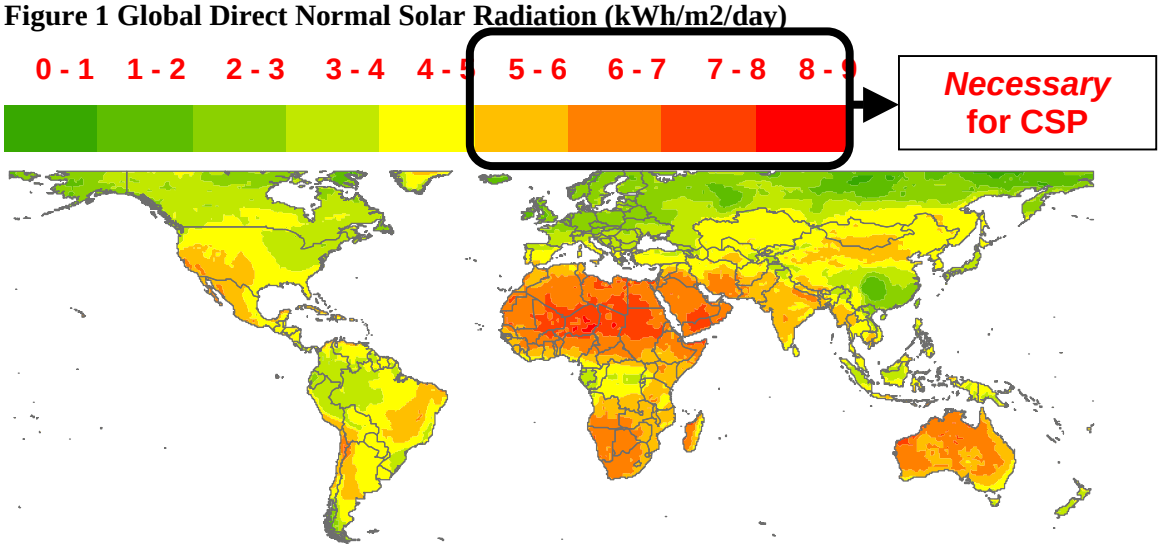
MENA Region
Regional Concentrating Solar Power (CSP) Scale-up Initiative
Concept Note

Introduction

Solar energy represents an enormous resource that is particularly large in many of the MENA countries (see figure 1). Solar thermal power generation using concentrating collectors, commonly referred to as concentrating solar power (CSP), involves the conversion of solar radiation to thermal energy, which is then used to run a conventional power system. Solar thermal power generation using concentrating solar collectors can integrate well with conventional power generation plants, as well as with advanced emerging technologies, and therefore provides significant opportunities for grid-connected renewable energy. At the same time, the region's final consumption of energy is growing faster than that of any other region in the world and renewable energy resources also need to be developed to meet the growing demand.

Figure 1 Global Direct Normal Solar Radiation (kWh/m2/day)



Source: D. Wheeler et al, "World Bank Power Projects: Crossroads on Renewable Energy", Presentation at the World Bank, April 14, 2008

The first power plants utilizing CSP were built in the U.S. After a period of brisk development during the 1980s, there was a period of stagnation in the 1990s due to reduced government support for the CSP program in the U.S. There is resurgence of interest in recent times in CSP given the increasing importance of climate change and the rising fossil fuel prices. In Europe, particularly in Spain, the industry is expected to add 170 MW of CSP capacity during 2008. In the U.S, there are several upcoming projects (at least 8 projects with a total capacity of about 3500 MW are in the pipeline) but apart from the 64 MW solar one project in Boulder city, Nevada which became operational in summer of 2007 the remaining developments are expected to be implemented only in 2010 or later.

However, major market barriers are preventing the development of a global CSP industry and uncertainty surrounds many of the planned CSP projects. There is considerable uncertainty as to how many of the planned facilities will actually be developed due to technical, regulatory and planning issues which often lead to delays and cost overruns. Barriers also include, high capital costs, technical risks, financial risks, and competing fuels whose full costs are not accounted for (subsidies, environmental externalities etc). Additional barriers add to the difficulties in many developing countries. These include uncertain policies, inadequate legal frameworks, lack of infrastructure, and lack of regional power sharing agreements and networks. Given the uncertainties of future business, the supply industries have operated on the basis of serving one-off customers instead of setting up complete R&D, large-scale manufacturing, and operations and maintenance programs. The result is very high cost, underexploited economies of scale and limited investment in R&D leading to technology development and innovation.

Background

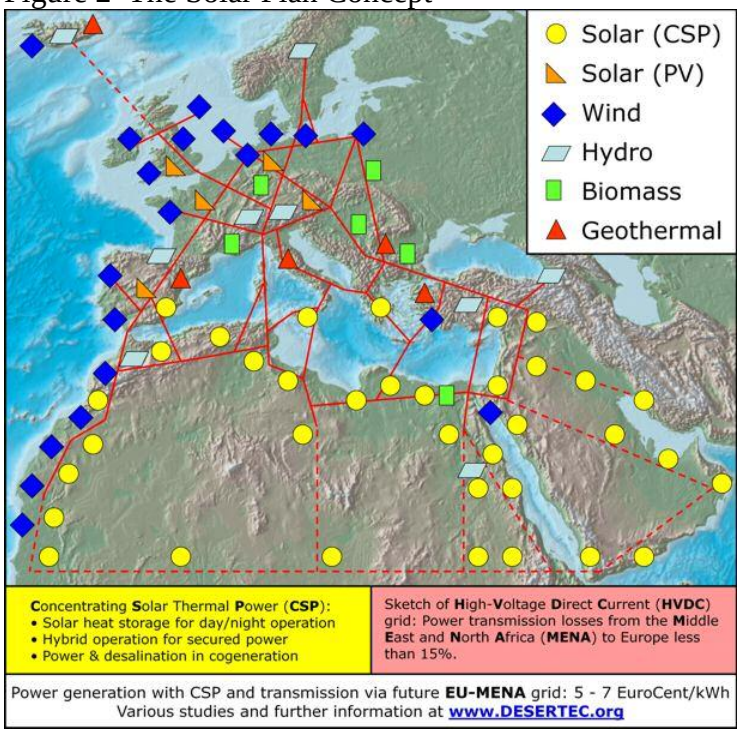
In the MENA region there is an increasing interest in this technology with projects under implementation in Morocco, Egypt and Algeria. The projects under implementation in Algeria, Morocco and Egypt are utilizing the Integrated Solar Combined Cycle (ISCC) configuration where energy from a solar field is combined with a conventional combined cycle gas turbine plant. Projects in Egypt and Morocco are receiving Bank/GEF support and have solar field capacities in the range of 20 MW each. These plants are expected to be commissioned in 2010.

CSP technology could receive a further stimulus through recent developments in the Mediterranean region. The European council approved the principle of a Union for Mediterranean and included several proposals to enhance cooperation among the countries in the region under what is called "Barcelona Process: Union for the Mediterranean." A regional Solar Plan has been proposed as one of the six concrete project level initiatives under this partnership. The key element is a new common framework for development of 20 GW of new solar and other renewable energy capacity by 2020 in the countries around the Mediterranean. The solar plan is also consistent with the Arab World Initiative objective of supporting regional integration, a dimension that was echoed by participants of the February 22, 2008 high level round table on North Africa sustainable energy development organized by the World Bank.

Other environmentally friendly options such as energy efficiency and avoided gas flaring could be included. A similar proposal was put forth by the Trans-Mediterranean Renewable Energy Cooperation (TREC). The solar plan envisages a network linking North Africa and Europe that will tap the vast solar and wind resources of North Africa to feed clean energy to Africa and Europe (Figure 3).[1]

[1] From the White Book "Clean Power from Deserts" to an Apollo-Programme DESERTEC for Energy, Water and Climate Security. Elements of an action program proposed by The Club of Rome/TREC. November 2007

Figure 2 The Solar Plan Concept



There is a strong rationale for bank participation in this initiative due to experience in implementing CSP projects in MENA and more importantly, the ability to catalyze financing of different sources and types for promoting large scale renewable energy technologies.

The Regional CSP Initiative

The proposed transformational approach to overcome market barriers is to offer the industry a credible commitment to developing a large scale multi-country portfolio of projects on the assumption that such aggregation will induce the employment of mass production techniques that will lower costs and improve performance. The approach could comprise of the following elements:

- A framework for market aggregation which could take the form of a CSP Market Transformation Consortium that would have as partner organizations such as interested utilities in both developing and developed countries venture capital companies and manufacturers. The purpose of this consortium is to develop a portfolio of projects across a number of eligible countries of about 1 -5 GW to be implemented within a 10 year period. The development of this capacity could be offered as a portfolio or package using a standardized procurement approach to an industry consortium/contractor based on providing electricity at, for example, a levelized cost of 7.5 UScents/kWh across the whole portfolio. The consortium that requires the lowest subsidy for the maximum installed capacity committed would be awarded the contract.

- An incremental cost funding facility tied to the CSP Market Transformation Consortium which will administer the required subsidies, made available through concessional financing sources.
- A partial risk mitigation facility to insure utilities that will contract to buy power from the CSP plants against any higher cost differentials in case marginal electricity supply costs drop below the levelized cost price offered by the CSP contractor. Alternatively, this facility could cover the premiums for commercial insurance as well as technical insurance.
- Technical assistance to support country dialogue and prepare the international cooperation agreements, prepare the feasibility and detailed engineering studies, develop bidding and contracting packages and power purchase agreements, establish the regulatory frameworks, support developing the regional power grids needed to evacuate power to the load centers, etc.
- Developing and applying the already approved programmatic CDM approach, or through the European Trading System or the voluntary carbon markets to leverage carbon financing for CSP programs.

Objectives

The main objective of the proposed TA is to plan and undertake preparatory work for the implementation of the regional CSP initiative.

Methodology

The preparation of such a complex program would involve a number of steps involving different facets of program development (see Annex 1 for an initial list). A phased approach would be appropriate considering the nature of this initiative.

Phase 1 – Upstream Analysis and Consultations: The initial work would involve validation of resources based on topographical and infrastructure characteristics; assessment of suitable transmission upgrade, extension and interconnection options and technology assessments. The technical assessment will be largely be based on existing work undertaken by agencies such as DESERTEC. Phase 1 will specifically examine two options for the regional CSP program including (a) full utilization of the energy within the region and (b) exporting part of the energy to for utilization in Europe to meet the EU identify a suitable policy framework, initiate discussions at the country level to build ownership for the concept. Initial industry consultations regarding the implementation approach also need to be undertaken at this stage.

Phase 2- Master Plan Preparation: Establishment of the necessary institutional structure and secretariat for the management of the solar plan implementation with required resources. Legal and regulatory framework for long term power purchase agreements (PPA) between EU and MENA countries including energy sharing and cost-sharing arrangements. Business models and financing approaches developed for implementation of projects. Detailed implementation plan for development of renewable energy resources

under the solar plan including sequencing of sites and associated infrastructure development.

Phase 3 - Pre-Implementation: Feasibility studies completed for construction of the projects in a pipeline of solar power projects identified in phase 2 HVDC/other transmission interconnections with full environmental and social assessments and public consultations; Feasibility studies for individual projects undertaken including environmental and social assessments and consultations as per the detailed implementation plan.

In order to strengthen the program preparation, there could be implementation of renewable energy pilot projects that can be implemented with existing cross-border agreements and interconnections in order to learn about policy and other barriers to be overcome for the full program.

The RFP/procurement process would start during phase 2 or phase 3 depending on the business models to be pursued. *For example*, transmission infrastructure to be financed by public resources would follow an approach different from project implementation that would be financed largely through commercial financing.

Outputs

The main outputs for Phase 1 would be

(1) Phase 1 report and a case study for WDR 2010
(2) Workshop for upstream consultation with stakeholders to get feedback on all aspects of the program including financing and implementation issues

Outputs for Phase 2 would include

(1) Detailed implementation plan including institutional structure and sequencing of investments to reach 1 -5 GW CSP installed capacity by 2020.
(2) Financing plan and business models

Phase 3 outputs would be

(1) Detailed feasibility studies, bid documents; and
(2) Evaluation reports of any pilot projects implemented.

Time Table

PCN Review	September 2008
Procurement of Consultants	October-November 2008
Workshop	April 2009
Final Phase 1 report	May 2009

Phase 2 completion	March 2010
Phase 3 completion	May 2011

Team

The task team will work in coordination with the assigned consultant. The team members are:

Name	**Responsibility**
Chandra Govindarajalu	Senior Energy Specialist-TTL
Husam Beides	Senior Energy Specialist
Mudit Narain	Energy Analyst
Pierre Audinet	Senior Energy Specialist

Full Program Budget

Activity	**ESMAP**	**Co-Financing BB**	**Donors**	**Total cost**
Phase 1	$ 80,000	$ 50,000	$ 0	$ 130,000
Phase 2	$ 150,000 (proposed)	$ 50,000	$ 2,000,000*	$ 2,200,000
Phase 3	$ 0	$ 150,000	$ 10,000,000**	$ 10,150,000
Total	$ 230,000	$ 225,000	$ 12,000,000	$ 12,455,000

***** MNA regional TA program and CTF preparation grant
****** Donors/private sector

The consultation work for Phase 1 would be financed by ESMAP in addition to a co-financing from Bank Budget to cover the task team's supervision costs:

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Activity	**ESMAP**	**Co-Financing (Bank Budget)**	**Total Cost**
Task Team Supervision Costs	$12,000	$ 25,000	$37,000
Consulting Services – (fees, travel, per diem)	$68,000	$ 25,000	$ 93,000
Total Financing/Costs	**$80,000**	**$50,000**	**$130,000**

Annex 1: Range of Issues related to Regional CSP Initiative

Technical Issues	**Policy Issues**	**Implementation Issues**	**Financing Issues**	**Political Issues**
• Identification of areas suitable for implementation of projects based on adequate solar resource availability as suitable gradient, water availability, network and road access. • Identification of the transmission expansion needs within each country • Identification of the transmission interconnection needs between countries in the region and with Europe.	• Suitable EU policies for importing green power from MENA countries (viable tariffs, off take arrangements, penalties etc.) • Policy on the proportion of power to be utilized for meeting energy needs in MENA countries • Policy on the eligible CSP technologies	• Overall institutional responsibility • Engagement of Client countries • Engagement of EU countries and Donors • Overall master plan development • Responsibility for implementation of the master plan • Mechanism for payments and resolution of disputes • Business models for project implementation • Procurement planning	• Source of financing for preparatory work • Financing for Transmission lines within countries • Funding of Transmission interconnections • Estimation of subsidy requirements • Power plant financing plan model	• Political commitment required within countries • Cost sharing arrangements for infrastructure • Energy sharing
Environment and Social Safeguards	**Industry Issues**			

• Need for regional level studies in addition to project level Env and Social assessments • Depending on the technologies to be included, the scope of this work may change.	• Solar thermal industry needs to be engaged at an early stage. • Industry assessmen to ensure that they will be able to respond			