UNITED NATIONS
ECONOMIC COMMISSION FOR AFRICA
Office for North Africa

Study on innovative financing mechanisms for renewable energy projects in North Africa

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Document prepared by Rafik Missaoui & Sami Marrouki.

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List of acronyms

ADEREE	Agence de Développement des Energies Renouvelables et de l'Efficacité Energétique
AFD	French Development Agency
ANME	Agence Nationale pour la Maîtrise de l'Energie / National Agency for Energy Management
APRUE	Agency for the Promotion and Rationalization of energy use
IEA	International Energy Agency
ADB	African Development Bank
EIB	European Investment Bank
WB	World Bank
BOOT	Built Own Operate and Transfer
Dh	Dirham
WSH	Water Solar Heater
UNFCCC	United Nations Framework Convention on Climate Change
CSP	Concentrated Solar Power Plant
EGYSOL	Italian Cooperation Programme for the development of the use of solar water heaters in the hotel sector
RE	Renewable energy
FIT	Feed in tariff
FNME	National Fund for Energy Conservation
FOGEER	Fonds de Garantie de l'Efficacité Energétique et des Energies Renouvelables Guarantee Fund for Energy Efficiency and Renewable Energy
GWh	Gigawatthour
KfW	Development Dutch Bank
Kgoe	Kilogram of oil equivalent
ktep	Thousand tons of oil equivalent
kWh	Kilo Watthour
CDM	Clean Development Mechanism
MEDREC	Mediterranean Renewable Energy Centre
MEDREP	Mediterranean Renewable Energy Program
MRV	Measurement, Reporting and Verification
MASEN	Moroccan Solar Energy Agency
Mtoe	Million tons of oil equivalent
MW	Megawatt
MWp	Megawatt peak
MWh	Megawatthour
NAMA	Nationally Appropriate Mitigation Action
NEAL	New Energy for Algeria
ONE	Office National d'Electricité / National Company for Electricity
UNDP	United Nations Development Programme
PV	Photovoltaïc
SIE	Société d'Investissement Energétique / Energy Investment Company
SONELGAZ	National Company for Electricity and Gas
STEG	Tunisian Company for Electricity and Gas
TND	Tunisian Dinar (~0,5 €)
TCO2e	Ton of CO2 equivalent
Toe	Ton oil equivalent pétrole

I. Introduction

The energy mixes of African countries are progressively including renewable energy contributions, which have significantly increased, given the technological maturity and advances in recent years. However, the development of renewable energies requires the implementation of coherent institutional, regulatory and incentive frameworks and involves significant funding due to the additional costs of the required initial capital investment for the technology (including wind power, solar thermal and photovoltaic). The conventional electricity subsidy and the scale of investment reflect the high production costs of renewable electricity for the economy and consumers.

The development of renewable energy is also dependent on the ability of countries to formulate and implement projects and operate facilities, which are often regarded as a key element of the quality and sustainability of results.

The continuously confirmed rise of oil prices since 2005 makes the use of renewable energy more competitive in comparison with conventional technologies for electricity generation. Thanks to economies of scale, and technological maturity and advances, confirmed and accelerated global trend for the decline in production costs of renewable energy, are beginning to be observed, particularly for wind, PV and CSP, which has resulted in a significant increase in installed generation capacity in recent years. However, these advances have often been accompanied by funding mechanisms put in place in consideration of the country-specific conditions (including feed in tariffs, investment aids and tax benefits).

Access to international resources is increasing and improving, taking into account the consideration of RE by the countries in their energy policy and the gradually marked interest of financial institutions (e.g. World Bank, ADB, AFD, EIB, KFW, German, Italian and Spanish cooperation...) for the development of this new area in the world and in North Africa in particular. The opportunities offered by different funds and the existing mechanisms should be utilized. The carbon finance issued from the Clean Development Mechanism (CDM), although showing slight progress in the region is still poorly used in relation to existing opportunities. NAMAs: abbreviation for "Nationally Appropriate Mitigation Actions" and the NMM: abbreviation for "New Market Mechanisms" should provide a framework for the future development of renewable energy with a view to contribute to fight climate change.

In this context, it is important that countries be able to implement transparent incentive frameworks to achieve the necessary visibility and attract private operators to invest in the sector. For this purpose, the energy pricing issues (essential to create visibility and encourage private sector investments) and the reduction of hydrocarbons subsidies should be studied in consideration of sociopolitical specificities and constraints of the countries.

This report describes the current situation and prospects of the funding mechanisms for renewable energies in North Africa. It consists of three main parts:

- International and regional background
- Inventory of RE in the region
- Prospects of RE in the region
- Funding mechanisms and incentives specific to RE

II. International and regional background

1. Energy in the world

1.1. The need for an energy transition

Global consumption of fossil fuels and rising emissions

World consumption of primary energy in 2010 amounted to 12.8 billion tons of oil equivalent (toe). It consisted up to 87% of stock energy sources (oil, coal, fossil gas, uranium), raw materials extracted from the earth's crust. Fossil sources accounted for 81% and uranium for 6% (the energy value of the heat generated in the reactors of nuclear power plants). Biomass consumption represents 10% and other renewable energy sources 3% (HESG: hydro, wind, solar, geothermal), most of which is devoted to the generation of electricity (heat from solar water heaters, as well as the directly used geothermal heat, are included but very low).

During the last twenty years, global consumption of primary energy has increased by a factor of 1.45, mainly from fossil fuels.

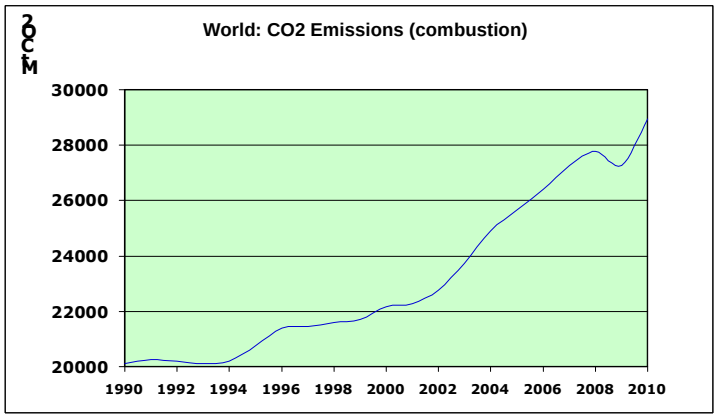


Diagram 1: Evolution of global CO2 emissions from combustion
(Source: Enerdata, 2012)

Consistent with this increase in primary energy consumption, from fossil fuels and especially coal during the last decade, carbon dioxide (CO2) emissions, the main greenhouse gas, due to its combustion, after a brief period of stabilization in the early 1990s (mainly due to the economic collapse of the former USSR), have steadily increased almost linearly from 1994 to 2010.

Increasingly strict energy constraints

Energy consumption reached 1.88 toe per capita in 2010 as against 1.67 in 1990. This average masks the reality of inequality between countries, especially between rich and poor countries. In 2008, primary energy consumption related to number of inhabitants was 7.5 toe for the US, 3.6 toe for the EU, 1.6 toe for China and 0.5 toe for India and sub-Saharan Africa. Rich countries themselves are experiencing fuel poverty in low-income households.

Global energy consumption is subject to multiple constraints:

- ✓ Limited reserves of stock energies: based on the current annual consumption, there are reserves for two to three centuries of coal but a few decades for oil, of half century or a little more for natural gas, and few decades for uranium.

- ✓ Geopolitical constraint: the largest oil reserves are in the Middle East, a fragile area, coveted and subject to rivalries of the great powers which could even lead to conflict.

- ✓ Damage to the environment, health and human life: pollution of air and water, serious accidents (oil spills, nuclear disasters, explosions in coal mines...), greenhouse gases emissions (carbon dioxide, methane), radioactive waste. Not to mention the complicity and compromise with questionable, even abhorrent regimes to procure energy commodities, which are the engines but also the drugs of a civilization too dependent and wasteful of energy.

It is perfectly legitimate and desirable for the whole of humanity that emerging and poor countries are developing to meet the needs of their populations. With China in the lead, this development is currently reproducing, under strong constraints, the type of civilization and energy system of the richest countries. These countries (Australia, Canada, US, European Union of 15 countries, Japan and New Zealand) represent 13% of the world population and 40% of global consumption of primary energy and their average annual consumption per capita is 5.3 tep.

What will happen if the rest of the world aspires to gradually reach the same level of consumption? Even assuming that the rich countries stabilize their own consumption, we will arrive somewhere in the 21st century, with a population of about 9 billion, each consuming 5.3 toe, be it a global consumption of 48 billion toe. In view of the 12 billion of today and the constraints that we already know, this is impossible: we would need four Earths to achieve it!

Since the beginning of the industrial revolution, energy systems have been designed and developed on the basis of the energy supply following the principle of constantly growing energy, considered essential to support economic growth.

The need for a new energy paradigm

The new energy paradigm is based on the fact that it is possible, by acting on consumption factors, to obtain energy services satisfaction (comfort, movement and production) with much lower energy consumption. Actions on demand thus become at least as important as actions on supply: bioclimatic building, energy renovation of existing buildings, more efficient heat production, the development of soft transport, public transport and train, more efficient electronic and audiovisual appliances, more efficient electrical equipment, etc.

The experience in Western European countries as well as recent studies of the IEA (International Energy Agency) and the IPCC (Intergovernmental Panel on Climate Change) and many national and international studies show that it is possible to significantly reduce energy consumption in industrialized countries and gradually replace the stock energy sources by energy flows which could cover all the needs on the horizon of half a century.

The rich countries can and should rapidly reduce their energy consumption by energy restraint and efficiency, and increasingly ensure it from renewable energy flows. Emerging and developing countries will then be able to increase their consumption on the basis of this more restrained and more effective model, the supply side of which will also be based on an increased use of energy flows. Stabilizing the temperature to a +2° C increase would require the efforts of industrialized countries but also the adherence of developing countries through new mechanisms that take the place of the flexibility mechanisms of the Kyoto Protocol (KP).

The energy transition is not only about technical and economic aspects, or about behavior, but more deeply about the design of energy systems itself. The centralized and pyramidal system will give way to an energy saving where the local, at the territorial level, becomes predominant as it is everywhere (rich and poor countries, urban and rural areas) that it is possible to develop energy saving and renewable energy. And it is also in this local application of the two approaches carefully interwoven and complementary that the true energy transition will be achieved, which will also be social and political. From a pyramid system from producer to consumer (who has to pay his bill), we move to a system built around the responsible citizen, the consumer - producer, a major energy transition actor, substituting a horizontal and interactive network for the hierarchical network of the traditional paradigm.

The "Nationally Appropriate Mitigation Actions" or "NAMAs" or more generally the new carbon market mechanisms "NMM" are the key instruments to support the expected energy transition. These instruments require the industrialized countries to support the commitment of developing countries in reducing their emissions of greenhouse gases (GHG), particularly through the implementation of appropriate mitigation actions at the national level.

Electricity generation: a priority sector of the energy transition

Approximately 40% of the world consumption of primary energy is devoted to the production of electricity. While at the level of primary energy, apart from biomass, the renewable energy contribution would appear to be relatively low, it is not the same for electricity generation. The production of electricity from renewable sources was, in fact, in 2010, 19% of the total world production, significantly more than the production from nuclear (13%) or from the oil (5%) and close to that from fossil gas, but still well below that from coal (41%).

The world's electricity generation increased by a factor of 1.8 from 1990 to 2010. With the exception of petroleum products, all sources increased at different rates: i) near stabilization of nuclear in the second decade, ii) strong increase of coal, particularly in the same decade, iii) steady increase in gas and a slower pace for hydroelectric, iv) significant increase of renewable energy sources other than hydro power (ESGB: wind power, solar, geothermal, biomass), especially after 2000.

From a review and analysis of the production of electricity from renewable sources and the role of this production in total net electricity production in countries with significant experience in the development of RE, excluding hydro, it is possible to draw a rough comparison and useful lessons[1] in guiding our thinking in the context of this study and providing a benchmark for the countries of the region:

1. The European Union countries are the most advanced, especially because of the European targets (three times 20), but not entirely.

   It is interesting to compare France and Germany. In 1990, the generation of electricity from renewable sources in both countries was provided by hydroelectric, about 25 TWh in Germany and 65 TWh in France. Twenty years later, the level of generation from hydropower is the same as in 1990 for each country, but in 2011 Germany has an original generation of 111 TWh of WSGB origin and France of 20 TWh. And this is the case even though the potential sources are higher in France.

2. Among European countries, Portugal is the one that has the highest share of renewable electricity generation, almost 50%, half hydropower and half WSGB. It is followed by Denmark, Spain, Italy and Germany.
3. In total production, Germany is in the lead for photovoltaic, which reached 20 TWh in 2011, representing approximately 18% of all renewable sources.
4. If we now look at the share of production from non-hydro renewable energy sources, it is Denmark which is in the lead at 35%, followed by Portugal (25%), Germany (19.5%), Spain (19%) and Italy (14%). The other countries are far behind.
5. In per capita production, Denmark is far ahead for wind power (1420 kWh in 2010), followed by Spain, Portugal and Germany. For solar, Germany is in the lead (244 kWh), followed by Spain and Italy.
6. We find the same type of contrast between the emerging countries of the southern and eastern Mediterranean. Turkey and Morocco have a significant share of electricity from renewables. Hydropower is in the first place, because of the scale of the resource, with also a significant startup in wind. On the other hand, in Tunisia, the production of renewable energy is very low, due to the lack of resources for hydropower but with significant and still untapped potential for wind and photovoltaic.
7. A comparison between major three countries, China, USA and India, shows that in China and India the share of hydropower is significant, around 17% (with an absolute value much higher in China), and we find that wind generation in the United States was the largest in the world (120 TWh in 2011). What is interesting is that wind generation in

[1] As of the availability of data, we produce those of 2011, or of 2010.

China is half of that of the United States and exceeds that of Germany, while reaching only 3% in India.

This comparison well illustrates that the issue of resources is obviously important in the development of electricity generation from renewable sources, particularly hydropower, geothermal and biomass. But there are still very significant differences between developing countries where resources are comparable. This shows that political attitudes to strategy and objectives, legislation and regulations, industrial policy and the terms of investments financing play an important role in creating and sustaining a dynamic development.

1.2. Global prospects for renewable energy

According to current policies scenario of the IEA **,** global demand for primary energy will increase by 30% over the period 2010-2035, with China and India accounting for half of the growth. The largest share increase would come from China and other developing countries, as shown in the following graph:

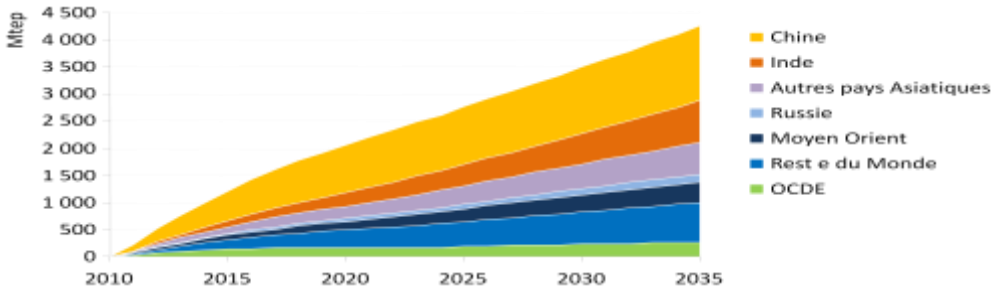


DIAGRAM 2: PROSPECT OF THE GLOBAL DEMAND FOR PRIMARY ENERGY ACCORDING TO THE SCENARIO OF CURRENT POLICIES

(Source: IEA, 2011)

Renewables and gas account for about two-thirds of the additional energy demand over the period 2010-2035.

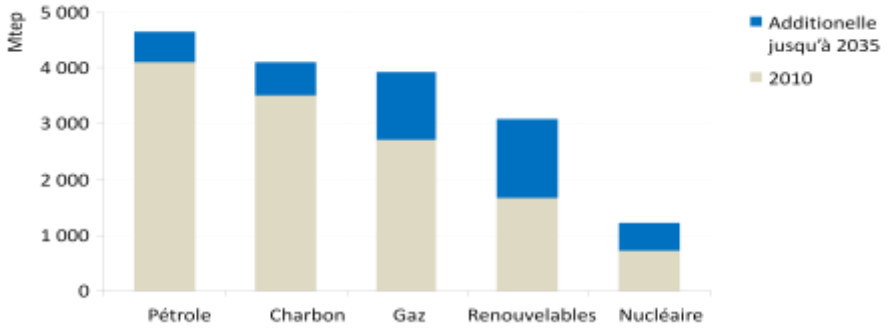


DIAGRAM 3: Prospect of global demand for primary energy by energy type

(Source: IEA, 2011)

Under the 450 Scenario of the IEA which should stabilize the increase in global temperature below 2°C by 2100, energy conservation represents 77% of the mitigation potential, 21% of which for renewable energy, as shown in the following graph:

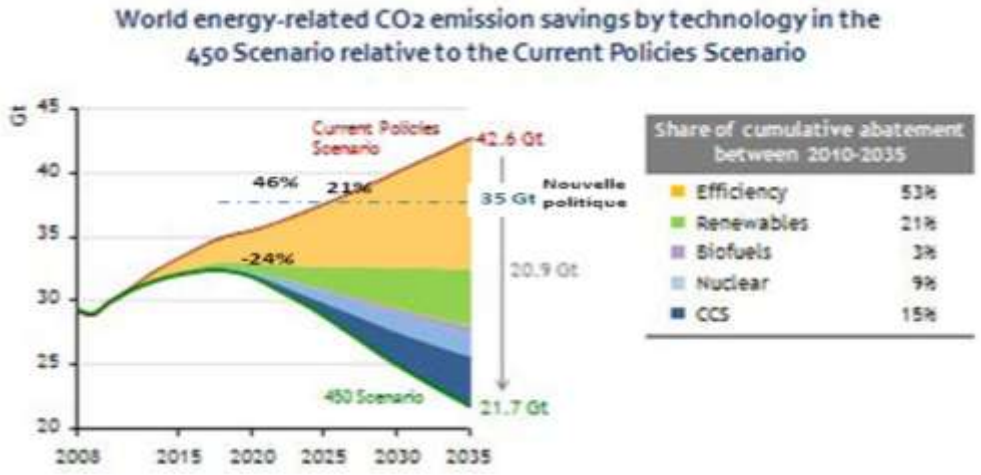


Diagram 4: Potential to reduce global CO2 emissions by type of measures according to the 450 Scenario
(Source: IEA, 2011)

This shows the importance of RE in the energy transition expected for fight global warming efficiently.

2. Energy context in the North African region

2.1. Overview of the region

The region, object of this study, includes Algeria, Egypt, Libya, Mauritania, Morocco, Sudan and Tunisia and has in total approximately 212 million inhabitants with the largest being in Egypt (83 million), Sudan (42 million), Algeria (35 million) and Morocco (32 million). The region has a GDP of $393 billion (2000), which corresponds to GDP/capita of about $1,848/capita with a peak in Libya ($8,103/capita) and almost similar values for Algeria, Egypt, Morocco and Tunisia of between $1810 and 2086 /capita.

Mauritania and Sudan have the lowest GDP.

Pays	Population	GDP ($ bn 2000)	GDP/inhabitant ($2000)
Algeria	35	76	2 189
Egypt	83	152	1 836
Libya	6	52	8 103
Morocco	32	58	1 810
Mauritania	3	2	593
Sudan	42	23	536
Tunisia	10	29	2 806
Total	**212**	**393**	**1 848**

Table 1: Socio-economic data by country
(Source: World Bank, 2012)

2.2. Energy demand in the region

2.2.1. Consumption

The total consumption of primary energy in the seven countries in the region was about 160 million toe in 2010, with Egypt, Algeria, Libya and Morocco accounting alone for over 91% of total consumption. The average consumption per capita is about 748 kgtoe/capita, which is well below the world average, which is almost 2.5 times higher with 1.88 toe/capita in 2010.

The situation of primary energy demand is highly variable from one country to another, as the following table shows, and this situation depends essentially on three key factors to be taken into account separately:
- The country's population, consumption is higher for Egypt and Algeria.
- The structure of the economy
- Conditions of access to resources in terms of quantity and tariff.

This situation is characterized by electricity consumption at a level generally consistent with that of primary energy consumption. The electrification rate, the level of household equipment, the structure of the economy and tariff policy are, all, the factors which define the level of electricity consumption of a country.

Given the differences among the countries regarding the above-mentioned factors, electricity consumption varies considerably from one country to another, being at its highest for Egypt with 119,000 GWh and at its lowest for Mauritania with only 440 GWh. The total consumption of the seven countries amounted to almost 210,000 GWh for a population of around 212 million inhabitant, be it a specific consumption per capita of 986 kWh/capita.

	Primary energy consumption (ktoe)	Electricity consumption (GWh)	Electricity sector consumption (ktoe)
Algeria	39 700	35 803	11 514
Egypt	70 448	118 903	26 772
Libya	20 237	22 028	8 759
Morocco	14 603	13 323	4 228
Mauritania	950	440	81
Sudan	5 061	6 026	298
Tunisia	7 906	12 862	3 554
Total	**158 905**	**209 385**	**55 206**

Table 2: Primary energy consumption and electricity consumption
(Source: IEA, 2012)

The primary energy consumption per capita in the region is also quite variable, being 3,152 toe/capita for Libya, 0.281 toe/capita for Mauritania and 0.12 toe/capita for Sudan. This variation shows once again the difference of the initial situation and the typology of the countries covered by the study, since we have observed three categories of countries:

- Tunisia and Egypt have specific consumption of respectively 0.758 toe/capita and 0.849 toe/capita and are very close to the average of the region which is around 0.748 toe/capita.
- Libya and Algeria have respectively 3.152 toe/capita and 1.138 toe/capita of primary energy consumption per capita, which is the highest. These values can be justified by the ease of access to energy for the population both in terms of resources and of tariffs. Inefficient processing systems may also partly explain the high value of the specific consumption.
- Morocco, Mauritania and Sudan respectively show the lowest values with 0.456 toe/capita, 0.281 toe/capita and 0.120 toe/capita. This decrease is explained by the low energy access for the population, the level of industrialization and the volume of household equipment.

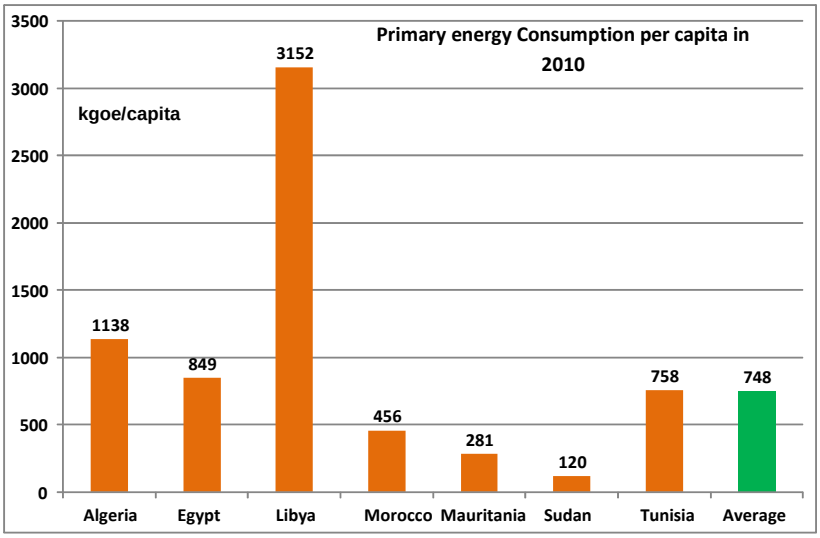


Diagram 5: Primary energy consumption per capita

(Source: IEA, 2011)

A similar distribution was observed for electricity consumption per capita, which is also quite variable from one country to another, with an average of 986 kWh/capita, and it should be noted that:

- Libya remains in first place with 3431 kWh/capita, explained by the great geographical dispersion of the country, the lack of efficiency in transport and distribution infrastructure and the high demand for electricity as an energy source because of ease of access to this form of energy particularly at the tariff level.
- Algeria, Egypt and Tunisia with respectively 1026, 1433 and 1233 kWh/capita are the second highest. Heavy industrialization and high volumes of household equipment are the two key factors of this demand for this form of energy.

- Morocco, Mauritania and Sudan have the lowest values of specific electricity consumption, these values being explained by the low electrification rate, low levels of equipment and difficulty of access to this form of energy.

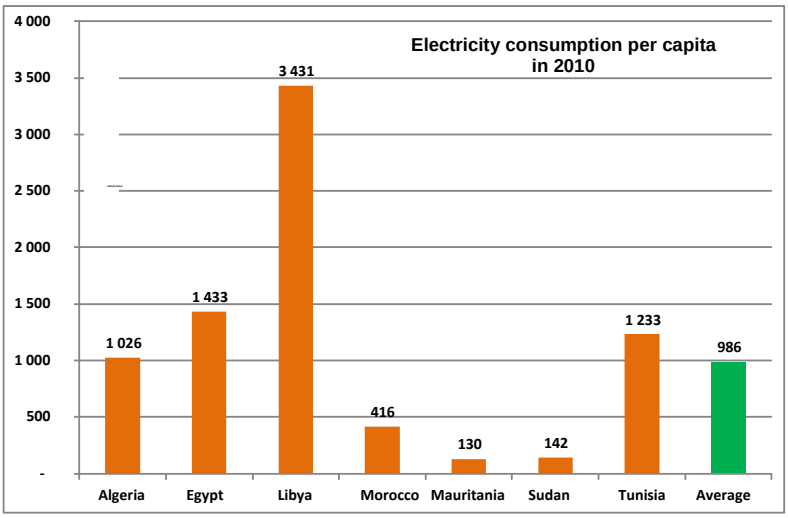


Diagram 6: Electricity consumption per capita

(Source: UAPE, 2012)

The electricity is a key factor in the development of the region since the three countries (Morocco, Mauritania and Sudan) with more than 77 million and representing almost 40% of the population of the region will be able to increase their rate of electrification and reach a level of development that will cause the growth of demand for energy in general and for electricity in particular. The achievement of the average value of 986 kWh/capita will increase demand for electricity by around 77,000 GWh per year, be it an additional demand of around 58,000 GWh per year.

2.2.2. The effectiveness of demand

Decoupling of energy demand from economic growth

The following graph shows the growth of primary and electric energy demand as well as that of GDP.

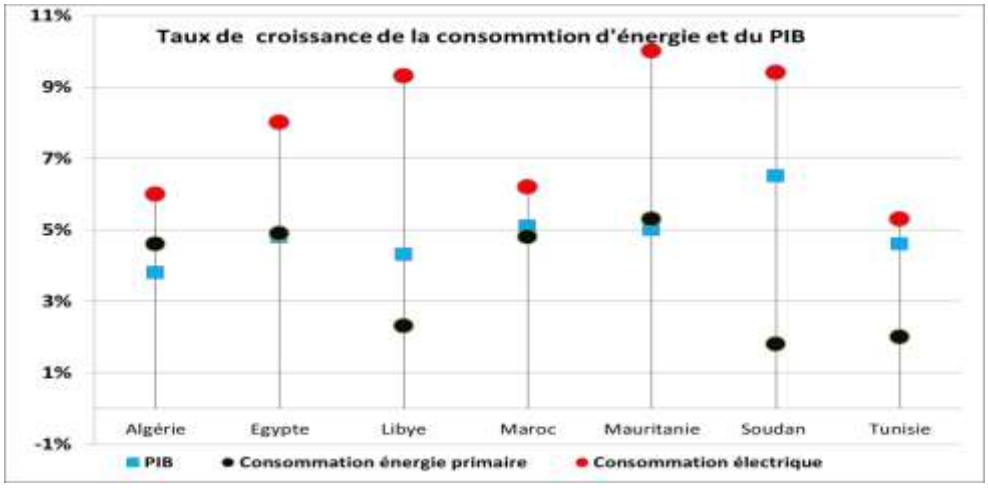


Diagram 7 : Growth rate of energy consumption and of GDP

(Source: based on IEA data, UAPE and World Bank)

Regarding primary energy consumption, we notice that there is a decoupling from economic growth in the case of Tunisia, Libya and Sudan. In other words, the GDP is growing faster than primary energy consumption. In Tunisia, this is explained by the energy efficiency efforts made by the country since the early 80s. In the case of Libya and Sudan, it could be explained by the fact that oil revenues increase GDP faster than primary energy demand.

For all the other countries GDP and primary energy demand are increasing in the same way, raising questions about the efficiency of the economy in terms of energy consumption.

However, the situation is critical with respect to electricity consumption, which is rapidly increasing compared to GDP (except for Tunisia). This strong increase in electricity demand is mainly due to the improvement of living standards of households and the consequent increase in their levels of electrical equipment. This exposes the countries of the region to major future challenges in terms of plants construction needs and peak load management.

Energy intensity

The challenge for the region is also an energy challenge as countries are required to optimize their intensity of primary energy, which is simply the ratio of the total consumption of primary energy and $1,000 of GDP at constant prices. The average energy intensity of the region is around 0.405 toe/1000$2000 which is still far from the global average intensity of around 0.19 toe/1000$ 2,000 in 2010.

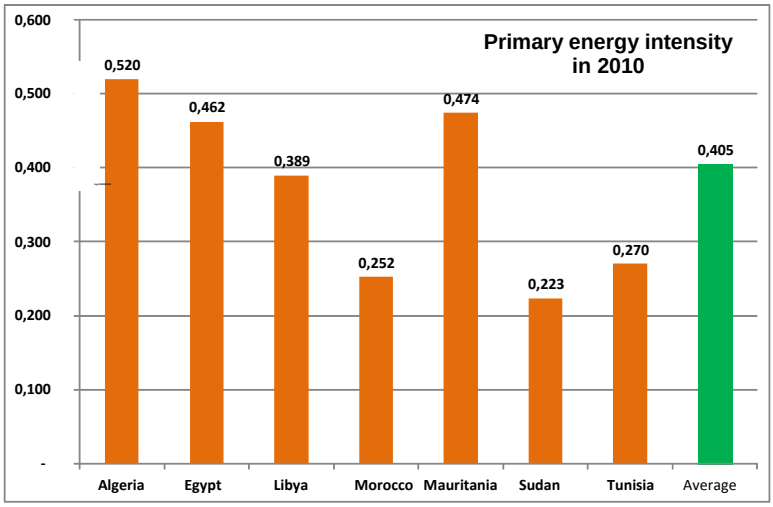


Diagram 8: Primary energy intensity
(Source: Data from the IEA and the World Bank, 2012)

In 2010, primary energy intensity was between 0.520 toe/1000$ for Algeria and 0,223 toe/1000$ for Sudan, passing to Morocco with 0.252 toe/1000$ and Tunisia with 0.270 toe/1000$ which, based on the benchmark, they are the best energy intensity levels. The countries are expected to improve their energy intensity, in particular, through:

- The adoption of an energy management policy (energy efficiency and renewable energy)
- Diversification of the structure of GDP and development of activities with low energy content as high value-added industries and the services sector.

2.3. Energy production in the region

2.3.1. Primary energy

The following table shows the production of energy by countries of the region.

	Energy Production (ktoe)
Algeria	152 240
Egypt	86 619
Libya	86 968
Morocco	302
Mauritania	782
Sudan	24 444
Tunisia	6 517
Total	**357 872**

Table 3: Production of primary energy in 2010
(Source: IEA, 2011)

The primary energy production in the region is around 358 Mtoe in 2010, excluding biomass. Countries of the region can be divided into two categories:

- The category of energy producing countries including Algeria, Egypt and Libya which have sufficient resources for their needs and produce an exportable surplus. The GDP of these countries depends largely on the energy sector and in return these countries have secure energy supply and energy independence.
- The category of energy-importing countries, which includes the other countries (Morocco, Mauritania, Sudan and Tunisia), that are dependent on the level of their energy supply and have more or less vulnerable economies given the impact of rising prices for petroleum products on the financial balances of these countries and their balance of payments.

2.3.2. Electric energy

Electricity generation was around 262,000 GWh in 2010, with a total installed capacity of about 57,000 MW, 63% of which is in Algeria and Egypt.

	Electricity Production (GWh)	Installed electricity capacity (MW)	Hydro electric-Capacity (MW)
Algeria	45 173	11 332	228
Egypt	138 782	24 726	2 800
Libya	32 559	8 349	
Morocco	22 681	6 320	1 770
Mauritania	470	253	97
Sudan	7 498	2 509	1 590
Tunisia	14 821	3 571	62
Total	**261 984**	**57 060**	**6 547**

Table 4: Production of electric energy in 2010
(Source: UAPE, 2011)

Electricity generation remains heavily dominated by fossil fuels as shown in the following graph:

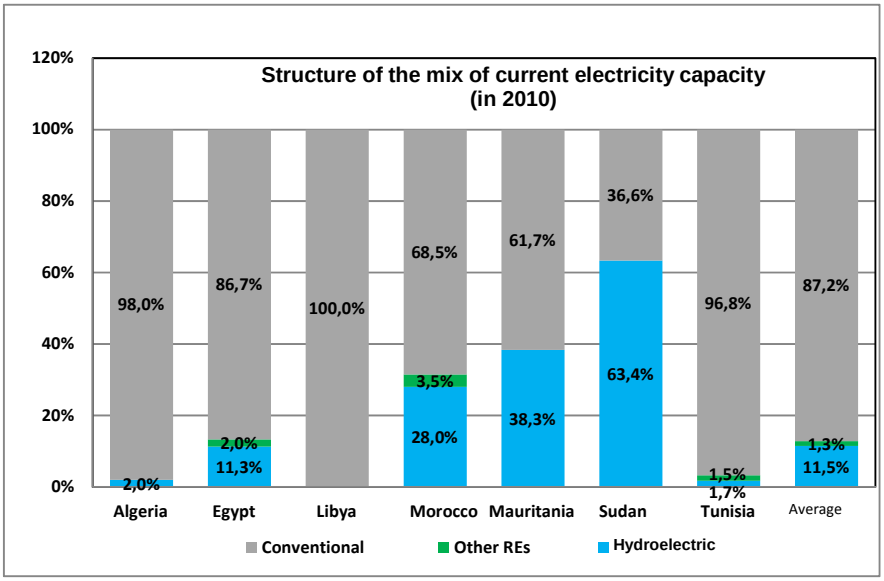


Diagram 9: Mix of electricity generation by country

The hydro capacity installed in the region is estimated at approximately 6,550 MW, 94% of which is located in only three countries (Egypt, Morocco and Sudan) with strong hydroelectric potential. The non-hydro renewable energy capacity installed in the region amounted to 765 MW.

III. Inventory of RE locations in the region

1. Electricity generation from renewable sources

Network-connected renewable electricity primarily refers to four streams, namely hydro, high-power wind, PV plants, thermodynamic plants and waste-generated electricity.

In 2010, the share of renewables in electricity production did not exceed 12.8% with 11.5% being of hydro sources and the rest of modern renewable energy.

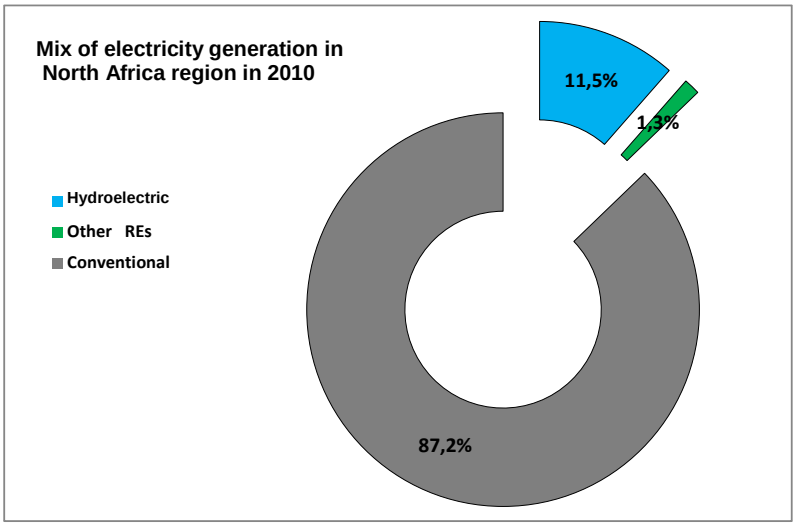


Diagram 10: Mix of electricity generation
(Source: UAEP, 2012)

Hydroelectric generation is mainly dominated by three countries, namely Egypt, Sudan and Morocco, as shown in the following graph.

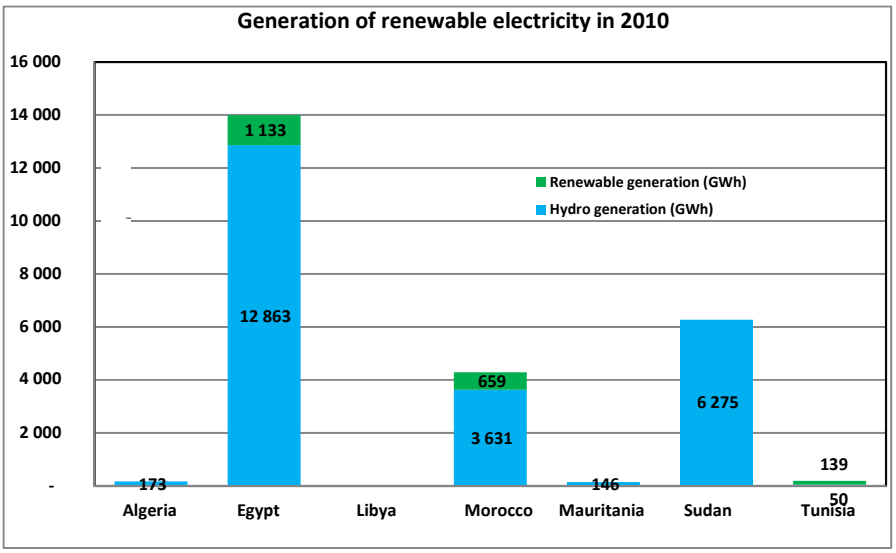


Diagram 11: Generation of renewable electricity in 2010
(Source: UAEP, 2012)

In 2010, the total renewable capacity installed in the region is estimated at 7312 MW with 6547 from hydroelectric and 765 from other modern REs.

As shown in the following graph, only three countries have renewable energy parks other than hydroelectricity; they are Egypt (490 MW), Morocco (221 MW) and Tunisia (54 MW).

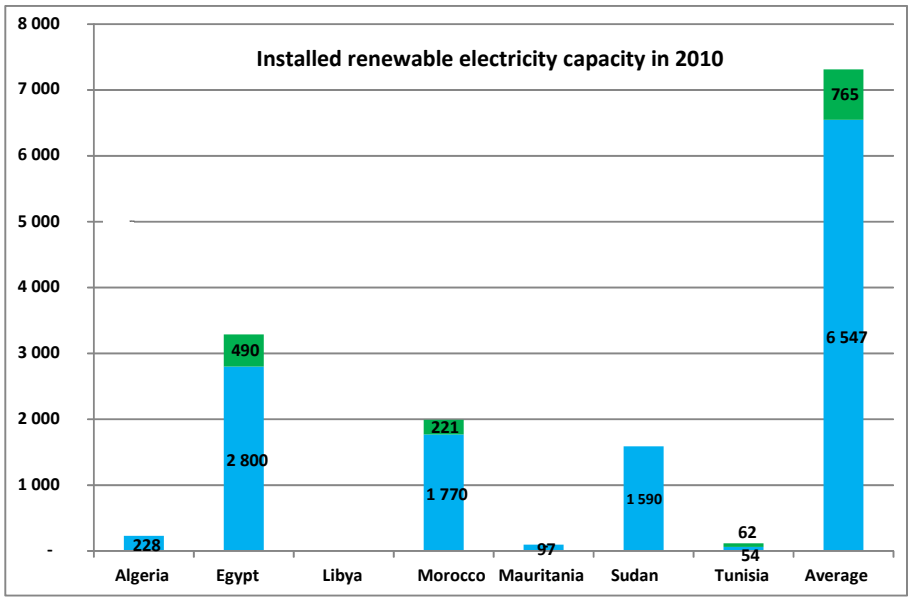


Diagram 12: Capacity of renewable electricity in 2010
(Source: UAEP, 2012)

In Egypt, the total non-hydro renewable energy capacity installed until 2011 was 575 MW, distributed as follows:

- Wind, 445 MW mainly on the Zaafarana region
- Solar PV, 10 MW especially for rural electrification, pumping and desalination
- Solar CSP, 20 MW integrated with a combined cycle of 120 MW

In addition, a 250 MW wind park is being currently installed under BOOT regime in the Gulf of Suez.

In Morocco, the installed capacity of renewables until 2012 is approximately 350 MW, distributed as follows:

- Wind, 290 MW
- PV, 3 MW for pumping and rural electrification
- CSP 20 MW (Beni Mathar)

In addition, an international consortium has been awarded the concession of a park of 160 MW of solar CPS (Ouarzazate), for both construction and operation. For wind energy, projects of more than 700 MW are already committed.

Algeria has a capacity of renewable energy which is essentially limited to solar CSP Park of Hassi R'Mell in addition to few MW of PV in decentralized locations.

Tunisia has, in 2012, some 245 MW of wind energy and some 5 MW primarily as solar PV connected to the low voltage network. A solar PV park a 10 MW is being installed in the Tozeur area.

In Libya, there is not currently any installed renewable capacity. However, projects of 180 MW are under implementation, 60 MW of which is of wind energy in Derna, 120 MW of wind energy in Al Maqrun and 15 MW of solar PV.

Since then, several projects have been achieved or are being currently installed, and which are basically:

- A 210 KW wind power plant connected to a local network in Nouamghar site
- Two desalination plants with a total capacity of 120 m3/day in the same region, in addition to two ice factories with a total capacity of 10t/Day
- A wind power plant with a capacity of 4.4 MW produced in 2012 in the Nouadhibou-Zouérate by the SNIM
- A 15 MW wind power plant in Nouadhibou is being currently installed
- A 3 MW Solar PV plant is being currently installed in Zouerate
- A Solar-Diesel plant with a total capacity of 5+3 MW connected to the local network of Kiffa is under study

In 2011, Sudan had a total installed capacity of about 1325 MW, which has increased of 297 MW compared to the previous year. Except hydropower, the country does not include any other renewables. However, the Government announced the construction and operation, in the coming years, of a 500 MW wind energy power which will be installed along the coast of the Red Sea with tranches of five phases of 100 MW each. These capacities will be achieved according to a public-private partnership approach.

Finally, we must emphasize that a first wind park of 100 MW is currently being developed in the region of Dongola and a 20 MW PV project in Khartoum.

2. The solar water heating

Except Tunisia and Morocco, the development of solar water heating has remained insignificant. However, even in these two countries, the development of SWH is very low compared to their potential and compared to other countries, as shown in the following graph:

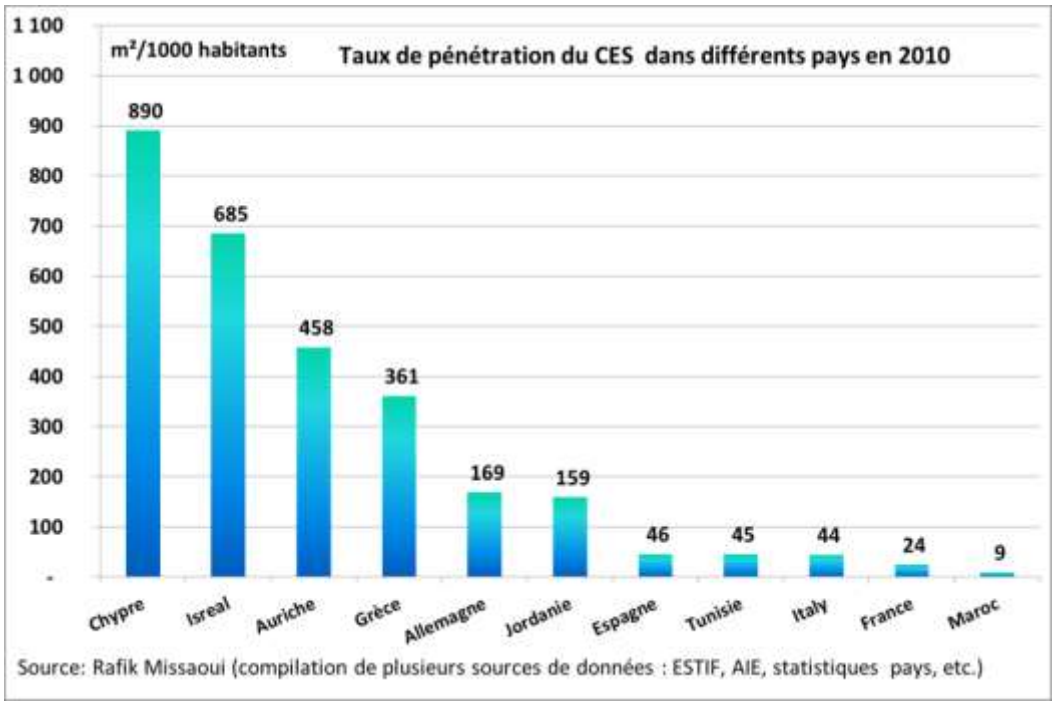


Diagram 13: Ratio of installed capacity of solar water heaters per 1000 inhabitants in 2010 in various countries

(Source: Rafik Missaoui from various sources: ESTIF, IEA, national statistics, etc.).

2.1. Tunisia

The Tunisian experience in the distribution of solar water heaters (SWH) started in the early 80s, with national manufacturing through a public company. For reasons of technological expertise, the market experienced serious difficulties, passing from about 5000 m² per year in the late 80s to a few hundreds of m^2 in the middle of the 90s. In an attempt to revitalize the market, in 1995 the Tunisian government launched, with funding from the GEF (Global Environment Facility), an ambitious programme aimed at distributing 50,000 m² until 2003. The programme's approach is based on subsidizing the purchase price by 35% and the implementation of quality control procedures to restore the consumer's trust.

The project has boosted the market, restored the image of solar technology and created a real network of local operators. However, the project was stopped in late 2001 with the exhaustion of the funds provided for the subsidy (6.6 million $). Since then, the distribution of SWH fell substantially from about 18,000 m² in 2001 to less than 7,500 m² in 2004.

The market decline coincided with a strong increase in the international level of oil prices and therefore the explosion of the amount of public subsidy for energy products, mainly the heavily subsidized LPG (as for butane in Morocco). In addition, suppliers have exerted significant pressure on the government to find a solution to this market downturn and the difficulties it creates for them.

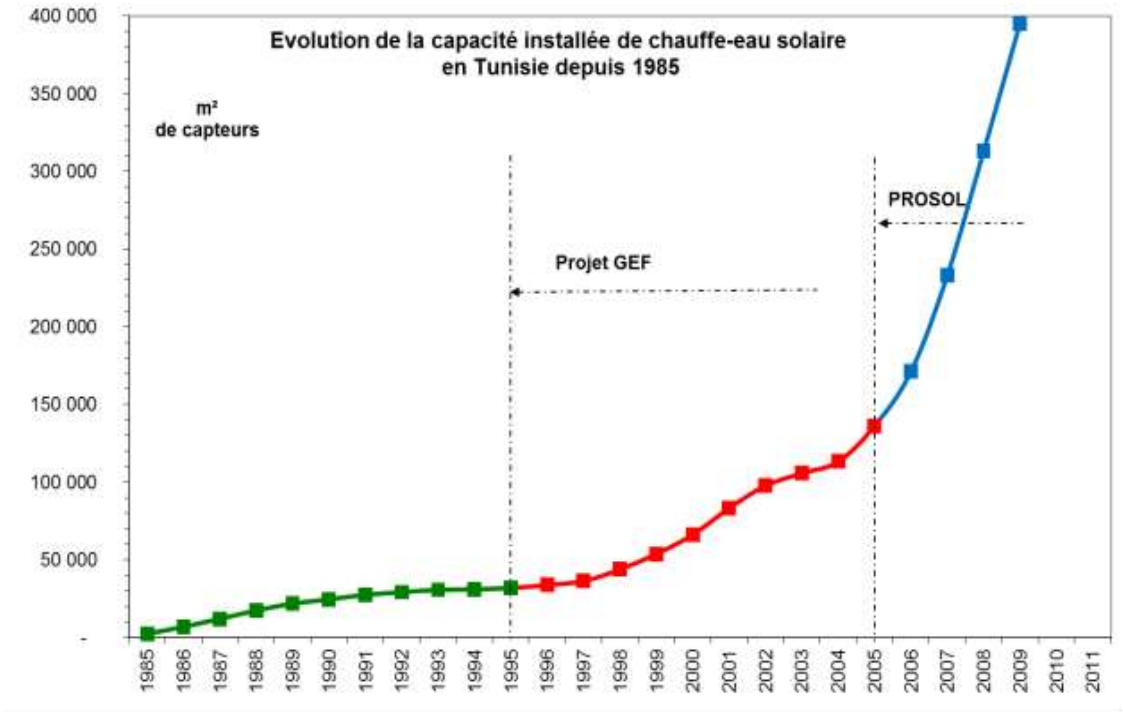


Diagram 14: Evolution of the installed capacity of solar water heaters in Tunisia

(Source: ANME/Database PROSOL)

Aware of the issues presented above, the Tunisian government has decided to implement an ambitious program based on a (PROSOL) mechanism to develop a sustainable sector of solar water heaters in Tunisia.

The pilot phase of PROSOL mechanism was initiated with the support of UNEP as well as the Italian cooperation through the MEDREP program and the MEDREC center, this phase has, however, engaged key actors and help decision makers for a program institutionalization.

PROSOL mechanism is an integrated solution designed to remove the main barriers against the development of a SWH market in financial, technical and organizational terms. This mechanism permitted a real market transformation by increasing annual sales of about 8,000 m² in 2004 to more than 80,000 m^2 currently. The installed park has grown to reach more than 0.5 million m^2, as shown in the graph above.

2.2. Morocco

There are no reliable statistics on the sales of SWH in Morocco, because of the relatively unstructured market. According to figures from the ADEREEE, the solar thermal market including both individual and collective is around 60,000 m² in 2009 and nearly 70,000 m² in 2010, as shown in the hereinafter diagram. Thus, the total capacity installed at the end of 2010 would be about 360,000 m².

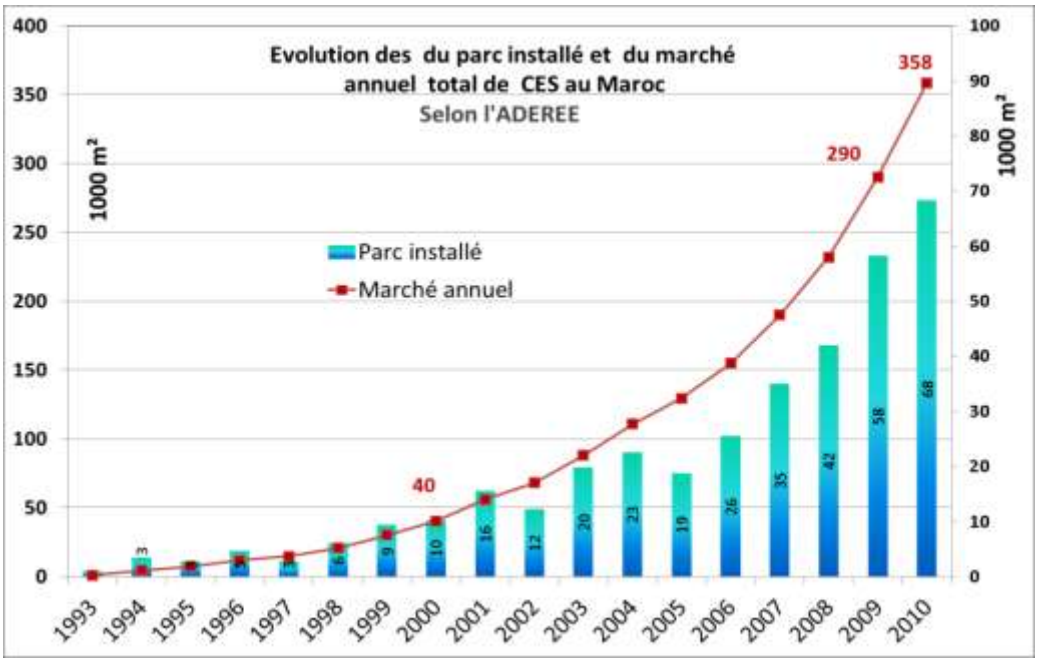


Diagram 15: Evolution of the installed capacity of solar water heaters in Morocco
(Source: ADEERE)

Individual SWH represent the majority of the market, be it about 80% of annual sales.

The recent study by the ADEREE on the market for heating, ventilation and air conditioning equipment shows other figures. According to this study, based on import statistics, the market for individual SWH in 2009 would be about 12,700 domestic units (approximately 40,000 m²) and nearly 8000 units for other uses.

3. Decentralized electrification and PV pumping

The following table presents the main achievements in the field of decentralized electrification and PV pumping.

country	**Achievements**
Algeria	Photovoltaic electrification programme conducted by Sonelgaz, funded by state grants for the benefit of 1000 homes spread over 4 large provinces of the South (Tamanrasset, Adrar, Illizi and Tindouf).
Mauritania	More than 10,000 households and water points electrified by PV systems.
Morocco	Approximately 13 MW of PV installed under the PERG electrification programme.
Tunisia	13,000 households with electricity by PV systems and a hundred by PV pumps.

Table 6: Achievements of decentralized electrification and PV pumping
(Source: Various national sources)

IV. Prospects for RE in the region

Most countries in the region have officially adopted ambitious strategies for the development of renewable energies, as shown in the following table:

	target year	% of RE in electricity generation	Installed RE capacity
Algeria		40% (37% solar and 3% wind power)	22,000 MW, 10,000 MW of which is for export and 12,000 for domestic consumption: ○ CSP: 7200 MW ○ PV: 2800 MW ○ Wind power: 2000 MW
Egypt	2020	20% (12% of wind power and 8% hydro and others)	- Wind power: 7200 MW - Biomass: 1500 MW
Libya	2020	10%	- 1500 MW Wind power - CSP: 800 MW - PV: 450 MW - Solar water heater: 1 m²
Morocco	2020	42% of the installed power, 28% of which of wind power and solar and 14% hydro.	- Wind power: 2000 MW - CSP / PV: 2,000 MW - Solar water heater: 1.7 million m²
Tunisia	2030	30% (15% wind, 10% solar PV and 5%)CSP	- 1500 MW Wind - CSP: 600 MW - PV: 2,000 MW - Solar water heater: 1.5 million m²
Sudan	2020 / 2030		- Wind power 500 MW by 2030 - CSP / PV: 2,000 MW by 2030

Table 7: Objectives of national strategies for renewable energy in the countries of North Africa
(Source: Various national sources)

To facilitate the implementation of these strategies, some of these countries have introduced specific regulatory frameworks, which are nevertheless, in most cases, unsatisfactory in relation to the stated objectives.

	Main regulations specific to RE	Access to the grid	Purchase price
Algeria	- Law N°02-01 of February 5, 2002 relating to electricity and gas distribution - Law N° 2004-09 of August 14, 2004 relating to promotion of RE - Law on energy management (fund for energy management)	- Authorized	In progress
Egypt	- New law in 2011 authorizing the self-production and sale of access to network	- En cours d'ouverture	In progress
Libya	No specific law	- Prohibited	No
Morocco	Law N°13-09 of 2009 (Self-production approach)	- Free for powers under 2 MW. Need of authorization for a higher power	- Partial regarding the surplus of energy produced by the operator
Tunisia	Law 2009-7 and decree 2009-362 (Self-production approach)	Free access to network regarding self-production	- Partial regarding the surplus of energy produced by the operator and not exceeding 30%.

Table 1: Key measures adopted by North African countries regarding promotion of RE
(Source : Various national sources)

V. RE Specific Funding and Incentives Mechanisms

1. International experience Feedback: Mechanisms Typology

1.1. Renewable Electricity Production Market Development Approach

Two main approaches have been used to promote the production of electricity from renewable energy sources:

- The first is based on the system of purchase obligation by distributors of photovoltaic[2] electricity at a displayed and "guaranteed price";
- The second is based on the guarantee of market share through goals set by government mandate or quota. These objectives are to be achieved through bidding for concessions production of renewable sources and / or the creation of a green certificate market from green electricity quotas imposed on national electricity producers.

The regulatory specific instruments applicable to the photovoltaic are essentially the following:

1.1.1. Guaranteed prices

Feed-In Tariff - FIT

The government (or any other regulatory body) sets a price that is guaranteed for a certain period of time during which electricity producers can sell electricity from renewable sources and fed into the grid. Some systems offer a flat rate while others combine fixed premiums added to market prices or related costs. Rates are expressed in national currency per kWh or MWh.

Feed-in tariffs are usually set at levels that provide good returns to investments in renewable energy projects, which is likely to promote market development.

The Feed-in tariffs system was phased in over a decade in nearly 50 countries or states. It covers most of the countries of the European Union, Japan, South Korea, Thailand, South Africa, Kenya, etc.

Net Metering

In the same spirit, net metering is one of the simplest systems since it is only about allowing the two-way flow of electricity between the electricity distribution network and the client's personal production. Customers only pay for the net electricity used. Net metering has been

[2] Noting that this generally also applies to other "green" electricity (wind, biomass, hydro, ...) with tariffs differentiated by technology

introduced in 13 countries including Germany, Canada, Jordan, Mexico, Pakistan, Philippines. This is often an option that customers can purchase, while other systems (Feed-in tariffs) may also exist in the country.

1.1.2. Objectives Requirements

Quotas - Renewable Portfolio Standard - RPS

It applies to quantitative electricity production requirements from renewable energy or quotas policies that are imposed on energy suppliers by the government. A minimum percentage of production sold or installed capacity must be provided through renewable energy. Subject companies or distributors are required to ensure that the target assigned to them by the public is reached in time and quantities required. Otherwise, they face heavy penalties.

To fulfill their obligations, retailers can develop production capacity in which they will invest and / or offer incentives to their customers who will generate their own clean electricity which they will inject into the network at an incentive rate the distributor will suggest to them. In the latter case, it is a tariff system but proposed by the distributor and not imposed by the state. Market mechanisms may therefore regulate it.

Less than 15 countries around the world have implemented this quota policy at national or state level, including Australia, Italy, Japan, Poland, Romania, Sweden, the United Kingdom, and California.

Tradable Renewable Energy Certificate - REC

The quota instrument is often backed by a system of green certificates, which are titles given for the production of renewable electricity. These certificates, which are acknowledged by Europe, are traded on national markets first, but also internationally.

Green Certificates operate in 20 countries at the national level, including Australia, India, Japan, Russia, Norway and most of the EU member countries. Often associated with large projects in Belgium, they are negotiable in the residential sector.

1.2. Incentive systems

1.2.1. Tax incentives

A number of tax incentives conducive to the emergence of renewable energy can be implemented.

Some will focus on reducing costs and improving the relative competitiveness of renewable energy technologies by providing indirect tax subsidies. Others consist of direct tax concessions.

It can be then: Tax credits for investment, property tax exemptions, tax credits for production, sales tax rebates, exemptions from excise taxes (Eg. VAT), etc. Usually applied in

industrial projects, some of these reductions can also be applied to the residential sector (Eg. France).

Indirect tax benefits

This is a classical approach providing benefits on indirect taxes on renewable energy equipment and more generally energy efficient equipment: exemption from VAT and customs duty on import. During the initial phase of the contract, this measure provides an inexpensive incentive for governments, because the base of its application is still low in the country. This type of measure has existed for several years in Tunisia for example.

Direct tax benefits

It is in this case given to investors in RE projects benefits in terms of tax revenue (or profits for corporations).

- Tax credit for investment

Part of the investment is tax deductible. A tax credit can be applied to the tax base or the tax due. In the second case, it is obviously more favorable. A tax credit involves a possibility of reimbursement by the State to the taxpayer. It can only be applied to certain categories of taxpayers. It can (and should) have limits.

- Tax credits for the production or reduction of sales, energy, carbon, excise, VAT, etc.

Alternative systems of tax credit on the sale of renewable electricity, energy assessment, carbon saved or VAT paid can be implemented. These are then applied to the amount of electricity generated during the year (and not the amount of the investment).

- Tax Reduction

Tax cuts may apply in the same way as tax credits. They apply to the final tax but unlike tax credits, they do not induce repayment in case of exceeding of taxation.

- Energy Production Payment

It is a system of direct government payment per unit of renewable energy produced. This is an incentive system of subsidy type for a limited duration, modifiable (since it depends on fiscal policy that is revised annually) and variable, non-contractual (as opposed to the feed-in tariffs). This system can therefore be of limited duration so as to encourage the emergence of a market without incurring the government in a long-term policy.

1.2.2. Public subsidy

These are incentives in the form of direct grants to investments in renewable installations. They aim to reduce investment costs for the user in order to make investment in renewable energy more profitable and therefore more attractive.

They can also affect the bank interest rate subsidy to reduce financing cost and improve the profitability of the facilities in question.

The subsidy payment may be made directly by the government (Public Treasury) or a dedicated state agency.

In order to ensure the sustainability of the incentive system, the subsidy origin may be backed by public funds fed by earmarked taxes, which will ensure stable resources for the incentive.

1.2.3. Specific funding mechanisms

It is most often a combination of mechanisms including several types of measures, but in a coherent way. In fact, in addition to the public subsidy, the mechanisms often rely on credit systems which duration is long enough to be adapted to the ability of households payment.

The credit system is most often backed upstream to a line of credit which rate and maturity duration are concessional. In addition to the concessional line of credit, the State may decide to subsidize interest rates to make credit more accessible to users.

Finally, the credit can be distributed directly by banks, but it can cause three main constraints:

- The household bankability rate which is often low in developing countries,
- High transaction costs in banks credit management (instruction and collection), given the small amounts of credit,
- The default risk may be higher, in the absence of guarantees provided by households.

To overcome such constraints, some countries (in the case of Tunisia, Kenya, South Africa) use electrical distributors as both harrow repayments through electricity bills, but also as guarantee payment agencies using the lever of household disconnection from electrical connection in case of default payment.

2. Main experiences of funding mechanisms in the region

Experiences observed in the countries of the region can be classified into five broad categories :

- The feed in tariff and / or net metering
- Direct and indirect tax incentives
- Investment grants
- Systems facilitating access to credit
- Innovative financing mechanisms

2.1. Feed in Tariff and / or net metering

For the moment, there is no region in the real feed-in tariff displayed and attractive for electricity production of renewable energy sources. However, in some countries, it is possible to sell the electricity generated by operators of renewable energy to the grid with negotiated rates. These cases are presented in the following:

Morocco

In the framework of the law 13-09 on renewable energy, the operator can sell the electricity produced to ONE by means of a usage fee of the transport network at 8CDH/kWh[3]and a negotiated selling price within a sales contract framework negotiated between the operator and ONE. The purchase price should be set around 60% of the sales price of electricity MV (medium voltage) to ONE.

Tunisia

In Tunisia, the law on energy management (Law 2009-7 of 2009) allows companies and business groups to generate electricity from renewable energy for their own needs and sell the excess at 30% maximum to electricity company. The purchase price is set at the same level as the selling price applied to medium voltage 4 posts by the National Electricity and Gas Company (Société Nationale d'Electricité et de Gaz) STEG[4].

For producers of electricity from solar PV connected to LV (law voltage) grid in the program Prosol-Elec, the net metering system is applied. In other words, the consumer pays the balance between the energy produced and energy consumed at the same rate of sale applied by STEG.

Algeria

It seems that a purchase price of renewable electricity is being implemented by the Algerian authorities on the basis of a multi-stakeholder dialogue currently led by the Regulatory Commission for Electricity and Gas (CREG) with technical assistance from the German cooperation. This action will set a price of free access to the electrical grid with the support of the German Ministry of Environment (BMU)

Egypt

With the support of the German Cooperation, the Egyptian government is putting in place a system of feed-in tariff, which should be operational in 2012. The rate will be revised every two to four years to assess the next step and probably would decrease by about 2% per year.

2.2. Tax incentives

Tax incentives observed in the countries of the region for renewable energy are essentially of an indirect type, including exemptions covering domestic taxes and customs duty. The following table presents the incentives observed in different countries of the region:

[3] Around 0,7 C€/kWh
[4] Around 0,06 €/kWh

Country	Incentives
Algeria	No specific measures
Egypt	Exemption from custom duty for renewable energy equipment
Libya	No specific measures
Morocco	Customs duty at 2.5% for renewable energy equipment
Tunisia	Exemption from VAT and customs duty on equipment

*TABLE 2: **Tax incentives for RE in North African countries***
(Source : Various national sources)

Thus, tax incentives are most important in Tunisia, where in addition to tariffs reduction, the law provides a total exemption from VAT on equipment related to renewable energy and energy efficiency.

2.3. Investment subsidies

Investment subsidies for renewable energy are particularly observed in 4 countries of the region, namely Tunisia, Algeria, Morocco and Egypt.

Tunisia

Direct financial benefits are granted to certain energy efficiency measures and renewable energy under the energy management law and related texts. For renewable energy, investment subsidies are presented as follows:

Measures	Maximum limit
Solar and wind lighting and pumping in agricultural farms	✓ 40% capped at 20 000 DT
Electricity generation from biogas	✓40% capped at 100 000 DT
Production of electricity by households from solar photovoltaic LV grid-connected	30% capped at 2300 DT/ kWp capped at 15,000 DT / home
Individual solar water heater (SWH)	200 DT for solar water heaters of 1 to 3 m² surface sensor. 400 DT for solar water heaters of 3 to 7 m² surface sensor.
Tertiary solar water heater	**Installation C1: less than 15 m² of sensors** - Public subsidy of 30% of the SWH price capped at 150 TND per m2
	Installation C2: more than 15 m² sensors and less than 30 m² - Public subsidy of 30% of the CES price capped at 150 TND per m2 - 10% premium financed by the Italian Cooperation through PNUE (50 DT / m²)
	Installation C3: more than 30 m² - Public subsidy of 30% of SWH price - 25% premium financed by the Italian Cooperation - Improvement of the interest rate by 2 points and 6 DT / m² per year for 4 years maintenance - Capped at 300 DT / m²

*TABLE 3: **Investment subsidies granted to RE in Tunisia***
(Source : Tunisian regulation)

Algeria

Through the National Fund for Energy Conservation, the Algerian State may award grants which amount varies according to the type of measures. For example, in the case of individual SWH, the subsidy should reach 55% of the investment cost.

Morocco

The Ministry of Energy, Mines, Environment and Water and ADEREE have signed an agreement under which the Energy Development Fund grants an amount of approximately € 10 million to support the individual SWH market in Morocco. This support should be in the form of capital grant for the acquisition of SWH by households, coupled with a system of consumer credit.

Egypt

EGYSOL program funded by the Italian Ministry of Environment is providing 25% subsidy for collective solar thermal installations. This pilot program which resources are limited to $ 0.5 million should be pursued through a specific mechanism supported by the Fund for Tourism Development, which should allow its continuity.

2.4. Measures facilitating access to loans

These measures are essentially of three types:

- Bonus on interest rate
- Guarantee funds
- Dedicated credit lines

Country	Bonus on Interest Rate	Guarantee Fund	Dedicated Credit Lines
Algeria	Possibility of bonus on Interest rate by FNME (eg ESCs consumer credit which entire interest rate will be taken in charge by FNME)	Possibility of fund guarantee by FNME	
Egypt	An incentive is being implemented to reduce the interest rate on loans to hoteliers to install collective SWH. Loans are granted by the National Bank of Egypt on mixed resources including 50% from the Tourism Development Fund.		The National Bank of Egypt seems interested in financing solar projects in hotels; this credit could be co-financed by the Tourism Fund.
Morocco	Consumer loan with a negotiated rate to finance SWH acquisition. The decline in interest rates is consistent with economies of scale and market structure.	Guarantee Fund for Energy Efficiency and Renewable Energy "FOGEER" to guarantee leasing companies that finance collective solar water heaters (including hotels) projects. A 10 million MAD fund closed in 2009.	
Tunisia	- Subsidy of the loan's interest rate by 2 points for the collective SWH. This is an ad hoc measure, supported by the Italian Cooperation to launch the market - Subsidy on the rate of interest of 3 pts of AFD credit line assigned to energy efficiency investments (EU grant).	Guarantee fund for energy service companies within the energy management in the industrial sector. Guarantee at 75% of loans for a maximum amount of 4 MTD	- AFD line of credit of € 40 million to finance major private projects of energy efficiency. This line is distributed through three private banks in Tunisia. - World Bank line of credit of $ 50 million to finance major energy efficiency private projects. This line is distributed through three private banks in Tunisia.

TABLE 4: Measures to facilitate access to credit for financing RE in North African countries
(Source : various national sources)

2.5. Innovative financing mechanisms

Innovative mechanisms are often an appropriate combination of different incentives coupled with a multi-stakeholders institutional organization.

In the region, such mechanisms are relatively recent and are observed in very few countries. Some countries have also begun to think about the implementation of such mechanisms.

2.5.1. Tunisia

Tunisia is one of the countries of the region where specific financing mechanisms for renewable energy were developed. Among these mechanisms:

- The PROSOL mechanism for the development of solar water heaters in the residential and tertiary sector
- The PROSOL-Elec mechanism for the development of grid-connected PV installations

PROSOL residential mechanism

The PROSOL mechanism is now the major determinant of SWH market in Tunisia, by the very nature of its incentives, its procedures and its actors. PROSOL mechanism is an integrated solution designed to remove the main financial, technical and organizational barriers against the development of SWH market. The following table presents the key elements of this mechanism.

Item	Information
Name	Residential PROSOL
Objectives	Achieving 1 million m² by 2015, which would reduce the penetration rate of 12 m² per 1000 inhabitants in late 2004 to 46 m² per 1000 inhabitants in 2009 and 92 m² per 1000 inhabitants in 2015.
Starting date	2005
PROSOL Specific Measures	PROSOL is an integrated mechanism targeting the creation of appropriate conditions for the development of the sector of ESCs in Tunisia, it consists of: - The provision of a public subsidy of 200 TND for 1 to 3m² sensor SWH and 400 TND for from 3 to 7 m² sensors SWH to lower the price of SWH acquisition and improve profitability to the final consumer. - Granting the consumer a bank loan repayable over a five years period, and which recovery is assured via the STEG bill to facilitate consumer access to SWH. - A system of quality control upstream and downstream suppliers and their products marketed within the program to ensure the after-sale and improve SWH brand image.
PROSOL Partners	The program's partners are : - ***ANME*** provides a subsidy on FNME, manages the program and ensure its promotion. - **Commercial Bank** (Attijari Bank) provides the loan to the consumer through a line of credit over a 5 years period**.** - ***STEG*** provides credit recovery on electricity bills and provides the security for the loan repayment. - **Consumer** adheres to the program and is committed to meet its requirements. - **Suppliers and installers** acknowledged by ANME ensure supply, installation and after sale service of SWH approved by ANME - **Professional union** which provides supervision of the profession and participates in the implementation of measures.
Accompanying measures	- Tax incentives for SWH import and manufacturing - Quality control of equipment and services - Training of operators - Communication to promote the program
Results	Quantitative results: - The PROSOL program, has achieved 500,000 m² SWH installed in late 2010 against only 120,000 m² in late 2004. The installation rate should stabilize around 100,000 m²per year from 2012 through the effect of trivializing the access to this technology. - The program should allow to avoid 570,000 tons of CO2 equivalent (tCO2e) over the period 2007-2011. Qualitative results: - Offer increase through the industrialization effect (50 suppliers including 6 local manufacturers.) - Adaptation of the range to the real needs of households and diversification of products to better meet these needs. - Lower prices of SWH by effect of competition and economies of scale. - Job creation in the field of supply and equipment installation. - Improved image of SWH compared to the period before PROSOL

*TABLE 5: **Description of the PROSOL mechanism in Tunisia***

PROSOL mechanism in the third sector

The mechanism is based on:

- The provision of a of 30% public subsidy of SWH price capped at 150 TND per m² of sensors on every SWH purchase so as to reduce the developer's payback time. This subsidy is awarded by ANME from the National Fund for Energy Conservation (FNME) resources;
- A premium and bonus are awarded according to the installation size, details of the premium, premium and the subsidy are shown in the following table:

	Category	Bonus	Premium	Improvement
C1	Installation of less than 15 m2 sensors	Public subsidy of 30 of SWH price with a 150 TND cap per m2		
C2	Installation of more than 15 m2 sensors and less than 30 m2	Public subsidy of 30 of SWH price with a 150 TND cap per m2	Subsidy of 10% financed by the Italian Cooperation through the PNUE(DT 50 / m2)	Enhancement of 2 points and 6 DT/m2 per year for maintenance over 4 years
C3	Installation of more than 30 m2	Public subsidy of 30 % of SWH price	Surcharge of 25% financed by the Italian Cooperation	
		300 DT/m2 Cap		

A quality control system based on products and suppliers eligibility on the basis of predetermined criteria, the sector structuring and operators qualification (offices, inspection offices, installers, ...)

The program allowed the installation of about 5000 m² since its implementation in 2008.

Prosol – Elec mechanism

In its first pilot phase aiming to introduce the market and which objective is to install 1.5 MW over 2010-2011, the PROSOL ELEC funding mechanism is based on the following incentives:

- A grant from the National Fund for Energy Conservation (FNME) representing 30% of the investment cost of photovoltaic system and capped at 3 000 TND per kWp and DT 15 000 for the entire photovoltaic system;
- An additional premium of 10% of the investment cost paid by the Italian Ministry of the Environment and Territory (MIET) through the Renewable Energy Centre MEDiterranean (MEDREC);
- STEG providing for inverter's cost;

- A subsidized loan at 0% rate for a period of 5 years, up to 3000 per kWp TND and capped at 6000 TND, payable on the STEG invoice. This loan is part of a line of credit made available to STEG by a private bank selected through competition (ATTIJARI BANK). STEG in turn ensures the recovery of claims in favor of the bank and guarantees payments by disconnecting the customer in case of default payment.

In its second phase (currently in development), PROSOL ELEC provides the subsidy provided for by the FNME as described above and a credit for a period of seven years at a rate of 1.2 TMM, or about 4.5%.

Invoices are issued by STEG based on the **net metering** principle, or on the base on the balance if the amount of energy provided (by STEG) is superior to the energy delivered (by the producer) and based on the current rate established by decision of the Minister of Energy.

If, on the opposite, the quantity of energy provided is greater than the energy supplied, the difference will be reported on the producer's invoice for the next billing cycle.

The pilot phase of Prosol Elec helped install 739 facilities totaling nearly 1,600 kWp. Over this period, the program helped prevent about 900 tep primary energy or 12,700 top on the lifetime of facilities.

2.5.2. Morocco

Morocco is in the process of setting up a specific mechanism for the development of individual SWH. It is likely that this mechanism will be based on the following elements:

- Subsidy to SWH prices sized to make SWH attractive to consumers. This grant will certainly be limited in time.
- Consumer loan for the remaining part of SWH cost. The loan will be for a period of 3 to 4 years with an interest rate of 9 to 10%.
- Quality control with the introduction of a strict system of quality control (upstream and downstream).
- Management Information System shared between the different actors to facilitate the mechanism management.
- Communication and information through mass communication campaigns for SWH (TV spot, fair, etc.), using the grant as a selling argument.

2.5.3. Egypt

SWH development market in Egypt focuses on tertiary applications segment due to the cost of solar heating in this sector as energy rates that are applied; in this context, a first mechanism called EGYSOL was established with the support of the Italian Cooperation to initiate this market.

The EGYSOL program supported by the MEDREP of the Italian Ministry of Environment is a mechanism that:

- Provides a 25% subsidy for collective installation of solar thermal and a decreasing subsidy of maintenance cost for 4 years after the first year of warranty
- Ensures the education and training of actors involved in order to improve their knowledge and skills
- Provides assistance to the establishment of quality standards of SWH.

Until the end of 2011, the program has equipped 9 hotel units with a capacity of 1120 m² SWH, the average return time is approximately 4.5 years.

This pilot program which resources are limited ($ 0.5 million) should be pursued through a specific mechanism supported by the Fund for Tourism Development, which should allow its continuity. In this regard, Egypt intends to initiate a mechanism based on a progressive development approach of SWH market and which will start with the tourism sector that, given energy prices applied, presents attractive terms of profitability.

Support mechanism of SWH market in the tourism sector in Egypt is based on the combination of direct financial incentives and loans with an optimized interest rate.

The funding mechanism is based on the following principles:

- Facilitate access to SWH through a flexible credit system, fast and attractive set up with the National Bank of Egypt.
- Improving profitability for hotels by the SWH acquisition premium effect granted for EGYSOL resources in the beginning and other resources to be mobilized later.
- Financially support the realization of design studies.
- Contribute financially to operation costs and maintenance (O & M) and require a guarantee of 5 years on equipment and quality of after sale service.

Support the program by:

- Monitoring equipment and services marketed under the program through program eligibility conditions.
- Actors qualification (installers, suppliers).
- Communication and awareness on the use of SWH in order to know their benefits.

2.6. Financing within the Public Private Partnership

Project funding or finance Project involves collecting, combining, and organizing the various funds contributions necessary to large-scale investments (eg. transport infrastructure, new industrial complex, energy production units ...), private, public or mixed, ensuring their financial viability.

Project funding differs from other financing methods (including "corporate" funding) as the funds contributions will mainly be paid by cash flows generated by the project itself.

The interest varies for the investor of the project in question, compared to "corporate" funding or "on balance sheet":

- Deconsolidate the investment amount of its own balance sheet, given the large amount of money at stake.
- Defer most of project risks to a funding vehicle managing the project (company ad-hoc, project company, or SPV Special Purpose Vehicle): concept of *non-recourse financing*.
- Optimize the flow of funds in the form of equity (shareholder capital or equity) and bank debt: this optimization makes sure to maximize return on equity of the shareholder or sponsor of the project, while ensuring repayment of bank debts on acceptable terms to lenders in case of degraded scenarios.

The project financing or the non-recourse financing concept requires from the banks, which master this expertise, an in-depth analysis of all financial, technical, contractual, organizational and legal factors related to the project. This analysis is called *Due Diligence*, and can include external consultants and business law firms.

The non-recourse financing means that the money-lenders cannot ask the project sponsor for reimbursement should the generated cash-flow is less than expected. The project economic performance (e.g. highway expected traffic, Electricity selling tariff according to market surveys, wind plant operational performance, etc.) is crucial to the reimbursement of the dept and to an acceptable return on shareholders' equities. Therefore, the money-lenders have this first-priority security on assets and contracts of the project's vehicles should this latter fail.

The project finance approach is usually adopted for large-scale renewable energy projects of electricity production by the private sector within the framework of Public-Private Partnership (PPP).

Country	Incentives
Algeria	- The hybrid solar-thermal plant (CSP) project in Hassi R'Mel with a capacity of 25 MW, developed by the NEAL Company under a contract of **BOOT type (Built Own Operate and Transfer)**. The cost of this project was 315 M€, with a total capacity of 150 MW, including 25 MW CSP.
Egypt	- The project of the wind plant in the Suez Gulf with a capacity of 250 MW.
Morocco	- A wind plant projet in Koudia Bida with a capacity of 50 MW, already running. - Tarfaya project with a capacity of 300 MW under construction - A programme of a capacity of 850 MW to be launched - The first CSP project of the Moroccan solar plan with a capacity of 125 MW IN Ouarzazate.

Table 13 : Key RE projects financed in the framework of PPP in the region
(Source : various national sources)

2.7. Clean development mechanism

The clean development mechanism (CDM) was established by the Kyoto Protocol in December 1997. Among the three mechanisms of flexibility, CDM is the only one to involve developing countries.

Through this mechanism, an economic operator in an industrialized country, may buy emission reductions generated by a project, from an economic operator in a developing country, according to a well defined process. Emission reductions, also called "certified emission reduction units (CERU) ou "carbon credit" are to be used during the first commitment period (2008-2012). These CERU can generate from projects implemented in developing countries (Non-Annex 1 countries) from 2000 to 2012. It is the only mechanism to involve these countries. CDM projects will generate CERU, of which buyer will be credited, will help them respect a part of their engagements to reduce greenhouse gas emissions. Thus, CDM can contribute to improve ER projects thanks to additional revenues it allows.

In North Africa region, results are very weak regarding the number of registered projects. In fact, at the end of August 2012, the total number of projects registered amounts to only 22 projects, 13 of which are RE projects, especially wind power.

Country	Total number of projects	ER Projets
Tunisia	2	0
Morocco	8	7
Egypt	11	5
Mauritania	1	1

*TABLE 6: **Achievements in CDMs in the North Africa region at mid-2012***
(Source : UNFCCC, 2012)

Other projects are to awaiting registration or validation, and would increase the number of projects to some 30 ones in the region by end of 2012.

These achievements are very weak in comparison with, on one hand, the potential of the region, and the results achieved by countries on the other hand. There is a multitude of constraints to CDM development in the region.

Some constraints are intrinsic to the CDM process itself, which is a complex process implying implementation deadlines and very high transaction costs in comparison with expected benefits. This complexity discourages operators (especially private ones) who often doubt in the outcomes of the CDM process.

The few number of registered projects is partially due to weakness of investments in the region on energy management projects, and particularly renewable energies, because of the low attractively of investors (low profitability, ambiguous regulatory frameworks, etc.).

It is also important to note that the low capacities specific to CDM in most countries of the region as well as expertise in private and in public institutions has been one of the major barriers to the development of the CDM market. CDM indeed requires specialized skills and a continuous watch on the development of methodologies and innovation in the field.

In most countries in the region, the economic structure, particularly in the private sector, is mainly composed of small-size projects that are unattractive to carbon buyers. Major projects are mainly in the public sector; however, public procurement procedures are often inadequate and too heavy compared to the specificities of the carbon market, which discourages potential buyers.

Finally, it is worth reminding that the commitment period of the protocol Kyoto ends at the end of 2012. Thus, the deadline for registration of CDM projects is December 31, 2012.

3. Good Practices to be Promoted in the Region

Measures	Advantages	Drawbacks	Applicability to the Region
• **Development Approach**			
Feed In Tariff FIT)	• Strong political signal • Good promotional tool • Management Ease • Transparency	• Difficulty to control the market if prices are too high (bubble effect) • Difficulty to make bear additional cost by electricity consumers in low consumption base • Strong reluctance of electrical distributors	-
(Net Metering)	• Easy to implement and manage • Less costly to the State • Can lead afterwards to a system of feed-in tariff • Transparency	• Does not ensure good attractiveness if energy rates are low • Market skimming since economically attractive for consumers with high tariff bands • Reluctance of electrical distributors	++
System of Green Quotas and Certificates	• Strong political signal policy in relation to distributors	• Mandatory measure resented by distributors • Conflict sometimes with the requirements of financial stability of distributors • Need for quotas monitoring system • Difficulties in establishing a national market of green certificates in small countries	-
• **Incentive Systems**			
Indirect Tax Benefits	• Easy to implement • Low pressure on public finances	• Low political visibility • Low efficiency in the case of the existence of the informal market • Difficulty in applying concerning the cost of services (installation, distribution)	++
Direct Tax Benefits	• Strong political signal • Low pressure on public finances (excluding tax credit)	• System does not allow a swift reduction in the prices of the installations market • Low efficiency in the case where the rate of tax avoidance is high • Complexity of implementation and management (high transaction costs) • Pressure on public finances in the event of tax credit system	-
Public Investment Subsidy to Users	• Strong political signal • Immediate effect on reducing investment costs for users • Good communication tool • Stimulator effect on offer	• Inflation measure, in case of grant over-sizing • Pressure on public finances • Weak sustainability, if sustainability measures are not considered • High transaction costs	+
Specific Loan System	• Reduces the constraint of users investment capacity • Ability to neutralize loan repayments through the gain on the electricity bill • Mobilization of the banking sector • Good communication tool	• Exclusion of the unbanked population • Transaction costs and high payment default risk	++

Measures	Advantages	Drawbacks	Applicability to the Region
Interest Rate Subsidy to Users	• Good communication tool • Improves profitability for the user	• Pressure on public finances • High transaction costs • Weak sustainability, if sustainability measures are not considered • Distortion of the financial market	+
Dedicated Loan Line	• Enables to solve the problem of financial resources upstream • Mobilization of the banking sector	• Process of line implementation often long • Problem of covering exchange risk	++
User Loan Guarantee System	• Allows easy access to loans • Stimulating effect for banks	• Implementation complexity • Risk of drift and complacency on collection	-

- Poorly Feasible + Moderately Feasible ++ Highly Feasible with Some Preliminary Measures

***TABLE 15**: SUMMARY OF RE FINANCING MEASURES AND THEIR APPLICABILITY IN THE CONTEXTS OF NORTH AFRICAN COUNTRIES*

4. Financing Prospects of Renewable Energies in the Region's Countries

4.1. Financing Needs

On the basis of the objectives announced by the countries, a summary assessment of investment needs has been conducted. The total needs are estimated at 68 billion Euros, broken down by sectors and countries as follows.

	Goals expected by	Wind	PV	CSP	Solar Water Heater	Total
Algeria	**2030**	3 000	5 600	21 600	-	**30 200**
Egypt	**2030**	10 800	3 000	-	-	**13 800**
Morocco	**2020**	3 000	-	6 000	510	**9 510**
Tunisia	**2030**	2 250	4 000	1 800	600	**8 650**
Libya	**2020**	2 250	1 600	1 350	300	**5 500**
Total		**21 300**	**14 200**	**30 750**	**1 410**	**67 660**

*TABLE 15: **Funding Needs of REN Programs in the Region's Countries***

Investment in CSP represents about half of the needed investment followed by wind (30%) and PV (20%).

The heaviness of these investments raises the crucial question of the ability of countries to mobilize financial resources to finance these investments.

4.2. Funding Sources Dedicated to REs in the Region

Funding sources can be divided into three categories:

- Sources for the granting of loans
- Sources of direct incentives (subsidies to RE)
- Support sources for equity

4.2.1. Loan Resources

In the region, access to loans for renewable energies is often hampered by significant difficulties for several reasons, including basically two:

Low profitability of RE projects in the region given grants to conventional energy; this makes the project unattractive to banks.

Weak awareness and limited knowledge by banks of such projects; in particular, banks have difficulty to assess the level of technical and financial risks associated with these projects and thus reject funding requests.

For this reason, some countries in the region have allocated specific loan lines with attractive cost terms and maturation duration. Some banks have even set up guarantee funds to reassure banks regarding the risk associated with funding these projects.

Country	Funding Source
Algeria	- Possibility to obtain loans from the FNME at 0 rate - Possibility of loan guarantee by the FNME
Morocco	- Guarantee fund for collective thermal solar energy (FOGEER)
Tunisia	- Loan line dedicated to energy management at €40 million by the AFD at subsidized rates and long duration - Long-term loan line dedicated to energy management at $50 million by the World Bank - Loan line from a private bank to finance the acquisition of CES (Attijari Bank). Guarantee of the loan line is insured

TABLE 16: Main Loan Sources in the North African Region
(Source: Various National Sources)

4.2.2. Sources of Direct Incentives

To ensure the sustainability of the system of incentives for RE in a country, it is important that subsidies are backed by stable financial resources not abiding by sectoral arbitrations of the State's budget. In this context, two experiments are relevant in the region, namely Algeria and Tunisia.

Tunisia

The National Fund for Energy Conservation (FNME), established in 2005, is the instrument of financial support for the policy of energy conservation in Tunisia. The FNME is fed by earmarked taxes from a share of the tax due on the first registration of cars in a Tunisian series and, on the other hand, the tax due on the importation or local production of air-conditioning appliances.

From the use point of view, the FNME finances grants under the law on energy efficiency and related texts.

Algeria

The National Fund for Energy Conservation (FNME) was established by the 2010 Finance Act to support the Algerian energy conservation policy in general, and the 2010-2014 national energy conservation program (PNME) including renewable energy activities (law promoting renewable energies, August 2004).

Ultimately, the FNME aims to help boost and develop a market of energy efficiency, in particular through:

- Granting of loans through contest,
- Granting unpaid loans or at reduced rates
- Loan guarantee.

The FNME has stable resources coming mainly from:

- Taxes on energy consumption;
- State subsidies;
- Proceeds from taxes on energy consuming devices;
- Fines provided under the energy management law;
- Proceeds from loan repayment;
- Other resources or contributions.

4.2.3. Equity Support Sources

One effective means of promoting large renewable projects is risk sharing with project sponsors by taking stake in corporate capital and capital exit, once the project is launched.

The only relevant experience found in the region is the **Energy Investment Company** (**SIE**) in Morocco.

The SIE is a public limited liability investment company with a capital of one billion MAD ($ 100 million)[5], which was created in 2010 by Decree No. 2-09-410 to support the State's efforts in the implementation of its energy conservation policy.

It has as main objective supporting the national development plan relating to renewable energy with high environmental quality through:

- Contribution as investor in the wind power integrated development program of 1000 MW in partnership with ONE;
- Investment in wind power projects by private developers (incl. EnergiPro Program 1000 MW);
- Supporting the implementation of the Moroccan Solar Plan 2000 MW in partnership with MASEN
- Investing in EE projects and supporting the ADEREE action as investor

The SIE acts as **investment fund** through active minority stakes in companies carrying out concrete profitable projects, whose industrial feasibility is proved. Its equity is formalized by the establishment of a protocol of associates spelling out transparent governance terms with clear exit strategy.

4.2.4. Funding Linked to the UNFCCC

Lessons learned from the CDM in the region:

Context of International Negotiations on the Climate

The 2007 fourth IPCC report found that compared to the preindustrial era, the temperature increase should not exceed 2 degrees to avoid a climate disaster. In order to achieve this goal, global emissions should be reduced by 50% by 2050 compared to 1990. Industrialized countries must reduce their emissions by 25% to 40% by 2020? and 85% by 2050 while the major emitters in developing countries will have to reduce the level of emissions in 2020 from 15% to 30% according to a baseline scenario.

In response to these findings, the Conference of the Parties in Copenhagen reached an agreement confirming the involvement of developing countries in efforts to reduce GHG emissions through a new mitigation financing instrument, i.e. NAMAs (Nationally Appropriate Mitigation Actions). They include all actions, measures, programs or policies to reduce emissions of greenhouse gas emissions in developing countries.

[5] Shareholders are mainly the State and the Hassan II Fund.

The elements of the Agreement were subsequently confirmed and specified at the conferences of parties in Cancun and Durban, and more recently the Bonn meeting. The main elements are as follows:

- NAMAs should be subject to MRV system (measurement, reporting and verification) to be eligible with the UNFCCC.
- To support developing countries in the fight against climate change including NAMAs, industrialized countries have committed to mobilize two types of funding:
  - Fast financing between 2010 and 2012 at $30 billion including capacity building and launching pilot NAMAs.
  - Long-term financing which will be operational from 2013 to mobilize $100 billion per year by 2020.
  - Creating a green fund which will be dedicated to finance all the activities in the field of climate change. This fund will be managed during the first three years by the World Bank.
- Obligation of developing countries to prepare a biannual report which aims at measuring their efforts in reducing emissions of greenhouse gases. The first report shall be submitted to the Secretariat of the Convention in December 2014.
- Decision to implement a new climate regime in 2015, which will be in force in 2020, with the extension of the Kyoto Protocol beyond 2012 with the involvement of all countries that have ratified the Convention on Climate Change.

Nationally Appropriate Mitigation Actions (NAMAs)

In accordance with the Bali Roadmap, the Copenhagen Agreement and the Cancun Agreements, developing countries are expected to undertake appropriate mitigation actions according to their context (Nationally Appropriate Mitigation Actions: NAMAs) to contribute to the international effort to limit the temperature increase by two degrees. They include all actions, policies, programs or projects to reduce GHG emissions in a measurable and verifiable way.

Two types of NAMAs are distinguished:

- NAMAs supported internationally with financial support from industrialized countries (NAMAs supported)
- Unilateral NAMAs that are done without financial support (unilateral NAMAs)

Implementation of NAMAs can also take several forms:

- An aggregated level which sets an overall target for reducing GHG emissions. Two goals are considered:
  - One goal in terms of absolute value of GHG reduction at a given time compared to a reference year (Example: X million reduction of GHGs by 2020 compared to 1990)

  - One goal in terms of relative value of GHG reduction at a given time compared to a reference year (example: X% reduction of the carbon intensity in 2020 compared to 1990*)*

- Disaggregated level of reducing GHG emissions. Reduction goals may focus on sectors (electricity, industry, building ...), segments (wind, solar, ...) or uses (heating, cooling, ...).

NAMAs Prospects in the Region

NAMAs may be a potentially important source of specific funding for renewable energy development in the region. Although the procedures for NAMAs implementation are not yet clearly defined by the members of the Conference of the Parties, it is essential for the countries of North Africa to be prepared well in advance to avoid gaps committed at the MDP level. This preparation can be done at several levels:

- Training and specific capacity building in this field both in terms of private expertise and concerned public institutions (Agency for Energy Preservation, Ministries in charge of Energy, Electricity Companies, etc. .).
- Implementation of strategies that should offer all actions to be taken to ensure the transfer of technology and quick access to funds from the entry into force of NAMAs.
- Developing portfolios of potential NAMAs and their prioritization by national criteria to define.
- Identifying and developing priority NAMAs to quickly accede to funding from the Green Fund.
- Developing pilot NAMAs in the field of renewable energies and more globally energy management in collaboration with bilateral and multilateral cooperation. This will allow visibility on the international scene, on the one hand and learning by doing, on the other hand.

Finally, it should be noted that at present, such initiatives are almost non-existent in the region. We were able to identify only two actions underway in Morocco: the development of one NAMA on the Moroccan Solar Program and the wind program.

4.3. Obstacles to Private Investment in RENs

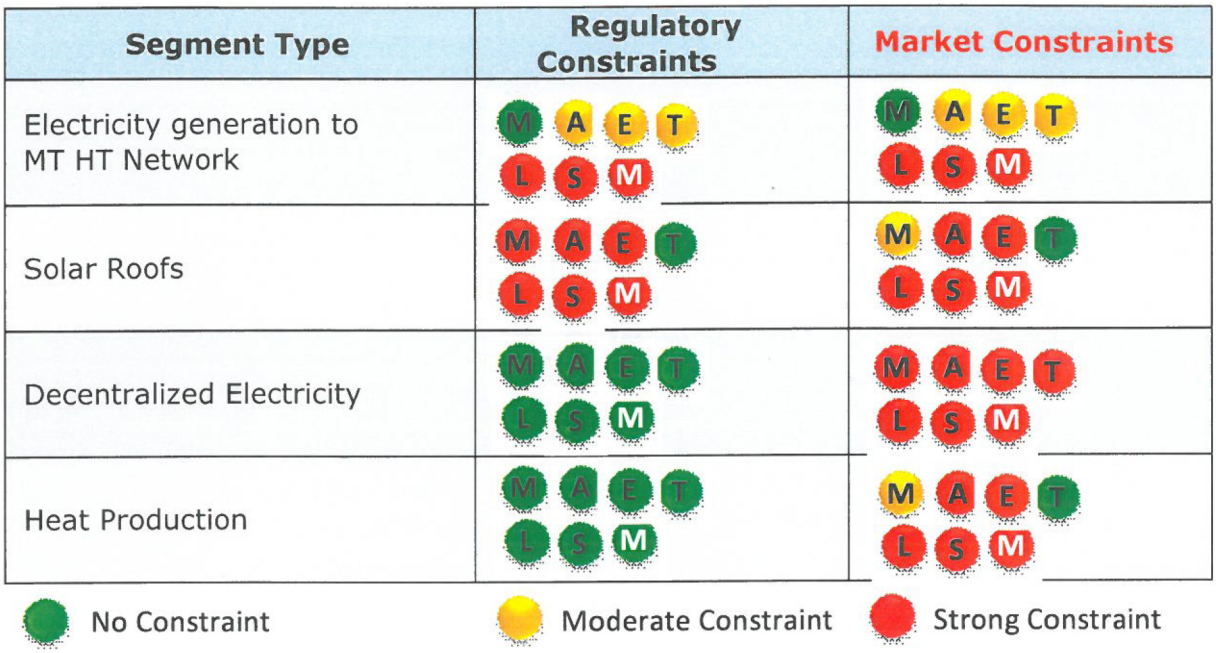
Given the scale of investment required, the private sector will have a key role in contributing to the funding of the implementation of national REN programs set by States.

However, the private sector faces various obstacles whose size varies depending on the context of each country. In general, these obstacles are of two kinds:

- Regulatory constraints which simply prevent investors from developing projects. For example, prohibition from the access to the electricity grid for developers of electricity production from renewable energies.
- Market constraints which are summed up as follows:
  - Low profitability of some renewable energy segments for investors due to the high subsidies to conventional energy

- High cost of access to finance for investors
- High country risk for capitalistic sectors in some countries, etc.

The following diagram shows the magnitude of these constraints, by country and by type of industry.



A	E	M	M	L	S
Algeria	Egypt	Morocco	Mauritania	Libya	Sudan

VI. Conclusions and Recommendations

First, Regulatory Obstacles

RE Development in the North African region faces first inadequacies of regulatory frameworks in the region's countries. This problem concerns mainly projects of electricity generation from renewable energy injected into the grid. Indeed, apart from a few countries such as Morocco, access to the electrical grid for the sale of produced electricity is often limited or even prohibited. In this case, even with the most interesting profitability conditions, projects cannot be created. This is what explains the slow development of wind projects in the region, despite the grid parity in several countries where high quality sites exist.

Need for Specific FundingMechanisms

In addition to this major constraint, there are profitability constraints of RE projects, given the subsidy to conventional energy introduced by the States to protect the poorest social strata and national economic operators.

This applies both to large projects of renewable electricity production and diffuse projects (solar water heater, individual PV, etc.).

Under such conditions, conventional financing systems (banking, etc..) are often insufficient to launch the RE market in the region's countries, hence the need for specific funding measures to take into account the specific characteristics of these projects.

In order to address these mechanisms, it is necessary to distinguish the two families of RE projects, including major capital projects requiring concentrated investments (high power wind, solar, etc.). Diffuse smaller investment projects (SWH, individual PV, etc.).

As far as capital-intensive projects are concerned, experience in the region has shown the limitations of the pure public financing approach in the change of scale in these segments (Tunisia, Egypt, etc.). As a matter of fact, the process of project development will be sooner or later blocked by the constraints of public finances (government debt, public limited budget, etc.).

On the other hand, some experiences in the region (Morocco and Algeria in particular) show the interest of a funding approach based on Public Private Partnership. In fact, more than 1,000 MW of wind projects have been launched in Morocco on the basis of this approach in addition to the 125 MW of CSP in Ouarzazate.

Even better for the development of this market, the pure private approach can result in two variants:

- Variant of self-generation of electricity from renewable sources (case of Tunisia and Morocco)
- Variant in feed in tariff

The PPP or private approach can be supported by dedicated investment funds like the Energy Investment Company in Morocco whose role is to initiate projects through equity participation in the capital projects.

Finally, the applied purchase rates must be well defined to allow attracting investors, as well as ensuring positive outcomes for the community.

Concerning diffuse projects, their nature implies the need to develop innovative financial mechanisms combining relevantly several measures. These mechanisms are often based on three main components, namely:

- Reductions in indirect taxes (VAT, DCT, etc..) to reduce the cost of equipment and make it more profitable;
- Granting public subsidies for the purchase of renewable energy equipment to lower their costs for the consumer;
- Access to loan on favorable terms to overcome the constraint of limited investment capacity of consumers*;*
- Adequate loan distribution system enabling access to largest number of consumers, while minimizing risks and transaction costs.

Industrial integration, one means to maximize the economic viability of RE development

Public subsidies to be given to RE whether through attractive purchase prices, direct subsidies or tax cuts must be justified economically. Furthermore, subsidies avoided by

the State with the consumed primary energy, the development strategy of renewable energy in the countries of the region should also justify the creation of direct and indirect employment generated by the integration of segments considered.

For this reason, the RE development strategies should be designed in a holistic approach taking into account the possibilities of integration in industrial countries. This requires the establishment of a whole component of technology transfer and local capacity building in the various businesses required.

Carbon Finance

RE development strategies in the countries of the region should be defined in the context of a comprehensive policy of low carbon development. Aside from the clean development mechanism that reaches maturity in late 2012, new funding under the UNFCCC are being put in place and should be exploited. They concern particularly NAMAs (Nationally Appropriate Mitigation Actions). They include all actions, measures, programs or policies to reduce greenhouse gas emissions in developing countries. Two types of NAMAs are distinguished: NAMAs supported internationally with financial support from industrialized countries and unilateral NAMAs without financial support.

To support developing countries in the fight against climate change including NAMAs, industrialized countries have committed to mobilize through a new fund (Green Fund) $100 billion per year by 2020.

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Appendix

Appendix 1: Compendium of Good Practices in the Region

Tunisia

PROSOL Mechanism for the Development of Solar Water Heaters in the Residential Sector

The PROSOL mechanism is now the major determinant of SWH market in Tunisia, by the very nature of its incentives, its procedures and its actors. PROSOL mechanism is an integrated solution designed to remove the main financial, technical and organizational barriers against the development of SWHs market. The mechanism is based on:

- Providing a public subsidy amounting to 20% of the SWH price with a maximum of TND 100 per m2 of collectors on every purchase of SWH to reduce the payback time for the final consumer. This subsidy is awarded by ANME from the resources of the National Fund for Energy Conservation (FNME);
- Granting consumers a bank loan repayable over a period of five years, with a collectability through the STEG invoice. Four loan levels are put into service (TND 550, TND 750, TND 950 and TND 1150) within the framework of the STEG/Attijari Bank Convention signed on January 23, 2007, allowing direct access to bank financing through the commitment to adhere to PROSOL (Authenticated signature of the membership Form to PROSOL);
- Quality system based on an upstream and downstream control, by ANME, of suppliers and their products marketed in the program. The upstream quality control system is based on a set of requirements relating to SWH performance, warranties and sales support service translated into the specification of eligibility to PROSOL program, published in 2005 and revised in 2007. The downstream quality control system is provided by ANME through verification visits on the basis of a representative sample from the PROSOL computer management application and/or complaints received from SWH purchasers.

PROSOL Key Players

The organizational structure of PROSOL is based on five key players, including:

- **National Agency for Energy Preservation** whose role is summed up as follows:
  - Management of the SWH public subsidy
  - Endorsing operators and operations quality control;
  - Negotiation with international donors to mobilize funds;
  - Training of actors, citizen awareness rising and promoting the program;
  - Periodic mechanism monitoring and evaluation.
- **Bank**

  Bank of the mechanism (currently Attijari Bank) contributes to the program by providing the STEG a loan line at interesting rate for distribution to consumers for the SWH purchase.
- **STEG**

  STEG plays a fundamental role in the mechanism by ensuring:
  - The payment of the loan amount paid directly to the supplier's bank
  - Billing of loan repayments and collection via electricity bills over a period of 5 years.
  - Guarantee of loan repayment by the client disconnection from the electric service in case of default of payment.
  - Transfer of funds collected from the program bank.
  - And collection is carried out through the STEG invoice over a period of 5 years.

In return for its intervention, STEG perceives the amount of approximately € 13 per case handled as management fees. This amount is to be increased by € 5.

- **The Chambre Syndicale Nationale des Energies Renouvelables** works to increase the quality of the equipment and installation services through training of stakeholders and their labeling. It also plays an important role in information, communication and coordination between professionals to protect the market against defects and poor quality.
- **Suppliers and installers that must be accredited** by ANME and provide a guarantee of equipment and services to SWH customers.
- **The Consumer** who must adhere strictly to the mechanism and enforce its rules by signing a contract to join the program.

Mechanism Management Procedures

PROSOL mechanism is managed by a set of procedures listed in the procedures manual of the program management unit at the ANME. In simplified terms, these procedures are described by the following schematic layout:

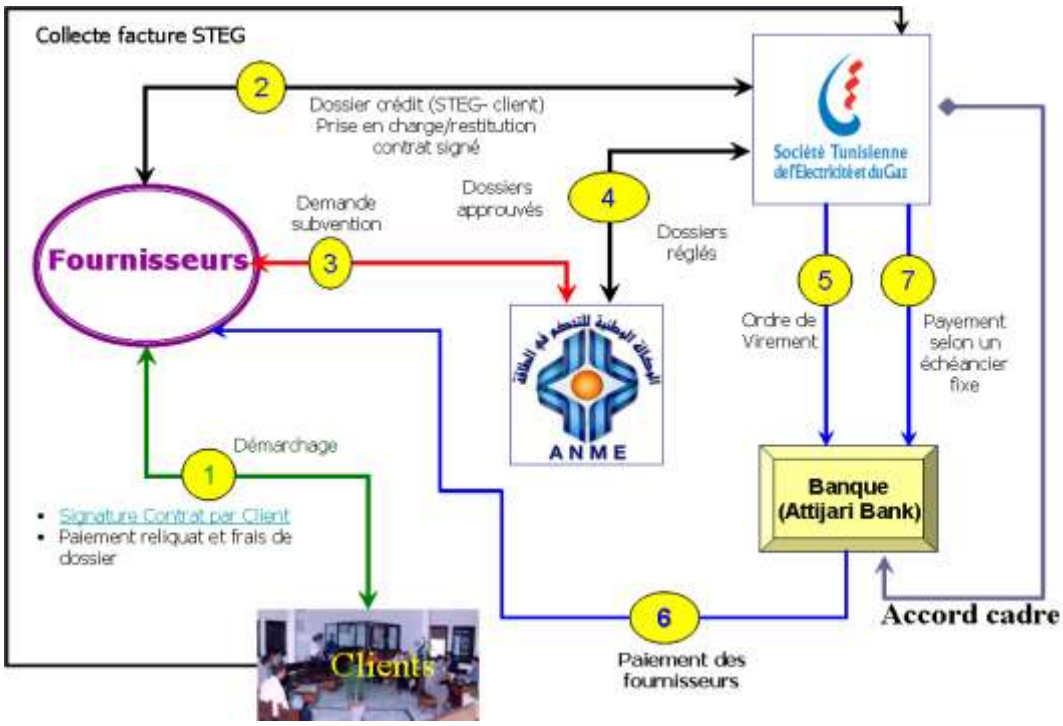


***DIAGRAM 16*: Schematic layout of the PROSOL mechanism procedures**

Collecte Facture STEG	*STEG Invoice Collection*
Dossier crédit (STEG-client) Prise en charge/restitution	*Loan File (STEG-Customer) Support/restitution*
Contrat signé	*Signed contract*
Fournisseurs	*Suppliers*
Demande subvention	*Grant Application*
Dossiers approuvés	*Approved applications*
Démarchage	*Canvassing*
Signature Contrat par client	*Agreement signed by customer*
Paiement reliquat et frais de dossier	*Remaining payment and file fees*
Dossiers réglés	*Settled cases*
Ordre de virement	*Transfer order*
Paiement selon un échéancier fixe	*Payment according to a fixed schedule*
Banque (Attijari Bank)	*Bank (Attijari Bank)*
Paiement des fournisseurs	*Payment of suppliers*
Accord cadre	*Framework agreement*

The mechanism management is based on a "Management Information System" (MIS), which manages all financial and information flows and decisions relating to the intervention of actors.

Implementation of procedures within and between actors governing the program generates delays in processing files which impose the pace of payment of different actors, including suppliers.

The general rule of subsidy payment deadlines by ANME and loan by STEG is as follows:

- ANME grant is released to the supplier on the 15th day of the month m+1, m being the date of submission of the customer file to ANME by the supplier.
- The loan is released by the STEG to the supplier on the 3rd day of the month m+3, m being the date of submission of the customer file to the ANME by the supplier.

The following diagram is an example of contractual deadlines relating to the release of subsidy by ANME and the payment of the loan amounts to the supplier.

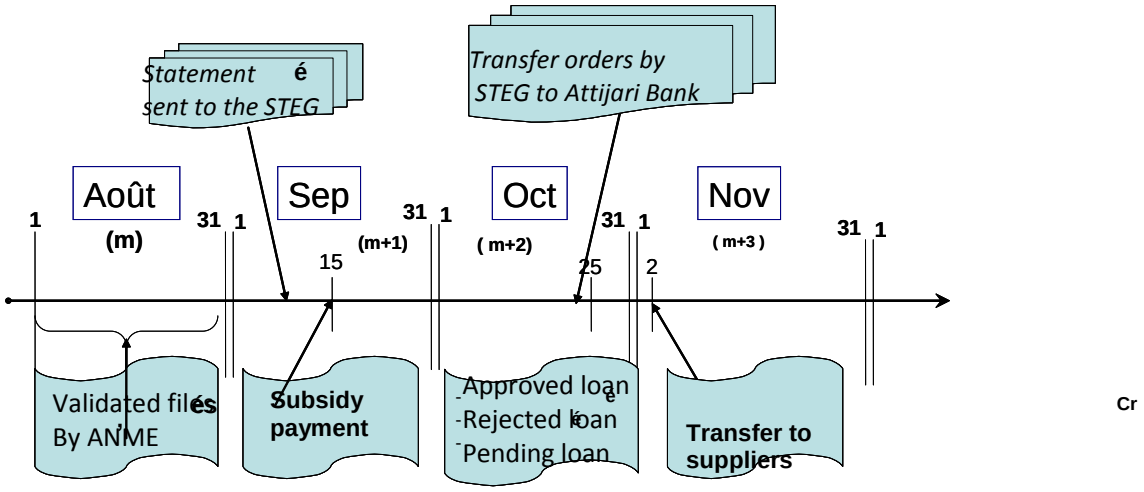


DIAGRAM 17: ***Contractual Deadline of Subsidy Release by ANME***
(Source: ANME)

Mechanism Impact

The Tunisian experience in the dissemination of solar water heaters is very old. It started in the early 80s, with a national manufacturing through the public company Serept Energie Nouvelle (SEN). This manufacturing was succeeded by a marketing based on a consumer loan system over a period of 7 years whose collection is assured via the electricity bill. However, for reasons of technological preservation, the market has experienced serious difficulties shifting from about 5000 m² per year in the late 80s to a few hundred square meters in the mid 90s.

The market was then re-boosted through the GEF project based on the subsidy on the purchase price up to 35% and the implementation of quality control procedures to restore consumer confidence. The project enabled to re-boost the market, restore the image of the solar technology and create a real fabric of local operators. However, the project was stopped in late 2001 with the exhaustion of the funds provided for the grant (6.6 million USD). Afterwards, the market experienced a significant decline to less than 8000 m2 in 2004.

It was not until 2005 to see a downright growing trend of the market through the implementation of the program to promote water heating by solar energy leaning on the PROSOL mechanism launched by ANME with contribution and support by UNEP, MEDREP and GTZ-ER, this mechanism is based on:

- Granting a public subsidy of 100 dinars per m2 of collectors on every SWH purchase so as to improve the return time for the final consumer;
- Providing the consumer with a loan to be repaid over five years, with a collection ensured via STEG invoice.
- Quality system based on upstream and downstream control of suppliers and their products.

"PROSOL-Tunisia" has created a real SWH market in Tunisia since it enhanced the pace of facilities from 7000 m² in 2004 to more than 80,000 m² in 2012. The success of the initial version of PROSOL in the residential sector has provided a basis for the extension of the mechanism to the tertiary sector (in 2009) and industrial sector in (2012). The current development of the SWH market in Tunisia set at more than 80000 m² in 2010 owes its growth to the **PROSOL mechanism**, as shown in the following graph:

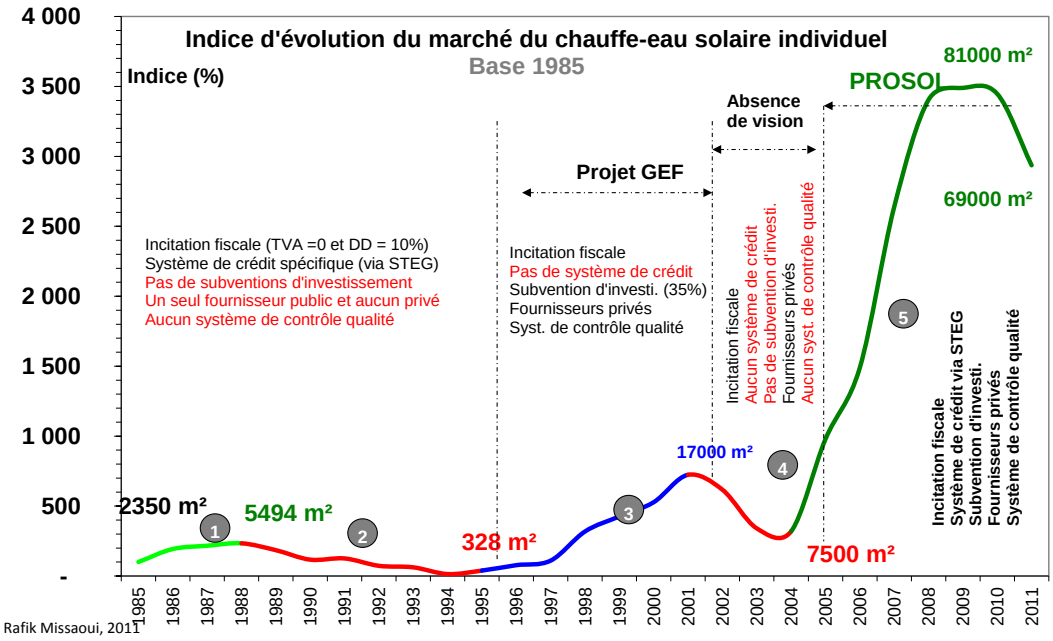


*DIAGRAM 18: **Evolution of the SWH Market in Tunisia Since 1985***
(Source: Rafik Missaoui, 2012)

Indice d'évolution du marché du chauffe eau solaire individuel	**Market Development Index of Individual Solar Water Heating**
Indice (%)	Index (%)
Base 1985	Basis 1985
Incitation fiscale (TVA = et DD =10%)	Tax incentives (VAT = and DD = 10%)
Système de crédit spécifique (via STEG)	Specific loan system (via STEG)
Pas de subventions d'investissement	No investment subsidies
Un seul fournisseur public et aucun privé	One public supplier, none private
Aucun système de contrôle qualité	No quality control system
Projet GEF	GEF project
Incitation fiscale	Tax incentive
Pas de système de crédit	No loan system
Subvention d'investi. (35%)	Investment subsidy. (35%)
Fournisseurs privés	Private suppliers
Syst. de contrôle qualité	Quality control system
Absence de vision	Lack of vision

As demonstrated in the table below, the impacts in terms of energy and economy are quite important:

	2005	2006	2007	2008	2009	2010	2011	Total 2000-2011
Installed capacity (m²)	22,000	33,362	60,000	80,000	82,000	81,000	69,000	427,362
Accumulated capacity (m²)	22,000	55,362	115,362	195,362	277,362	358,362	427,362	427,362
Annual energy saving (toe)	1,230	3,094	6,448	10,919	15,502	20,029	23,885	81,106
Energy saving over expected lifetime (toe)	18,444	27,969	50,301	67,068	68,745	67,906	57,846	358,279
Total investment (MTND)	11.7	15.6	28.7	38.9	39.8	40.9	34.9	211
Expenses FNME (MTND)	1.9	2.9	5.0	7.0	6.9	7.3	6.7	38
Subsidies annually avoided by the government (MTND)	0.6	1.7	4.2	7.9	8.1	18.3	21.3	62
Total cost of the avoided toe (TND)	633	559	570	580	579	603	603	588
Toe cost avoided for the FN ME (TND)	101	103	99	104	100	108	116	105

TABLE 7: Main impacts of the PROSOL program
(Source : Rafik Missaoui)

During the period from 2005 to 2011, the overall public subsidy granted to the SWH field is estimated to 38 MTND. Over the same period, the avoided public subsidy to LPG for each program is estimated to 62 MTND[6]. Hence, during the period from 2005 to 2011, the Prosol program enabled the government to make a benefit of 1.6 times the amount of the subsidy granted to the SWH field. This amount does not include the future savings generated by the SWH over its expected lifetime. In this case, the Prosol program leverage effect should be 5.7 times (avoided subsidy 213 MTND[7]).

We can assess Prosol's benefits to the Tunisian government by calculating the time needed by the government to completely recover the subsidy granted via the FNME (*National Fund for Energy Conservation*) by means of the amount of avoided subsidies thanks to the LPG shifted consumption (payback time for the government).

	2005	2006	2007	2008	2009	2010	2011	Average 2005-2011
Average subsidy FNME/m² for SWH	85	87	83	88	84	90	97	**88**
Average subsidy for avoided GPL/year/m² for SWH	25	31	36	40	29	51	50	**38**
Average payback of the FNME subsidy for the government	**3.4**	**2.8**	**2.3**	**2.2**	**2.9**	**1.8**	**1.9**	**2.3**

TABLE 8: Index of PROSOL Profitability for the Government
(Source : Rafik Missaoui)

The table above shows that, during the period from 2005 to 2011, **the average payback time of the FNME subsidy varies between 3.4 and 1.8 years, with an average of 2.3 years. This means that it is an excellent "investment" for the government.**

As far as the community is concerned, the average cost of the avoided overall toe is TND588, compared to USD780 of the LPG toe in the international market. The public contribution to the coverage of this cost is estimated to 105 TND only per avoided toe, in addition to the Prosol management costs borne by the ANME. Other impacts on the community can be assessed by many factors, such as, the generated business opportunities, the industrial opportunities, and the creation of new jobs.

- Investments amount: 211 MTND, including around 38 MTND of government's participation, with a leverage effect of around 6.
- Around 1,500 direct jobs created during the 2005-2011 period.
- Over 40 suppliers in 2012, compared to 6 suppliers in 2004.
- 6 manufacturers in 2012 (1 manufacturer in 2005) covering 80% of the market and exporting to Morocco, Egypt, South Africa, France, amongst others.
- Over 120 SWH designs placed on the market in 2012 compared to 20 designs in 2004.

[6] Subsidy per toe: (Average import price – average LPG take-back price + taxes collected by the government) X saved quantity of primary energy.
[7] Assuming that all along the SWH expected lifetime, the balance of the average import price and the take-back price remains equal to the balance of the year of installation.

Therefore, Prosol is a real win-win mechanism that gathers many stakeholders and proves its sustainability.

The tertiary PROSOL Mechanism

The mechanism is based on the following:

- The granting of a public subsidy of 30% of the SWH price with a maximum limit of 150 TND per m^2 of sensors in each SWH purchase in such a way to reduce the payback time for the developer. This subsidy is granted by the ANME on the resources of the National Fund for Energy Management (FNME);
- An extra premium of 10% granted by the Italian Cooperation through the MEDREC. This extra premium is used to improve the interest rate by 2 points for the loans granted to hotels developments, and to improve the maintenance cost during 4 years after the year of warranty.
- A monitoring system based on the products and suppliers eligibility according the existing criteria and the organization of the field and the qualification of the operators (Engineering offices, Monitoring offices, contractors, etc.)

Thanks to this program, around 5,000 m² systems have been installed since 2008.

The PROSOL-Elec mechanism

Following the success of the PROSOL financing mechanism, the Tunisian government set up a similar mechanism in 2010 in order to develop the PV solar system connected to the Low voltage network in the residential areas.

Hence, in order to provide the requirements needed to promote solar buildings in residential areas, Tunisia has established the PROSOL ELEC program based on innovative financing mechanism by means of effectively combining investment subsidies and loans.

Description

In its first pilot phase, which aims at installing 1.5 MW during the 2010-2011 period, the financing mechanism of the PROSOL ELEC program is based on the following incentives:

- **Subsidy granted by the National Fund for Energy Management (FNME)** of 30% of the photovoltaic plant investment cost with a maximum limit of 3,000 TND per kWp and 15,000 TND for each photovoltaic plant;
- **Extra premium of 10%** of the investment cost granted by the Italian Ministry for Environment and Territory (MIET) via the Mediterranean Renewable Energy Centre (MEDREC);
- **Commitment of the National Company for Electricity and Gas (STEG) to bearing the cost of the inverter**;
- Subsidized loan with an interest rate of 0% for a period of 5 years. It can go up to 3,000 TND per kWp with a maximum limit of 6,000 TND, and is payable in the STEG invoice. This loan is granted within the framework of a credit line put at the disposal of the STEG by a private bank chosen by way of competition (ATTIJARI BANK). The STEG guarantees the recovery of the loans for the bank as well as the payment guarantee by means of cutting power should the client fail to pay.

In its second phase (currently being installed), the PROSOL ELEC shall provide the subsidy scheduled by the FNME as indicated below as well as a loan over 7 year with an interest rate of TMM (*Money Market Rate*)+1.2, be it around 4.5%.

The invoicing is made by the STEG on the basis of the « net metering » principle, be it on the basis of the credit if the supplied energy (by the STEG) exceeds the energy provided (by the producer) and on the basis of the tariff in force which is determined by decision of the Ministry in charge of energy.

Société tunisienne d'électricité et du gaz	*The Tunisian Company for Electricity and Gas*
Un ensemble de panneaux photovoltaiques	*A set of photovoltaic panels*
Générateur photovoltaique	*Photovoltaic generator*
Onduleur	*Inverter*
Un ensemble d'onduleurs transformant le courant continu en un courant alternatif	*A set of inverters that turn direct current into alternating current*
Habitation	*Household*
Compteur de consummation	*Consumption meter*
Compteur de production	*Production meter*
Un système de comptage permettant de mesurer l'énergie électrique totale produite par le système et celle injectée au réseua électrique	*A metering system allowing the measurement of the total electricity power produced by the system and the power injected into the electricity network*
Réseau de distribution	*Distribution network*

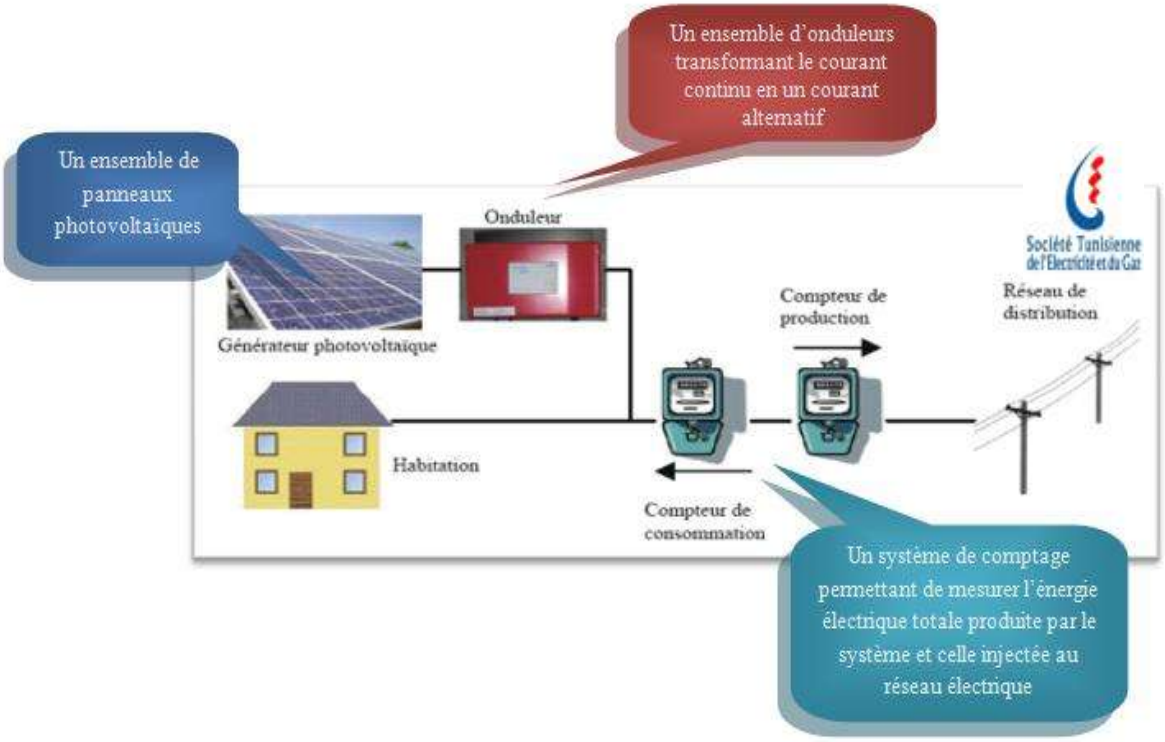
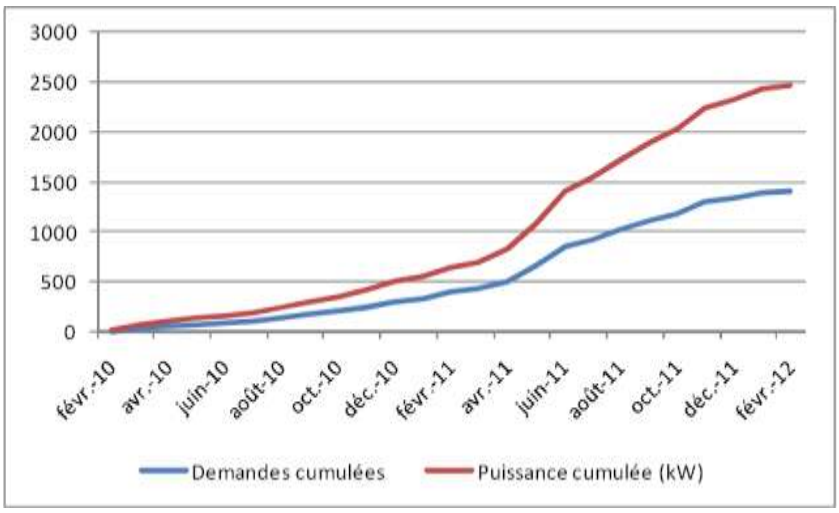


*DIAGRAM 1: **Sketch of the Prosol-Elec Principle***
(Source : ANME)

If the quantity of the provided power is higher than the supplied power, the balance shall be included in the producer's invoice for the next billing cycle.

Impact

Since the establishment of the PROSOL ELEC program in Tunisia, the market of photovoltaic systems connected to the grid has been in constant growth. Thus, the number of application for connection to the National electricity network reached 1,400 subscriptions with a total of 2.4 MW during the period of the program. The diagram below shows the monthly progress of these achievements:



Accumulated subscriptions *Accumulated power (kW)*

DIAGRAM 2: Progress of the PROSOL ELEC program
(Source : ANME)

During the Prosol-Elec pilot phase, 739 installations with almost 1,300 kWp have been completed. During this period, the program enabled to avoid around 900 toe of primary power or 12,700 toe over the expected lifetime of the systems.

Moreover, this program enabled the emergence of 30 companies specialized in this field and the establishment of the first plant for photovoltaic modules in Tunisia, with an annual production capacity of 25 MWp.

The National Fund for Energy Management

The National Fund for Energy Conservation (FNME) which was created in 2005, is a financial support instrument for the energy management policy in Tunisia. The FNME is financed by earmarked taxes from both taxes on the first registration of tourism vehicles in a Tunisian series, and from taxes on imports or local production of air conditioning devices.

As far as usage is concerned, the FNME also helps financing direct financial benefits granted by virtue of the energy management Law and the taxes related to it. Many energy efficiency measures in various sectors as well as some renewable energy fields are eligible to FNME. With regard to renewable energy, the granted benefits are as follows:

Measures	Maximum limit
Solar and wind lighting and pumping in agricultural farms	✓ 40% capped at 20 000 DT
Electricity generation from biogas	✓ 40% capped at 100 000 DT
Production of electricity by households from solar photovoltaic LV grid-connected	30% capped at 2300 DT/ kWp capped at 15,000 DT / home
Individual solar water heater (SWH)	200 DT for solar water heaters of 1 to 3 m² surface sensor. 400 DT for solar water heaters of 3 to 7 m² surface sensor.
Tertiary solar water heater	According to the system size, the subsidy is made up of the following components: - 30% subsidy with 150 TND/sensor m² max. limit - 10% extra premium from the Italian cooperation - 10% extra premium for reduction of interest rate (2 points) and diminishing maintenance subsidy over 4 years.

Taxation Instrument

The direct aids granted by the FNME are complemented with energy management-specific tax benefits:

- Minimum customs fees and exoneration of the VAT on energy management equipments and products not available in the local market.
- Exoneration of the VAT on energy saving equipments and products purchased in the local market.

Besides these benefits, the general regime governed by the investments law, gives many advantages and aids to investment according to the concerned sectors and fields of investments.

Morocco

The FOGEER Guarantee Fund

Description

The PROMASOL program has been launched in 2001 by the Moroccan government in order to overcome the obstacles hindering the development of the solar thermal field. This program is based, amongst others, on the establishment of a Guarantee Fund for Energy Efficiency and Renewable Energy "FOGEER" securing the leasing companies which provide financing to the collective solar projects (especially hotels).

Since its launching with the support of the Italian Ministry for the environment & MEDREP, FOGEER has a budget of 10 MMAD and is managed by Dar Ad-Damane (guarantee organization). The said moneys are aimed at providing guarantee to the leasing companies on 70% of the leasing amount, with a maximum limit of 1.5 MMAD per project. The eligible projects shall have a fundable package between 300,000 MAD and 1.5 MMAD.

Impacts

FOGEER's primary aim is to guarantee 50 to 70 SWH collective installations. At the end of the project (2009), the actual completed works had been less than expected; around 20 installations with some 3,500 m².

The Energy Investment Company

The SIE (*Energy Investment Company*) is a public investment company with a capital of 1 Billion MAD (100 MUSD)[8]. It has been established in 2010 by Decree No.2-09-410 in order to support the government's efforts to implement its energy management policy. It is one of the main operators in financing renewable energy solutions and energy efficiency.

Objective

The primary objective of the SIE is to follow up the national schedule for the development of high-quality and environment-friendly renewable energy solutions, by means of the following:

- The contribution, as an investor, to the development of the integrated wind power program of 1,000 MW, in partnership with the National Office for Electricity (ONE);
- The investment in wind power projects owned by private developers (including the EnergiPro Program of 1,000 MW);
- The follow up of the completion of the Moroccan Solar Plan of 2,000 MW in partnership with MASEN;
- The investment in EE projects and backing of the ADEREE (*Renewable Energy Development and Energy Efficiency Agency*) activities.

Intervention Method

The SIE intervenes as an **investment fund** by means of active minority equity participations in the companies that conduct practical and profitable projects with proven industrial feasibility. These equity participations are made official by the establishment of a shareholders' protocol with transparent governance tools and a clear exit strategy.

The SIE intervenes only in profitable projects and applies a variety of distribution policies for the invested capitals in each field of renewable energy in order to limit its risks.

[8] The shareholders are mainly the State and the Hassan II Fund

In order to increase its resources leverage, the SIE promotes partnerships with other private investors and seeks to promote synergies and complementarities with institutional partners, such as the ONE, the ADEREE, and the MASEN. Finally, the SIE plans to reinvest all its income in new projects, which shows, again, the leverage of its contribution to the development of this field.

Setting up of public-private partnership; the case of the MASEN projects

The projects shall be conducted according to an IPP approach by means of bids. In this case, the independent producer produces and sells electricity to the MASEN for the price determined by competition while ensuring profitability for the investors.

Independant producer
Y : profitability selling price for the IPP
MASEN (Government, ONE, Hassan II Fund)
Price Differential (Y-X): borne by the government/cooperation
X: Fixed feed-in equal to the marginal cost of production
Overall ONE Feed-in tariff
ONE
Ultimate consumer

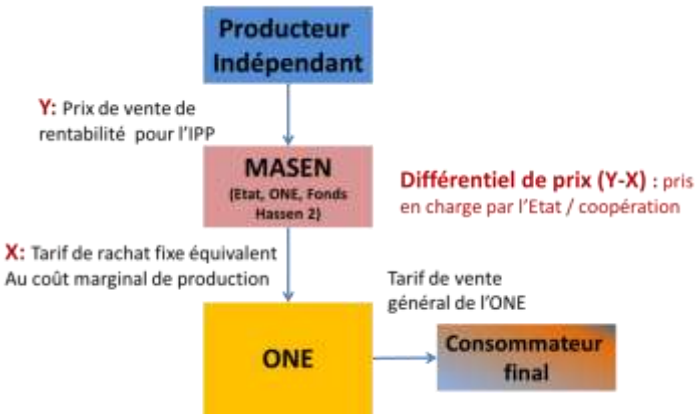


DIAGRAM 3: Organization scheme of the MASEN intervention in the financing of solar projects within the frameworks of the Moroccan Solar Plan
(Source : ANME)

The MASEN ensures mediation and then resells the produced power to the ONE for the feed-in price to be determined by this latter up to a ceiling that covers its economic costs (Cost recovery approach), which can be estimated to the average marginal production cost. This feed-in tariff shall be passed on to the ultimate consumer in the general tariff of the ONE.

SWH financing mechanism

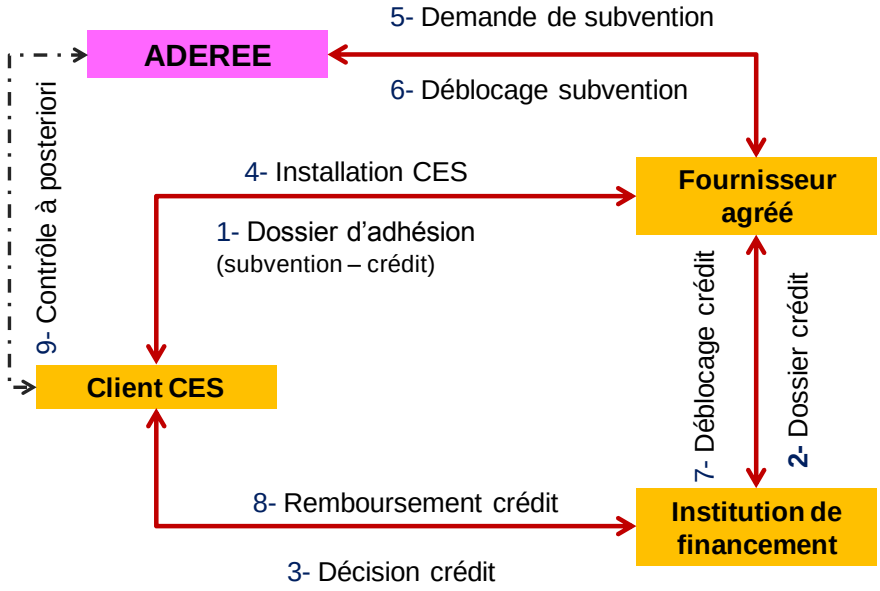
Morocco is currently establishing a special mechanism for the development of individual SWH.
This mechanism might be based on the following elements:

- Subsidy to the price of SWH which will be designed in such a manner that attracts consumers. This subsidy shall surely be limited in time;
- Consumer loan for the remaining amount of the SWH cost. The loan shall be due for payment during a period of 3 to 4 years with an interest rate of 9 to 10%.
- Quality control with the establishment of a firm quality control system (mainstream and downstream).
- Management information system which should be shared between the various stakeholders in order to facilitate the management mechanism.
- Communication and information by means of massive communication campaigns for the SWH (sport TV channel, exhibitions, etc.), while utilizing the subsidy as a selling point.

The mechanism should be based on the following principles:

ADEREE
Accredited Supplier
SWH Client
Financing institution

1. *Application file (subsidy - loan)*
2. *Loan file*
3. *Loan granting decision*
4. *SWH installation*
5. *Request for subsidy*
6. *subsidy Granting*
7. *loan Granting*
8. *loan reimbursement*
9. *monitoring*



Algeria

The Project Finance ; the case Hassi R'Mel plant

Description

Project funding or finance Project involves collecting, combining, and organizing the various funds contributions necessary to large-scale private, public, and mixed investments (i.e. transportation infrastructure, new industrial complexes, power production plant, etc.), while ensuring their financial sustainability.

Project funding differs from other financing methods (including "corporate" funding) as the funds contributions will mainly be paid by cash flows generated by the project itself.

The investor can draw many benefits from the said project, if compared to the "corporate" or "on-balance sheet" financing, such as:

- Deconsolidate the investment amount of its own balance sheet, given the large amount of money at stake.
- Defer most of project risks to a funding vehicle managing the project (company ad-hoc, project company, or SPV Special Purpose Vehicle): concept of *non-recourse financing*.
- Optimize the flow of funds in the form of equity (shareholder capital or equity) and bank debt: this optimization makes sure to maximize return on equity of the shareholder or sponsor of the project, while ensuring reimbursement of bank debts on acceptable terms to money-lenders should the project fail.

The project financing or the non-recourse financing concept requires from the banks, which master this expertise, an in-depth analysis of all financial, technical, contractual, organizational and legal factors related to the project. This analysis is called *Due Diligence*, and can include external consultants and business law firms.

The non-recourse financing means that the money-lenders cannot ask the project sponsor for reimbursement should the generated cash-flow is less than expected. The project economic performance (e.g. highway expected traffic, Electricity selling tariff according to market surveys, wind farm operational performance, etc.) is crucial to the reimbursement of the dept and to an acceptable return on shareholders' equities. Therefore, the money-lenders have this first-priority security on assets and contracts of the project's vehicles should this latter fail.

The project finance approach is usually adopted for large-scale renewable energy projects of electricity production by the private sector within the framework of Public-Private Partnership (PPP).

Algeria has adopted this approach in the financing of the hybrid solar-thermal plant (CSP) project in Hassi R'Mel. The cost of this project was 315 M€, with a total capacity of 150 MW, including 25 MW CSP.
This project was developed by NEAL Company, which is owned by Sonelgaz and Sonatrach (45% each) and SIM (10%). A BOOT (*Built Own Operate and Transfer*) contract was signed with the said company within a consortium consisting of the Spanish company ABENER (51%), NEAL (20%), SONATRACH (14%), and COFIDES (15%). This consortium provided 20% of the total financing, while the balance was provided by bank loan granted by local banks.

Impact

The Hassi R'Mel project should ensure :

- Around 65 GWh p.a. Solar electricity production;
- 16 ktoe p.a. primary energy saving;
- 37 teCO2 p.a. avoided GHG emissions

Direct financial aids ; the National Fund for Energy Management

The National Fund for Energy Conservation (FNME), has been established by the 2010 budget bill in order to support the Algerian energy management policy, the national program for energy management (PNME) 2010-2014 and, especially, these renewable energy activities (bill on renewable energy promotion, august 2004)

The FNME aims at contributing to the establishment and development of a full-term energy efficiency market, by means of:

- Granting loans via competition;
- Granting of non-remunerated or interest-free loans;
- Guarantees for borrowing.

The FNME has sustainable resources coming essentially from:

- Taxes on power consumption;
- Government subsidies;
- Taxes on energy consuming devices;
- Fines due within the framework of the energy management law;
- Loans reimbursement;
- Other resources and contributions.

Egypt

Solar thermal system development mechanism for water heating in hotels

The EGYSOL program supported by the Italian Ministry for the Environment is a pilot mechanism for the financing of solar energy water heating systems in tertiary sector. This mechanism is based on:

- The granting of 25% subsidy to collective solar thermal systems and a diminished subsidy to the maintenance cost over 4 years after the first year of warranty;
- Awareness raising and training of the concerned stakeholders;
- Follow up for the establishment of SWH quality standards.

Till the end of 2011, 9 hotels have been equipped with 1,120 m² SWH systems, with an average pay-back time of around 4,5 years.

This pilot program, which has very limited financial resources (.5 MUSD), should have been followed by a specific support mechanism provided by the Tourism Development Fund, in order to ensured its sustainability. In this concern, Egypt is planning to launch a mechanism based on a progressive development approach for the SWH market. This mechanism will start with the tourism sector which shows important profitability condition, with regard to the applied energy tariffs.

The support mechanism for SWH market in the Tourism sector in Egypt will be based on the combination of direct financial incentive and a loans system with optimized interest rates.

The financing mechanism is based on the following principles :

- Affordability of SWH by means of flexible, quick and attractive loans system in collaboration with the National Bank of Egypt;
- Increase profitability for hotels as a result of the premium on SWH purchase, which is granted from the EGYSOL resources at the beginning and from other resources to be used later;
- Financial support the surveys related to the system size;
- Financial contribute to the operating and maintenance cost (O&M) and require a 5 year warranty on equipments and good after-sale service;
- Follow up the program by means of:
    - Controlling equipments and services marketed within the framework of the program via program eligibility terms;
    - Training of stakeholders (manpower, suppliers);
    - Communication and awareness raising about the usage of SWH in order to shed light on its advantages.

The financing mechanism will be based on the following structure:

Annexe 2 : Benchmark of international experiences

INTERNATIONAL BENCHMARK OF RENEWABLE ENERGY SEGMENTS FOR ELECTRICITY GENERATION

BENCHMARK INTERNATIONAL POUR LES FILIERES RENOUVELABLES POUR LA PRODUCTION ELECTRIQUE

Pays	Objectifs	Organisation du marché de l'électricité	Mécanismes de soutien
Allemagne	• Accroissement de la part des ER dans la consommation finale brute de 18% en 2020; 30% en 2030; 40% en 2040 et 60% en 2050; • Accroissement de la part des ER dans la consommation brute de l'électricité de 35% en 2020; 50% en 2030; 65% en 2040 et 80% en 2050	• Les marchés du gaz et de l'électricité sont totalement ouverts depuis 1998; • Une loi a été adoptée en 2005 pour la création d'un organe régulateur et pour le renforcement des règles de séparation des activités de production, transport, distribution et fourniture; • 1 100 fournisseurs d'électricité sont recencés en Allemagne. Toutefois, le marché est toujours largement dominé par les 4 opérateurs intégrés historiques (E.on, RWE, Vattenfall et EnBW) qui se partagent les quatres zones du réseau de transport et disposent tous ensemble de 70% de la capacité totale de production et produisent 67% de toute l'électricité consommée (82% de l'électricité non renouvelable); •Les réseaux de distribution sont gérés par 900 opérateurs qui disposent d'un monopole dans leur zone de desserte, dont 40% sont des entreprises municipales. Ces dernières produisent environ 10% de la consommation totale.	• La 1ère loi portant sur l'obligation d'achat a été votée en 1991. Elle imposait l'achat de l'électricité d'origine renouvelable à 90% du prix de détail de l'électricité au consommateur final; • En 2000, un système complet de tarifs différenciés selon les filières a été mis en place (Loi EEG). Ce système a été révisé en 2004, 2009 et 2012 suivant les principes suivants: la garantie de la rentabilité de l'investissement à travers des contrats d'achat d'une durée suffisante, la répartition des surcoûts entre les consommateurs selon le principe de "pollueur/payeur et la réduction des tarifs d'achat en fonction du degré d'industrialisation et d'innovation de la filière. **Niveaux de tarifs :** • **Eolien terrestre :** entre 89 et 130 €/MWh pendant 5 ans, puis entre 35 et 38,5€/MWh pendant 10 ans; • **PV injecté:** entre 215,6 et 391,4 €/MWh suivant la puissance et la catégorie sur 20 ans; • **PV auto-consommé:** entre 94,8 et 123,6 €/MWh suivant puissance sur 20 ans; • **Gaz de décharges, d'eaux usées et de mines:** entre 40 et 127,3 €/MWh suivant technologies sur 20 ans; • **Biomasse/Biogaz:** entre 136,3 et 250 €/MWh suivant sources et technologies sur 20 ans.
Espagne	Porter la part d'électricité renouvelable à 40% de la consommation finale brute à l'horizon 2020	• Le marché de gros espagnol de l'électricité a été ouvert à la concurrence en 1998; • Le processus d'intégration avec le marché portugais, engagé depuis 2004, est pratiquement achevé: l'opérateur espagnol étant chargé du marché spot et l'opérateur portugais du marché dérivé; • Le marché de détail au sein duquel subsiste un tarif régulé inférieur aux prix de marché pour les puissances de moins de 10 kW reste fortement concentré entre les mains des opérateurs historiques ENDESA, IBERDROLA et UNION FENOSA qui se partagent à eux trois 60% du marché.	• En vertu de la loi de 1997 portant sur l'ouverture du marché de l'électricité, un objectif de 12% de sources renouvelables dans la consommation d'énergie primaire en 2010 a été instauré. Il est ensuite décliné par filières par le plan de développement des ER en décembre 1999; • Un nouveau plan d'actions pour la période 2005-2010 a été mis en place en 2004. Ce plan a été concrétisé par la mise en place en 2007 d'un système de soutien optionnel: Les producteurs ont la possibilité de choisir pour une durée d'un an au minimum soit un tarif d'achat à prix garantis inspiré du modèle allemand, soit un système de prime s'ajoutant à la vente de leur production sur le marché. Ce système a été très efficace pour la filière éolienne qui a doublé sa production d'électricité entre 2005 et 2010 principalement sous le régime "prix de marché+prime". **Niveaux de tarifs**: • **Eolien terrestre** : 81,27 €/MWh pendant 20 ans, puis 67,92 €/MWh + prime=20,14 €/Mwh pendant 20 ans. • **Hydraulique (< 10 MW)**:86,56 €/MWh + Prime = 22,8€/MWh pendant 25 ans puis 78 €/MWh + prime = 14,9/MWh; • **Hydraulique entre 10 et 50 MW**: Pas de tarif, prime=23,3€/MWh pendant 25 ans, puis 14,9€/MWh; • **PV sur bâtiment (< 20 kW)**: 266,2 €/MWh, > 20 kW: 193,1 €/MWh pendant 20 ans; • **PV au sol:** 121,72 €/MWh pendant 20 ans; • **CSP:** 299 €/MWh pendant 25 ans + Prime = 28,19 €/MWh

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Pays	Objectifs	Organisation du marché de l'électricité	Mécanismes de soutien
Portugal	Atteindre une part des renouvelables dans la consommation d'énergie finale de 31% à l'horizon 2020	• Avant 2006, le secteur de l'électricité est composé d'un service public régulé et fourni par des productions sous contrat exclusif avec l'opérateur de transport et de distribution de l'électricité et un secteur totalement privé. • En 2006, ce cadre législatif a été révisé de manière à ce que la distribution et la fourniture ont été découplées et un système de fournisseur de "dernier recours" a été créé. Les productions ont donc commencé à être vendues à la bourse de l'électricité au spot et produits futurs en 2007 et le Gouvernement portugais a de ce fait encouragé la concurrence par des programmes de mise aux enchères de capacités de production et d'appels d'offres pour des nouvelles capacités de production. La production et la fourniture de l'électricité sont désormais libres et seul le transport et la distribution sont publics. • L'accès au réseau électrique est régie par les principes de priorité d'utilisation des énergies renouvelables et de non-discrimination du type de production. • Si le réseau est disponible sur le site, le gestionnaire est obligé d'accepter la connexion du producteur, sinon, il partagera avec le producteur, le coût de l'extension du réseau; • Afin d'assurer la stabilité du réseau, le gestionnaire doit placer en priorité d'investissement l'accroissement des capacités. En revanche, les producteurs doivent s'engager à fournir au moins 50% de la production prévue.	Il existe un mcanisme d'obligation d'achat pour tous les producteurs d'énergie renouvelable. Le tarif d'achat est constitué de 2 parties: Une base de prix fixe et un montant variable dépendant de plusieurs facteurs; à savoir le type de production, l'impact environnemental évité et la taille de l'installation. De plus, la fourniture d'énergie renouvelable est soutenue par un taux réduit de TVA. **Niveaux de tarifs:** **Eolien:** 75 €/MWh à concurrence de 33 GWh/MW ou 15 ans; **Hydro:** 93 €/MWh à concurrence de 52 GWh/MW ou 20 ans; **PV:** 257 €/MWh à concurrence de 21 GWh/MW ou 15 ans;
Maroc	Porter la part des énergies renouvelablesà 42% de la puissance électrique installée à l'horizon 2020	• En 1963: création de l'ONE en tant que établissement public à caractère industriel et commercial, titulaire du monopole de la production, du transport et de la distribution de l'électricité; • Depuis 1997, la concurrence s'ouvre progressivement sur les segments de la production et de la distribution. En revanche, l'ONE conserve son monopole pour acheter l'électricité aux producteurs et la revendre aux clients finaux; • Une loi relative aux ER a été adoptée et publiée en 2010. Elle introduit 4 innovations majeures, à savoir: l'ouverture à la concurrence de la génération d'électricité d'origine renouvelable, l'accès au transport de l'électricité via le réseau national, la possibilité d'exporter de l'électricité via le réseau national et la possibilité pour un promoteur de construire sa propre ligne de transport direct. Les promoteurs privés titulaires d'une autorisation peuvent ainsi produire l'électricité pour leurs propres besoins, la commercialiser au Maroc ou l'exporter. • La réalisation des centrales électriques renouvelables est confiée à des opérateurs nationaux et internationaux qui seront sélectionnés sur appel d'offres par la société "MASEN" créée pour développer les projets correspondant à la mise en oeuvre du Plan Solaire Marocain	Il n'existe pas de tarif dachat proprement dit pour l'électricité renouvelable au Maroc. La commercialisation de l'électricité à l'ONE se fait à un prix fixé à 60% du tarif MT pratiqué par l'ONE.

BENCHMARK INTERNATIONAL POUR LES FILIERES RENOUVELABLES POUR LA PRODUCTION ELECTRIQUE

Pays	Objectifs	Organisation du marché de l'électricité	Mécanismes de soutien
Turquie	Accroître la capacité de production par les ER pour atteindre 30% du parc à l'horizon 2023	• La loi de 2001 a permis de créer un véritable marché de l'électricité. Les activités de commerce et de gestion des réseaux ont été séparées et des règles d'accès au réseau ainsi qu'un tarif d'utilisation du réseau non discriminatoire ont été mises en place; • La loi ainsi que la réglementation secondaire établie par le régulateur ont permis de mettre en place un système fondé sur des contrats bilatéraux, un mécanisme d'ajustement et d'équilibre et l'accès des tiers au réseau; • En 2012, la Turquie a été divisée en 21 régions de distribution d'électricité. 13 d'entre elles sont aujourd'hui gérées par des sociétés privées, et le processus de privatisation est en cours dans les 8 autres régions. La consommation des 13 régions actuellement gérées par des sociétés privées représente plus de la moitié de la consommation totale d'électricité en Turquie; • En 2012, plus de la moitié de l'électricité produite est issue d'outils de production privatisés ou privés; • Une bourse de l'électricité a vu le jour en 2006. Elle a permis de stimuler la concurrence et représente actuellement 20% de la consommation totale d'électricité. Plus de 100 entreprises sont aujourd'hui enregistrées sur ce marché de gros; • Le marché spot spot de l'électricité est opérationnel en Turquie depuis décembre 2011.	• Chaque fournisseur agréé doit acheter un quota d'électricité verte matérialisé par des certificats d'origine. Ce quota est déterminé par le Gouvernement (8% en 2011); • Le marché détermine le prix de cette électricité ou des certficats si le fournisseur ne peut contracter pour des volumes suffisants en accords bilatéraux; Niveaux des tarifs d'achat: Après des années d'échec de la politique de développement dû à des tarifs de rachat trop bas, le gouvernement a décidé de fixer les nouveaux prix en 2011 pour 10 ans ou à concurrence d'une capacité installée de 600 MW comme suit: • Solaire: 133 US$/MWh; • Biomasse: 133 US$/MWh; • Géothermie: 105 US$/MWh; • Hydroélectricité: 73 US$/MWh; • Energie éolienne: 73 US$/MWh

RENEWABLE SOLUTIONS FOR THERMAL PRODUCTION : SOLAR HEATING OF DOMESTIC WATER

Legal measures

Example	Implementation	Advantages	Limits
National, regional, or local government laws for solar thermal obligation Examples: Israel, Spain, Portugal, Italy, India, Brazil, Mexico, Germany Other countries on a smaller scale (Syria)	Can be implemented in a developed SWH market and in an energy efficiency awareness in the construction field Without consideration to the SWH economic feasibility in the country	Can be the cornerstone for the development of the SWH market iF the legal texts are backED with implementation, quality, communication, awareness raising, etc. control measures	Transparent inspection system is mandatory for the law enforcement May be not effective in countries with low inspection and control capacity Evasion rate which may be high in housing that go through official real-estate development.

Financial incentives

Example	Implementation	Advantages	Limits
Direct financial incentives (direct subsidy) **Examples: Canada, France, Netherlands, Sweden and California, Thailand, Tunisia, South Africa**	Can be implemented in most of the countries only if they have the political will to promote the SWH Requirement of a strong political will in favor of renewable energy solutions. Requirement of possessing sufficient and sustainable financial resources for the incentive system.	Enhancing the SWH profitability for the final consumer, making it affordable for the final consumer, and organizing the market in such a way that makes the control possible. Quickly develop the market while taking into consideration the real needs of the households Other social impacts such as the creation of new jobs	Making the SHW market accustomed with the granted incentives and market downturning in case of removal of the aid ; thus, sustainable resources are required. In Tunisia, the aid is provided by the National Fund for Energy Management fed by taxes. Introducing the subsidy awareness amongst consumers The transaction cost of the direct aid management is usually high.

Tax incentives

Example	Implementation	Advantages	Limits
Direct Tax incentives : **Exoneration of customs fees and, especially, VAT on SWH and even on components and raw materials used in its local manufacturing.** Examples: Tunisia, Uruguay, Portugal DD : Tunisia, Morocco, Cyprus, Uruguay	Applicable for countries with indirect taxation system (VAT, ICT, etc.)	Highly efficient measure to reduce SWH final cost (in Morocco, 14% on equipments and 20% on system). Measure that have no direct impact on the government's budget, especially, in the case of emerging markets such as SWH. Easier to manage than direct subsidy, with almost no transaction costs. Encourages local industrialization, because it allows tax exclusive purchasing of products and raw materials needed for SWH manufacture.	Requirement for the establishment of an efficient follow up system when it comes to exoneration of components and raw materials for SWH manufacture (lists of products, program contract with local manufacturers); see Tunisian law. Requirement for the application of this measure to all renewable energy system of the same type (PV, small windmill, etc.). it is rarely acceptable to apply this measure only to SWH. Difficulty in convincing the Ministry of Finances.
Direct tax incentives : **Tax credits** **Example :** France, Italy, Portugal, Greece, Chili, USA, etc.	The disencumbrance by means of tax credit is not applicable in most developing countries where income tax is usually deducted from the source.	Simple management and low transaction cost.	Difficulty in convincing the tax authorities. The actual impact of the measure relied on the taxation level in the concerned country, and mainly on the tax evasion rate.

Dedicated Credit systems

Example	Implementation	Advantages	Limits
Consumption credit system with low-interests **Example: India**	Applicable in countries with a banking sectors developed enough for consumption credits, and very high interest rates.	Quick implementation in countries where consumption credits are developed. Can facilitate access to affordable capitals for SWH purchasing. The pressure on public budget is in general lower than that caused by direct financial incentives	Rely on annual budgetary allocation with eminent stopping risk. In some cases, the banks guarantee requirements may become a hindering factor. The possible complexity of the loan and the procedures of application to subsidy on interest rate, needs to be simplified so as to make the system more attractive. Risk of exclusion of a large part of the population who does not have bank accounts or have no access to banks. The enhancement of tax rates is becoming a rate practice because of its complexity, and of the banks' bylaws which prohibit it.
Credit system with recovery on electricity bill. **Examples :** Tunisia, South Africa (Cape Town and Johannesburg local governments), implementation underway.	Applicable in countries which have efficient power distributor with very low rates of unpaid bills. Easier to implement with public sector distributors. Requirement of a strong political will.	Open access to all households who already have an electricity meter and have no litigation with the distributor. Larger target than consumption credit. Efficient guarantee for credit reimbursement (cutting off power supply should the client fail to pay), which minimizes the risk of unpaid supply. Possibility to negotiate low bank interest rates thanks to the guarantee of collection. Marginal loan collection cost Spreading energy management culture amongst electricity operators.	Difficulty in convincing private sector electricity distributors. Requirement of setting up clients' management system by the distributors. Transaction cost relatively high, but still lower than consumption loan Relatively long-term deadline of loans reimbursement to the SWH suppliers (3 to 4 months), which increases the treasury needs of these latter. Requirement of an efficient and strict quality control system.

Les systèmes de crédit dédié

Exemple	Application	Avantages	Limites
Système de crédit à la consommation avec taux d'intérêt bonifié **Exemples:** Inde	Applicable pour les pays ayant un secteur bancaire assez mature pour les crédits à la consommation, mais où les taux d'intérêt sont très élevés.	Rapide à mettre en œuvre dans le pays où le crédit à la consommation est bien développé Peut faciliter un meilleur accès à des capitaux abordables pour l'achat de systèmes de CES. La pression sur le budget public en général inférieur à celle des incitations financières directes	Dépend des allocations budgétaires annuelles avec un risque d'arrêt à tout moment. Dans certains cas, les exigences de garanties des banques peuvent devenir un facteur limitant. Complexité possible de l'emprunt et des procédures de demande de subvention de taux d'intérêt, qui nécessitent d'être simplifiés pour rendre le système suffisamment attractif. Risque d'élimination d'une large frange de la population qui n'est pas bancarisée ou qui ne peut pas avoir accès aux banques La bonification du taux d'intérêt est de plus en plus rare, compte tenu de sa complexité d'une part et des réglementations bancaires qui interdisent assez souvent cette pratique, d'autre part
Système de crédit avec recouvrement sur la facture d'électricité **Exemples:** Tunisie, Afrique du Sud (municipalités de Cape Town et Johannesburg), en cours de mise en place.	Applicable pour les pays ou le distributeur d'électricité est efficace, avec des taux d'impayés des factures d'électricité très faible. Plus facile à mettre en place quand le distributeur d'électricité est public. Nécessité d'une forte volonté politique.	Accès ouvert à tout ménage ayant un compteur électrique et qui n'a pas de contentieux avec le distributeur. Cible nettement plus large que le crédit à la consommation. Une garantie efficace du remboursement du crédit (coupure du service électrique en cas de non payement), d'où la minimisation du risque d'impayés. Possibilité de négocier des taux d'intérêt bancaires bas grâce à la garantie de recouvrement. Coût de recouvrement marginal du crédit Introduire la culture de la maîtrise de l'énergie chez les opérateurs électrique.	Difficultés de convaincre les distributeurs électriques, surtout quand ils sont privés. Nécessité d'aménager le système de gestion de la clientèle au niveau des distributeurs Coût de transaction relativement élevé, mais qui reste tout de même plus faible que le crédit à la consommation Délais de versement des crédits aux fournisseurs de CES relativement long (3 à 4 mois), ce qui augmente les besoins en trésorerie de ces derniers. Nécessité d'un système de contrôle de qualité efficace et ferme.