Strengthening Private Sector Participation for Infrastructure in the Pacific Region
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Case Study:
Solar Power PPP in Rural Morocco

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Sources: Decentralized Rural Electrification in Morocco, The French Global Environment Facility, 2005.
Case Study: Electrifying rural Moroccan households, World Business Council for Sustainable Development, 2005.
Morocco Case Study (Solar Power) (http://www.ncppp.org/undp/morocco.html)
Temasol presentation at the 3rd Future Environmental Trends Conference, Bangalore, 14-16 December 2006.

Morocco & Rural Electrification

- Morocco: North West of Africa
- Over 95% of energy needs: imported
- Government policy: electricity for all (1994)
- Power system: centralized to support needs of urban centers & industrial sites
- Rural population: over 13 million (45% of total)
  - only 18% electrified (1995)
  - 91% of villages: cost effective to connect to the national grid.
  - 9% of rural households: scattered and too expensive to connect to the grid.
- Solution: decentralized rural electrification
  - Mini-networks (wind or hydroelectric)
  - Individual household photovoltaic systems (using PPP arrangements)

Morocco Rural Electrification Pilot

- In 1994: Moroccan Government policy for rural electrification
- In 1995: Rural Electrification Pilot Program (PPER) launched by the Moroccan government supported by the French government:
  - Installation of 2,000 photovoltaic (PV) systems
  - Several group micro-networks (small hydro or diesel power plants)
- Lessons learned from PPER:
  - Rural customers could become accustomed to making payments with the help of an appropriate organizational structure.
  - Solar power was an appropriate for rural electrification in Morocco.
  - Key issue: the long-term maintenance of the facilities
  - The solution: delegate the management of electricity services (supply, installation and maintenance of the photovoltaic kits) to private operators.

The PPP Solution

- In 1996, the ONE (National Power Office) launched the Global Rural Electrification Program (PERG)
  - To increase rural electrification from 18% in 1995 to 98% in 2007.
  - Target: 34,400 rural villages receiving power by 2007.
  - 91% of the rural villages: to be connected to the national grid
  - Remaining 9%: decentralized system of electrification
    - mini-networks (wind or hydroelectric)
    - individual household photovoltaic systems.
- But large scale solar project would require investments beyond the capabilities of the ONE.
- The ONE decided to form PPPs with private operators who would deliver the electrification service using solar power technology and contribute to the operating costs.
- Given the limited resources of the rural households involved, the government would provide financial support to make the PPPs
  - viable for the operators and
  - affordable for the customers.

The PPP Project Development & Procurement Process

- Prior to implementation, ONE defined the **specifications** of the project.
- The government also established a **legal framework** to define the private operator's mission.
  - Whenever it costs more than 27,000 Dirhams ($3,250 USD) to connect a household to a grid,
  - it would be electrified using a photovoltaic kit.
- ONE then selected the private operator through a **competitive tender**.
- In 2002, ONE signed the first PPP contract with a private operator (Temasol) for installation of 16,000 solar home systems in 4 provinces.
- In 2004, ONE issued another tender and the same private operator won the new contract for 37,000 more solar home systems in 20 provinces.

The PPP Partners

- **Private Operator:** Temasol, a renewable energy service company (owned by a French oil company, a French electricity company and a French photovoltaic systems company), implemented the solar program:
  - supplying and installing the solar home systems,
  - maintaining the installed systems,
  - replacing equipment when needed, and
  - collecting users' connection & monthly fees.
- **Public Sector Partner:** The National Electricity Office (ONE) managed the overall coherence of the rural electrification project.
  - ensuring the private operator maintains its commitments to the project,
  - measuring the satisfaction of the operator's customers, and
  - providing subsidy funding, which enables the private operator to provide the service at affordable rates.
    - The subsidy was made possible through grants and loans from bilateral aid agencies.

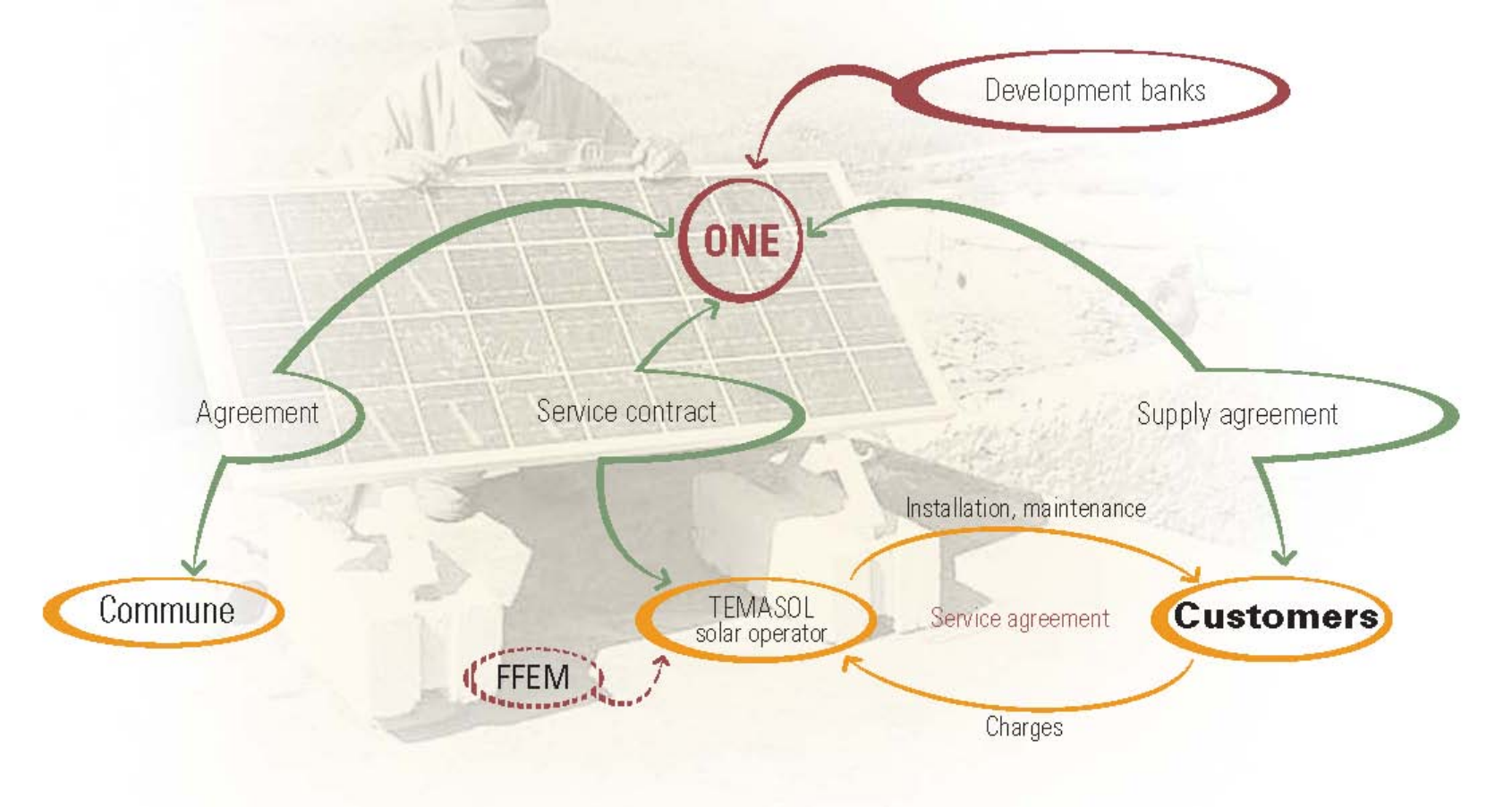
The PPP Contract Provisions (1)

- Contract between ONE and a commune (village) defines the plan for the photovoltaic distribution program the village.
- Contract between ONE and the operator is on **sale of service** (rather than sale of equipment) model (to ensure maintenance).
- When a rural household decides to install a solar home system, they sign a contract with ONE and the operator.
  - The operator buys and installs the solar home system within 15 days.
  - Equipment is certified by ONE.
  - Installation is performed by **trained, local technicians**.
  - Once installed and working, equipment's ownership transfers to ONE.
  - The user is considered to be a **customer of ONE**, though the operator is responsible for maintenance and collection of user's fees.

The PPP Contract Provisions (2)

- The operator is compensated by customers with a **connection fee** and a **monthly service fee**.
- The monthly service fee provides users with annual routine system **maintenance** and breakdown service within 48 hours.
- The equipment is dismantled **if the customer failed to pay** the monthly fee for 3 consecutive months.
- The operator **guaranteed** the equipment for **ten years.**
- It is responsible for equipment **replacement** (including light bulbs).
- The government is able to collect revenue from the project through **taxes**:
  - 20% value added tax (VAT) on service charges,
  - income taxes on salaries, and
  - benefit taxes from private operator.

The PPP Contractual Structure



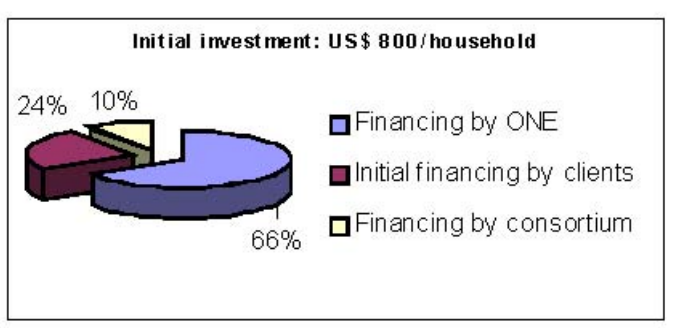
Source: Decentralized Rural Electrification in Morocco, The French Global Environment Facility, 2005.

Technical Aspects

- The **solar home system** fitted to each house includes: a solar panel, a battery, and an electronic controller.
- **Solar panel:** turns the sun's rays into electricity
- **Battery:** stores the electricity so that it is available night and day to run lamps, a television, etc.
  - Battery can store enough power to last up to 5 days, supplying electricity even when the weather is bad.
- **Electronic controller:** automatically manages the charging and discharging of the battery.

Financial Aspects

- Total project cost: $35.5 million funded as follows:
  - 66% equipment grant from ONE largely financed through
    - A $6.5 million grant from KfW
    - a $6.5 million soft loan from AFD
    - a $1.5 million grant from FFEM.
  - 24% private operator
    - $1.5 million self financing
    - $2.5 million borrowings
    - $4.5 million shareholders capital contribution
  - 10% customers' connection fees
    - 40% government subsidy reduces connection cost (close to what city dwellers pay for grid connection).



- User' monthly fees collected by the operator enable it to recover its initial investment, replace equipment, and cover running costs.

Pricing of Service

Cost of the service to the customer:

Phase	Capacity	Service	Connection Fee	Monthly Service Fee
I 16,000	50 Wp	4 lamps + 12V socket	US$ 80	US$ 7.50
	75 Wp	6 lamps + 12V socket	US$200	US$10.00
	100 Wp	8 lamps + 12V socket	US$350	US$15.00
II 37,000	75 Wp	4 lamps + 12V socket	US$100	US$ 7.50
	100 Wp	4 lamps + 12V socket + Fridge	US$450	US$18.00

Wp = Watt peak; V = Volt; Fees = US$ equivalent of Moroccan dirham amounts

Phase II provided a higher capacity system that could handle the power demands of a refrigerator.

Challenges Overcome

- The average **cost** (including equipment, installment and maintenance) of a solar system is twice the cost of connecting a household to a mini-grid supplied by a diesel generator system.
  - ONE had to provide equipment and connection subsidy.
  - The subsidy also provided an incentive to households who were unsure about the performance quality of the solar home system.
  - To help sustain the subsidy, Moroccan consumers already connected to the grid pay a tax of 2% of their monthly bill.
- The operator was responsible for **recruiting clientele** and **providing customer service**.
  - The operator's teams ensured presence in each weekly market.
  - This enabled sales info to be given, new contracts to be signed, monthly fees to be collected and repair requests to be logged.
  - This also strengthened contacts with existing and potential customers.
  - To reach out to illiterate prospects, the operator used audio publicity materials on local radio broadcasts.

Impacts of the Project

- Jobs were created jobs in areas where they are rare:
  - 140 direct employees and subcontractors (May 2005).
- Transfer of know-how to the local employees.
  - hands-on training in photovoltaic energy (equipment, installation, maintenance and management).
  - in-house training (technical, quality, customer relations, etc.).
- Electricity to rural populations has improved living conditions:
  - encouraging local farmers and livestock breeders to remain on their land, rather than moving to towns that are connected to the grid.

Lessons Learned

- The project was a successful experiment in decentralized rural electrification:
  - Installation of the solar systems was ahead of the projected schedule.
  - The collection rate of monthly fees from customers exceeded 98%.
  - Demand in the villages was very high.
- The project demonstrated the technical feasibility of decentralized rural electrification based on solar power.
- The project also demonstrated the relevance of the “sale of service” business model based on a public–private partnership in ensuring long-term success:
  - In contrast, in the “sale of equipment” model each recipient becomes an owner of the solar system and is responsible for equipment maintenance and replacement.
- The local agents were one of the keys to the project’s success.

Thank You