costs and benefits associated with CSP**. If one was only

[22] This can be defined in several ways: (i) taking one of the national tariffs as reference, (i) taking the cost of generating with the most used generation during peak hours, (iii) the same as in (ii) but assuming no subsidies if that technology uses fossil fuels, and (iv) taking the contractual LCOE if it is the case of a PPP like in Ouarzazate.

to look at the CAPEX values, the incentives to invest in CSP would be limited, as these values are high because we are still at the top of the learning cost curve as there are still not many CSP power plants contracted around the world. The subsidy requirements should therefore be looked at with caution, as they do not consider some of the specific characteristics of CSP that will now be introduced.

(b) Energy Benefits

144. The LCOE approach treats all electricity generated as a homogeneous product. However, this fails to take account of the fact that **the value** (wholesale market price when a market exists) **of** electricity **supplied varies widely between the high and the low hourly prices** over the course of a typical day (peak, out of peak hours). According to experts, this difference can be up to four orders of magnitude.

145. Therefore, **whether a technology is dispatchable or intermittent can be of critical importance** when preparing decisions on generations' investments. The fact that CSP can incorporate thermal energy storage (TES) makes it a dispatchable technology, and gives it a clear comparative advantage with respect to wind or PV, as it can be dispatched at most moments of the day depending on the specific shape of the electrical demand. It follows that choosing between offers to supply wind or solar energy by choosing the suppliers with the lowest supply bids without regard to when the electricity will be supplied is likely to fail to lead to the selection of the highest value renewable electricity supply offers.

146. Aside from bringing dispatchability, **TES increases the plant´s capacity utilization factor**. Net energy injected into the grid with TES is proportional to the number of storage hours considered. Designing the optimum number of storage hours requires thorough cost-benefit analysis of increase in net production compared to the corresponding increase in CAPEX. This is another degree of freedom that CSP offers with respect to other renewable energy technologies.

147. **Among renewable energies, CSP with TES offers the best ancillary services**. In order to obtain a good functioning electricity transmission system, it is essential to allow the flow of alternating current (AC) power from multiple generators through the transmission network to be controlled (i.e. to match demand and generation). For this to be achieved, an adequate control of the frequency of the oscillations of the AC is required. There are three types of frequency control (some refer to very short term instabilities, and others to longer spans of time). Engineers refer to these controls as ancillary services (which also include other elements such as voltage control or blackstart). Since neither wind nor PV generation offer good ancillary services, it follows that in order to keep a transmission system stable, if one increases the proportion of generation without ancillary services heavily (e.g. expansion of wind and PV), the proportion of a generation technology with frequency control will be need to increase. To sum up, there are only 2 main ways to keep the stability of the system when introducing important amounts of wind and PV, and at the same time not increase the quantity of CO2 emissions: to increase the amount of CSP with TES in the system, or to increase the hydro one - which is often not available in many MENA countries.

148. **Although** they are difficult to quantify and introduce in a classical cost-benefit analysis framework, the three characteristics mentioned above are advantages of CSP with TES with respect to other renewable energy sources that have lower LCOEs.

(c) Socio-economic benefits

149. The **added value of expanding the solar industry** due to the installation of CSP plants should also be taken into account when deciding whether to make the strategic choice of betting on CSP. For example, a study jointly published by the WB and ESMAP in 2011 assessed that under an optimistic scenario of having 5 GW of CSP installed in selected countries of the MENA region by 2020 (as well as 2 GW worthy of export components), the total potential of local added value of CSP plants could reach close to 60% by 2025. The impact on the commercial balance can also be noticeable under optimistic CSP development scenarios.

150. In addition, **the effect on job creation** should also be considered - both construction jobs as well as operation and maintenance ones. The types of jobs created are usually classified in three categories: direct (those employed by project itself), indirect (those employed in supplying the inputs to the project), and induced (those employed to provide goods and services to meet consumption demands of additional directly and indirectly employed workers). Obviously the value of interest is the net creation of jobs, meaning that the creation of CSP jobs is compared to the jobs that would have been created if another generation technology had been used to satisfy the same electricity demand.

151. The **security of supply** is of paramount importance to any country's electricity development strategy. A clear advantage of CSP with respect to fossil fuels generation technologies is that its fuel, the sun, is provided for free. Under certain assumptions, one can conclude that each MW of CSP has the potential to bring between US$ 200,000 and 400,000 per year of fuel savings. However, this fact should already be captured in the calculations of the fossil fuel generation plant LCOE if appropriately done. However, in addition to fuel savings, diversification of sources is also perceived as key in increasing the security of supply. Quantifying this benefit is not an easy task, but it is straight forward to see that increasing CSP in an energy mix starting from a null level will inherently increase the diversification of the energy mix of any country of the region.

152. Further to the reduction on fuel consumption, another key benefit of developing CSP plants is the potential to **reduce the greenhouse gas emissions and other pollutants** to the atmosphere. In fact, a MW of CSP has the ability to abate in between 1,000 and 4,000 tons of CO2 per year depending on the hours of energy storage for the CSP considered. The substitution of conventional fossil fuel plants also lead to emission reduction of nitrous oxide (N2O), carbon monoxide (CO), volatile organic compounds (VOC), and other pollutants. The CO2 avoided could be translated into explicit financial gains if the CO2 markets were to regain momentum in the short to medium run.

(d) Next steps

153. Analytical work is currently being developed by the WB to **quantify some of the variables described above in the countries included in this investment plan**. This is done by calculating impacts of reaching self-imposed national targets for each country. Four types of technologies are considered in these national objectives: wind, solar PV, solar CSP, and solar CPV. For example, in the case of Morocco, these are its 2020 targets of having an installed capacity of 2000 MW of solar power (distributed in 5 power plants in Ouarzazate, Ain Bni Mathar, Foum Al Oued, Boujdour, and Sebkhat Tah) and 2,000 MW of wind power. The national targets of Tunisia, Egypt, and Jordan are also considered. The same categorization as above is being used, and some of the variables will also be calculated both at the project specific level – aside from the national target level.

154. First, the **costs and subsequent subsidies needs** of these projects are presented. These are computed both at the project level and at the national program level. The program cost is computed as the difference between the local power purchase agreement to reach the break-even point and the cost of a reference plant. Yearly costs and cumulative discounted costs are computed, as well as the connection and grid reinforcement costs.

155. Second, the **energy benefits** of the national renewable energy strategies targets are presented. Annual values from 2010 to 2020 are presented for the additional and cumulative capacity installed in MW for each of the four technologies, as well as the percentage of domestic demand covered by this generation. Annual fuel gains of baseload (GWh) and back-up/peak (MWh) are calculated, as well as gains linked to capacity reduction of conventional and of back-up/peak (in million US$). In addition, the reductions of base capacity installed by each type of 4 technologies (MW) are computed, as well as its increase in back-up capacity.

156. Finally, the **socioeconomic benefits** of those targets are discussed. The calculations undertaken include the following variables:

- value created by a better coverage of the hydrocarbons risk price – disaggregated by coal, oil, and gaz;
- average savings of modifications of the hydrocarbons balance - disaggregated by coal, oil, and gaz;
- impact on State budget, on commercial balance variation, on GDP (disaggregating it in i) direct and indirect added value created by local firms, ii) direct and indirect VAT collected, and iii) import taxes);
- net direct, indirect, and induced full-time jobs created per year (disaggregated in gross jobs creation and substitution effect);
- direct and indirect value added created by local firms (disaggregated in gross and substituted value added);
- additional imports of materials (disaggregated in additional and substituted imports);
- net fiscal revenues from renewable energies development (disaggregated in income tax, tax on firms, VAT, tax on imports, and impact of fiscal revenues on GDP).

ANNEX III – TECHNICAL ASSISTANCE

157. While project-based activities go some way in bringing down the barriers to the development of CSP in the MENA region, as has been argued on the previous two updates, these are not sufficient instruments in addressing these barriers. In addition, this Update is therefore proposing a technical assistance component, which proposes to (i) establish a network to exchange information among the countries; and (ii) provide a dedicated grant mechanism for companies in the region that are interested in engaging the supply chain in solar thermal technology.

158. The network is intended to work as a knowledge sharing platform, which among others could show-case the lessons of experience of the Moroccan Ouarzazate project, bring in international experience, and bring in experience from within the broader region such as Saudi Arabia's ambitious CSP program. Technical assistance an knowledge sharing would be provided through the following mechanisms:

- An internet platform with access to all partner countries on which information about the program's projects would be shared. It would serve both for pure knowledge exchange but also as a trouble-shooting mechanism, which would allow countries to share knowledge on implementation challenges they face.
- Targeted informational and training workshops, field visits, long-term on the job training with existing CSP projects, dedicated training workshops that would inform program participants about issues of joint interest. These could include as follows:

  a. Knowledge sharing on CSP projects design, implementation and operation,
  b. Networking among national/regional research and education centers
  c. Knowledge Sharing on developing local manufacturing of CSP equipment at the regional level in a coherent and consistent manner
  d. Designing and implementing legal and regulatory framework for developing CSP and renewable energy power trade
  e. Designing incentives, FIT and other mechanisms for promoting CSP/RE,
  f. Capacity building for attracting investors and mobilizing the required funding through appropriate packages for financing CSP projects

159. The grant mechanism would provide for development of business plans and start-up grants as well as capacity building and would be organized along the same principles as the "Development Market Place" initiatives of the World Bank.

160. The Development Marketplace is a competitive grant program that identifies and funds innovative, early stage development projects. The grant beneficiaries under a CSP-type

program would be entrepreneurs with projects that aim to get engaged in the manufacturing of parts for CSP in MENA, thereby creating jobs locally. Projects are identified using Development Marketplace competitions, whereby the most promising projects are selected for seed financing.

161. Applications go through rigorous, merit-based scrutiny by panels of development experts from inside and outside the World Bank who short-list a group of finalists from a pool of applications. The finalists are then brought together at a face-to-face Marketplace event in country locations to present their ideas to the public and participate in networking and knowledge sharing events. At the same time, a jury comprised of corporate executives, investors and funders, development professionals and other experts meets with the finalist teams and collectively decides which projects merit Development Marketplace funding. With the proposed envelope it is expected that between 10-14 start-up grants could be administered.

162. A table below provides an aggregate cost breakdown by component. The costs presented only show the costs directly covered by the program. It is expected that country participants will contribute to this program.

Component	**Costs (US$ million)**
Knowledge Sharing Platform	2
• Internet interface	0.8
• Workshops/training	1.2
Development Market Place	8
• Platform costs	1
• Grants in support of business ventures	7
Total Costs	10