



## Electricité de France (EDF), Tenesol, Total Electrifying rural Moroccan households

Currently more than 2.1 billion people lack access to electricity. Poverty and a lack of access to electricity are intertwined -- the lack of access is especially noticeable in rural areas of the developing world. Basic consumption needs – evaluated at 1 kWh per family per day – require the provision of additional power generation capacity of 60GW, which corresponds to less than 2 percent of currently installed global capacity. The cost of providing this additional capacity (including transportation and distribution infrastructure) with various technical options (connection to the grid, decentralized grids, solar home equipment, etc.) amounts to about US\$ 200 billion. Spread over a 25-year timeframe, the cost of providing this capacity would amount to around US\$ 8 billion per year.

In regions where housing is highly scattered it is impossible for the electricity grid to reach each individual house in a cost-effective way. However, by using solar power the inhabitants of these regions can also enjoy the benefits of electricity. Through a unique program developed by Morocco's National Electricity Office (ONE), EDF, Total and Tenesol<sup>1</sup> are helping remote Moroccan villages access electricity through solar power installations. This innovative program ensures not only the supply of solar equipment but also a real local service in the long term. This is especially important because a simple aid program would not include maintenance after installation.

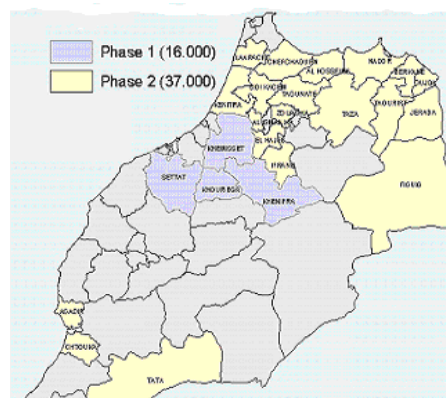
EDF's involvement in the Moroccan program stems from a unique joint-venture between EDF, Total and Tenesol (a joint subsidiary of EDF and Total, specializing in solar electrification since 1983), called Temasol. Its activities are based on the inclusive business model of EDF's Access program. EDF has a keen interest in electrification, both as a major player in the global power industry, as well as a public company with a history of dedication to public service and rural electrification and a commitment to sustainable development with clean energy.

In rural areas, the EDF's Access program involves the creation of small, locally run companies to provide rural services including electricity, water, gas and telephone services in order to stimulate local economic activity and contribute to wealth creation. In peri-urban areas, the program aims to increase access and reduce poverty through adapted solutions, including pre-payment systems and demand-side management pilot projects.

### The program

Today, Temasol is working in 24 Moroccan provinces to provide solar power to more than 53,000 customers.

- Phase 1: 4 provinces where installations began in 2002 and will finish in 2005 with 16,000 customers.
- Phase 2: 20 provinces where installations will start in 2005 for 37,000 clients.
- Next phase likely: 5,500 more customers.



<sup>1</sup> Previously Total Energie



In order to generate its own electricity, each house is fitted with a solar home system (solar panel + battery + controller). The solar panel turns the sun's rays into electricity that is stored in a solar battery so that it is available night and day to run lamps, a television, etc. The electronic controller automatically manages the charging and discharging of the battery. The battery can store enough power to last up to five days, allowing the equipment to run year round, even when the weather is bad.

The equipment offered satisfies the main requirements of rural households: lighting (4 to 8 lamps) and a socket for a television, a radio, a mobile phone charger, or other small audio-visual appliance.

A kit including a fridge will be offered in the ONE's next contracts in order to satisfy this requirement, even though demand is still low.

The project is designed to put an emphasis on providing long-term services that go beyond simple installation. Temasol, the solar operator, is authorized by the ONE

to install a solar home system, low consumption lamps and a 12-volt socket in each household, along with all necessary cabling. The operator is also responsible for maintaining the equipment for a 10-year period (including the replacement of the batteries at the end of their lifetime).



*Lighting and television in a rural household.*

### The cost for consumers

Each customer pays an initial connection fee and then a monthly fixed service fee. Several different service levels are available. For example, for the first phase - 16,000 customers – 4 provinces (prices included all taxes):

- Service 1: for 4 lamps and one 12 V socket – 50 Wp  
Connection: 700 Dirham (US\$ 80)  
Monthly fee: 65 Dirham (US\$ 7.50)
- Service 2: for 6 lamps and one 12 V socket – 75 Wp  
Connection: 1,800 Dirham (US\$ 200)  
Monthly fee: 96 Dirham (US\$ 11)
- Service 3: for 8 lamps and one 12 V socket - 100 Wp  
Connection: 3,100 Dirham (US\$ 260)  
Monthly fee: 129 Dirham (US\$ 15)

For the second phase - 37,000 customers – 20 provinces:

- Service 1: for 4 lamps and one 12 V socket – 75 Wp  
Connection: 900 Dirham (US\$ 100)  
Monthly fee: 65 Dirham (US\$ 7.50)
- Service 2: for 4 lamps and one 12 V socket and a fridge – 200 Wp  
Connection: 4,000 Dirham (US\$ 465)  
Monthly fee: 150 Dirham (US\$ 17.50)

The fees were established based on the results of preliminary studies performed before the program started. They are adapted to the budgets of local households: approximately the same amount was being paid for candles, gas, batteries, or battery recharging.

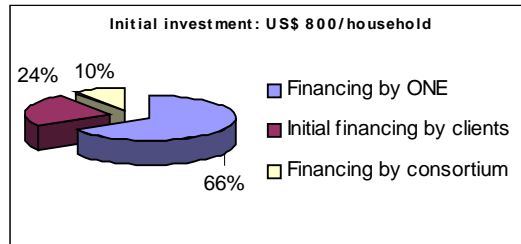
These rates are reasonable because they are equivalent to the amount paid for similar consumption rates by customers connected to the grid. The prices are in fact lower than the actual cost of the equipment and service received. This is because the ONE gives a grant for each installation in order to provide equal energy access opportunities to the Moroccan population. Temasol acts as an investor by also participating in the financing of the equipment.



## Program cost and financing

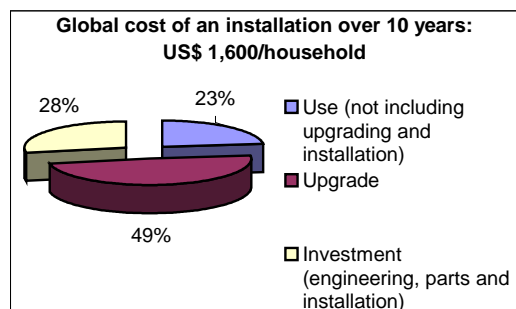
The initial average cost of an installed system is approximately US\$ 800 (630 Euros):

- The ONE provides a grant, which covers around 66% of this cost;
- The customer provides around 10% in connection fees
- Temasol contributes the balance of around 24%.



The monthly fees collected by Temasol enable it to cover the amortization of its initial investment, replace equipment (including batteries) and cover running costs.

Temasol has benefited from financial support in the form of an equipment grant (US\$ 28.5 million– an average of 5,100 Drh excl VAT per customer) from the ONE based on a US\$ 6.5 million grant from the German Bank KfW and on a US\$ 6.5 million soft loan of the French Development Agency (AFD) to the ONE. Furthermore, the program has also been supported by the FFEM (French Fund for the World Environment) in the start-up phase, e.g. US\$ 1.5 million for electricity.



Each customer also contributes to the initial financing of the operation through the connection fee (US\$ 4 million). The company's shareholders (Tenasol 35.6 %, Total Maroc 32.2 % and EDF 32.2 %) have each brought additional financing (US\$ 4.5 million).

## Positive impacts on daily lives

Temasol's activities have had positive impacts on the daily lives of the population:

- The business creates jobs in areas where they are rare (currently 83 direct employees, and 31 subcontractors). All the employees follow high-level in-house training (technical, quality, customer relations, etc.).
- Bringing electricity to rural populations improves living conditions, which encourages local farmers and livestock breeders to remain on their land, rather than moving to the small towns that are connected to the grid.

## Impact assessment

From November 2004 to May 2005, EDF worked with an external consultant to run an impact assessment survey to determine what effects, if any, the Temasol program was having on the rural areas where they are installing solar home systems.

The findings of the assessment indicate that, as with all solar electricity systems, the one proposed by Temasol has improved living conditions for the families that have the installations. In the houses that are equipped, electric lighting has replaced gas lamps and candles, and, above all, has permitted the installation of an outside lamp that can be left on all night to keep thieves away and to better monitor herds at night.

Those equipped with systems no longer need to recharge batteries and control television usage; with photovoltaic electricity, time spent watching television (color sometimes) increases, especially after midday for the women and children.

## An exemplary public/private partnership

The ONE decided to use solar power, in addition to more traditional technologies, in order to advance the geographical limits of electrification and to enable populations living in areas of scattered habitat to have access to electricity.

Conscious of the specificity of the solar component of its programme, the ONE asked experienced professionals to join it within a well thought-out public/private partnership:

- The solar power operator, Temasol brings its expertise and ensures a full service with flexible means, adapted to the technical, geographical and social conditions of solar electrification.
- The ONE ensures the overall coherency of rural electrification, identifies the areas to which the solar solution will be the most adapted. These choices are made official through agreements with the relevant communes. The ONE defines the specifications, selects and mandates the solar operator, checks that the commitments are respected and measures the satisfaction of solar power customers.
- The advantage of a large market makes it possible to minimize the costs of the services provided. The ONE provides the financing to provide equal access opportunities, which enable the solar power operator to offer fair prices.
- The development of solar contracts has been facilitated by close cooperation between the ONE and the solar businesses represented by the association AMISOLE (Moroccan Association of Solar and Wind Industries). This partnership is considered to be a reference by many countries that would like to integrate the advantages of solar power into their solar electrification programmes.



## The solar power operator's job

Temasol will be providing an overall solar power operator's service over 10 years as a "sub concession". Temasol has the advantage of benefiting from the experience of Tenesol, a solar operator in many countries, for more than 20 years. This business includes the following tasks:

- Sales and marketing -- Temasol promotes solar power and signs contracts with interested customers;
- Running a small stand at the local *souk* (market) where employees interact with existing and potential customers;
- Supply and installation -- Temasol buys the equipment (usually Tenesol modules) and installs them (within 15 days of signature of the contracts);
- Maintenance -- Temasol replaces components (batteries, controllers), and carries out repairs (within less than 48 hours according to its guarantee);
- Operation and management -- Temasol manages the programme which includes collecting the monthly fees from the customers.

## Everyone benefits

In April 2005, more than 12,000 customers had received solar home systems at an installation rate of 400 to 700 per month. At this rate, the 16,000 customers of Phase I will have been connected before the end of 2005, or one year in advance of the contract schedule. Phase II (37,000 customers in 24 other provinces) will start in the second quarter of 2005. The installation of equipment in the 37,000 households will last 3 years and then the service will be ensured for 10 years. The estimated budget for this second phase is US\$ 27 million. ONE will provide US\$ 22 million.

In April 2005, for Phase I, Temasol already had:

- 83 direct employees (17 at head office and 66 in the local branches);
- 31 subcontractors (to top-up the internal installation teams);
- 1 head office and 7 local branches in the regions concerned;
- 24 vehicles;



- Accounting, customer and maintenance management software adapted to “solar concessions”;
- A 99% payment rate (installations are dismantled after 2 months’ non-payment);
- Operations that conform to the business plan – economic viability will mean the activity is sustainable.

At Temasol’s head office located in Rabat, employees are recruited and trained, equipment supplies are received, the logistical preparation is carried out and the operation and coordination of the local branches actions is centrally managed. The local branches, located within the regions concerned, are responsible for sales, installation, repair or maintenance and collecting monthly fees.

In order to be as close as possible to its customers, Temasol’s teams are present in each weekly *souk* (market) as the inhabitants of these regions regularly frequent them. This presence, like at the branches, enables sales information to be given and contracts to be signed with new customers, monthly fees to be collected and any repair requests to be logged.

Because Temasol is well known throughout the country, its human resources department receives countless offers from diverse sources, including:

- The main engineering schools in Morocco that Temasol contacts regularly;
- Spontaneous demands sent directly to Temasol from prospective employees.

Candidates are invited to participate in a learning and selection internship. After this internship they take more in-depth classes and then are hired for a trial period. They are followed very closely and put through periodic evaluations to define where they need additional training, including installation techniques and after-sales service, as well as sales methods (each Temasol agent is trained to handle all aspects of the job, from installation to bill collection to after-sales service). The agency managers are all technical and commercial agents who have been promoted because they are serious and apt at management.

Subcontractors working for Temasol to install the solar systems are independent companies who often have Temasol as their largest client. The quality of their work is very important because at the end of installation, Temasol does not contract out additional activities. After-sales service and bill collection are handled internally.

Not all subcontractors come from the region where Temasol is active. While the company needs some employees that know the region well in order to start offering their services, people brought in from outside quickly get to know the region. This is important because Temasol aims to help their employees remain dynamic and effective by rotating them from region to region. Because the program is expanding rapidly, Temasol also often needs to move their best employees from older markets to new ones to keep up with demand.

From these successful beginnings, the solar program will now be extended to more than 110,000 households, making Morocco a world leader in the use of solar power for rural electrification.



## More information

For more information about Temasol,  
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**Total**  
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**Tenesol** (formerly Total Energie)  
[www.total-energie.com](http://www.total-energie.com)

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### About the WBCSD

The World Business Council for Sustainable Development (WBCSD) is a coalition of international companies united by a shared commitment to sustainable development via the three pillars of economic growth, ecological balance and social progress. Our members are drawn from more than 35 countries and 20 major industrial sectors. We also benefit from a Global Network of 40 national and regional business councils and partner organizations involving more than 1,000 business leaders globally.

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