A Strategy for Water and Energy Security in MENA and Europe

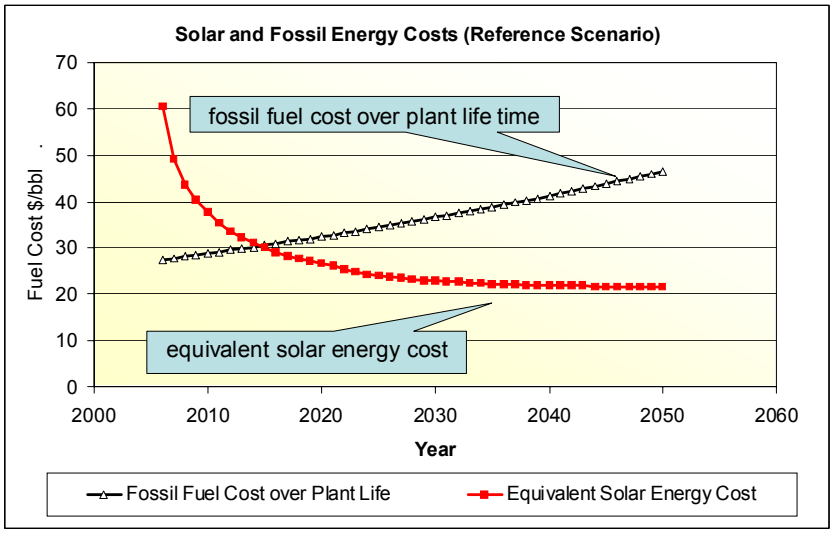
Proposal of the Trans-Mediterranean Renewable Energy Cooperation (TREC) and the Club of Rome

Security of water and energy is one of the most pressing challenges of the coming decades, as pointed out by HRH Prince El Hassan bin Talal of Jordan in his proposal for a "Community of Water and Energy in the Arc of Crisis" in August 2001. The growth of economy and population in MENA will inevitably lead to a growing demand of potable water and energy, and within the next 20 years, sustainable solutions must be found that do not endanger economic development, natural environment or social stability of the region. Already today, many cities withdraw water far beyond their renewable capacities, and in some cases their water reserves may run dry within a decade.

There is plenty of water available in the sea. However, to make it useful for human needs, it must be desalted, which requires investment in desalination plants and in their energy sources. The latter ones must be inexhaustible and inexpensive.

A very efficient way to tackle the water and energy problems at the same time is the method of combined generation of heat and power, using e.g. thermal multi-effect-desalination plants coupled to steam cycle power stations. However, only countries with large domestic fossil fuel resources have been able to afford such plants. Other countries fear an increased dependency on fossil fuel that may become more expensive or even scarce. Moreover, an increased use of fuels for desalination worldwide would accelerate carbon emissions, accelerate global climate change and thus affect the delicate natural water resources in MENA.

Concentrating solar thermal collectors provide a technically and economically viable solution to that problem. By concentrating the sunlight with mirrors, heat can be generated to produce steam for co-generating electricity and desalted water. This will considerably reduce the dependency on the costs and availability of fossil fuels. With 354 MW of installed capacity, concentrating solar power plants have proven technical viability in almost 20 years of continued operation. Most MENA countries have solar radiation intensities equivalent to the energy of 1- 2 million barrels of fuel oil per year on every square kilometre of arid land. A solar power plant with 50 MW capacity, and with a concentrating collector covering one square kilometre of land, can produce about 300 000 MWh of electricity plus 12 million cubic meters of desalted water per year, without any emission of carbon dioxide or other pollutants.



Moreover, solar energy has the potential to become cheaper than fossil fuels, if the production volumes of the solar collectors are increased and if technology development is continued. However, there is a conflict between this long-term least cost option for power and water, and the least cost approach of present project development. Within the Reference Scenario[1] of cost evolution shown in the figure at right, solar energy will be initially more expensive, but new solar plants will become cheaper every year, while fuel costs will

[1] For data on the Reference Scenario and on the Optimized Scenario please refer to the table on page 2 and to the report.

slowly increase. Under the reference conditions assumed in this scenario, and if capacity expansion starts now, new solar plants build in 2015 would produce electricity and water at the same cost as plants using fuel. Plants installed afterwards would be cheaper than plants powered by fuel. After 2015, parts of solar electricity could be exported to Europe, thus tackling water and energy security in MENA and the European efforts of reducing carbon emissions in "co-generation".

Period	Comment	Capacity	Investment US$	Support US$	Cost Level Achieved for Power & Water *
2006 – 2010	Technology Transfer Phase	355 MW, 118 Mm³/y	1.3 billion	290 or soft loan	3.8 – 6.8 ct/kWh 75 – 90 ct/m³
2010 – 2015	Technology Establishment Phase	2100 MW, 700 Mm³/y	7.4 billion	370 or soft loan	3 – 6 ct/kWh 60 – 90 ct/m³
until 2050	Long Term Perspective	450 GW, 150 billion m³/y	2100 billion		3 – 5 ct/kWh 5 – 65 ct/m³

* Variation between Reference Scenario (9 % Interest Rate, 20 Years Capital Return Period, 3 $/ton emission credits) and Optimized Conditions Scenario (4 % Interest Rate, 40 Years Project Life, 10 $/ton emission credits)

The table above illustrates a scenario of capacity expansion. Preferential financing during the initial phase would be required to achieve a long-term least cost solution for power and water. Funding should be provided by all beneficiaries of this development. They may form an international team for water and power security and within this frame, establish attractive conditions of finance for the plants required. Initial support may be provided as grants. Optimized conditions including soft loans and carbon trading could alternatively reduce costs. Another important instrument for cost reduction is the assessment of best sites by advanced methods like those applied in the UNEP programme for Solar and Wind Energy Resource Assessment (SWERA). Long term purchase agreements for water and power guarantied by national and international development banks will also have a cost reducing effect, as they will allow investors to reduce their usual surcharges for risks on interest rates.

Plants implemented under optimized conditions[1] would initially produce power and water at 5 ct/kWh and 75 ct/m³. Solar plants build in 2030 could provide power at 3.5 ct/kWh and water at less than 10 ct/m³. Under the same financing conditions, fuel plants would generate electricity and water at initial 5 ct/kWh and 75 ct/m³, with an increasing trend due to fuel cost escalation.

The concentrating solar power capacities proposed here coincide with the expected deficits of many cities in the MENA region. E.g. the water table in Sana'a is falling 6 meters every year, with an estimated annual water deficit of 300 to 500 million m³. A solar power project to solve the water and energy problem of a city like Sana'a, funded by international stakeholders and donors, would at the same time save a unique world heritage, introduce a sustainable and affordable solution for water and energy security in MENA, and establish a powerful instrument to combat global climate change. At the same time, it would lay the foundation for a close cooperation and economic interrelation of MENA and Europe. Therefore, it could be named a "World Sustainability Project".

In the MENAREC conference in Sana'a, the Trans-Mediterranean Renewable Energy Cooperation proposes to form a "Strategy Team" from MENA and Europe to formulate the details of implementation of such a project and to prepare for the initiation of a community of water and energy security in the frame of an integrated EUMENA sustainability region.

Within the MED-CSP study coordinated by the German Aerospace Center (DLR) and sponsored by the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), an information basis for the expansion of concentrating solar power is gathered and evaluated for the Mediterranean region since January 2004. Interested experts from MENA countries are invited to provide demand side information of their countries as well as to formulate key questions that from the point of view of MENA should be answered by that study.