



CASE STUDIES



Capacity building workshop Beirut 24-25 May 2016



OUTLINE

□PART I: Moroccan Experience (Fee For Service)

- ❖ Current situation of the Moroccan Power System
- ❖ The Moroccan Energy Strategy
 - Renewable Energy Perspectives
 - Regulatory Framework
- ❖ Rural Electrification Program
 - History of the program
 - Characteristic
 - Institutional design
 - Achievements
 - Financing

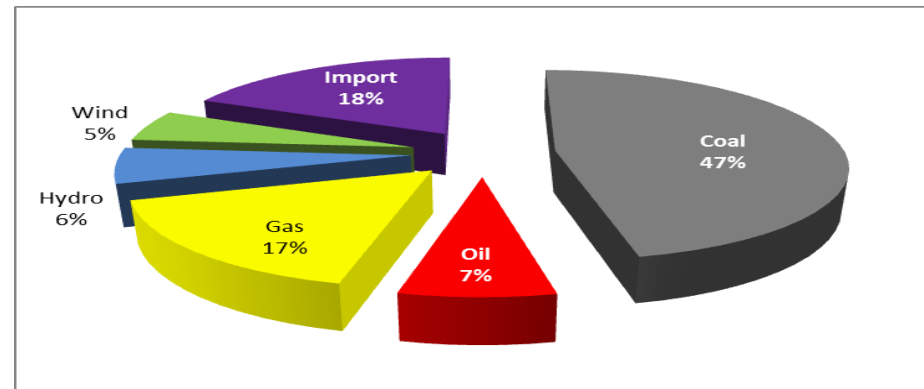
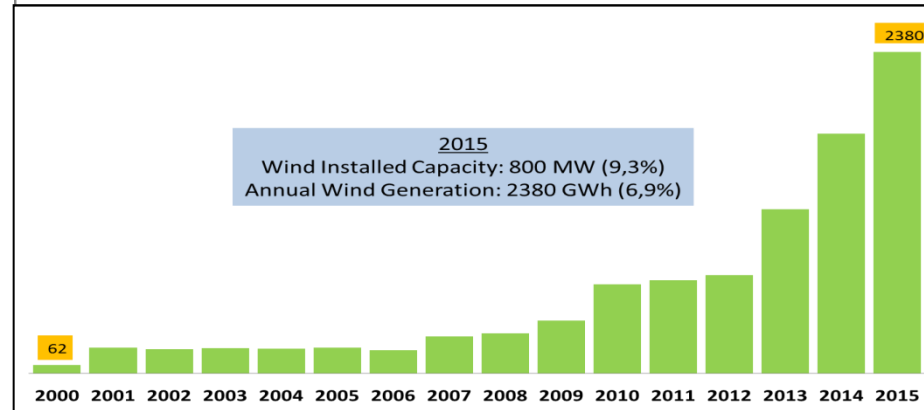
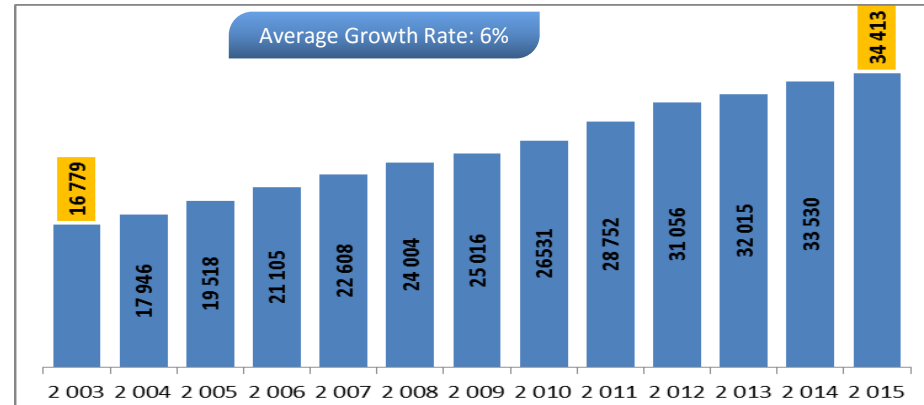
□PART II: Some Local Initiatives

- ❖ Electricity Access in Southeast Asian Countries
- ❖ Rural electrification planning in Vietnam
- ❖ Community selection approach in Lao People's Democratic Republic (PDR)
- ❖ Rural Electrification Fund (REF) in Cambodia
- ❖ Creation of village energy committee in Lao PDR
- ❖ Capacity Building and Training in Vietnam

PART I
MOROCCAN EXPERIENCE

MOROCCO: A GROWING ELECTRICITY DEMAND

- ❑ Total Installed Capacity : 8 160 MW
- ❑ Demand average growth rate : 6%
- ❑ Energy consumption : 34 413 GWh
- ❑ Peak Load: 5860 MW
- ❑ Current penetration rate of RE: 31% in term of capacity and 13,4% in term of energy
- ❑ Rural Electrification Rate: 99,12%
- ❑ Consumption per Capita: 900 kWh
- ❑ Interconnection Capacities:
 - ❑ 1400 MW With Spain
 - ❑ 2400 MW with Algeria



AMBITIOUS ENERGY STRATEGY WITH AN APPROPRIATE FRAMEWORK

5 strategic directions

Diversified and optimized mix built around reliable and competitive technologies choices

Mobilization of national resources through developing renewables

Energy efficiency set up as national priority

Reinforcement of regional integration

Sustainable development

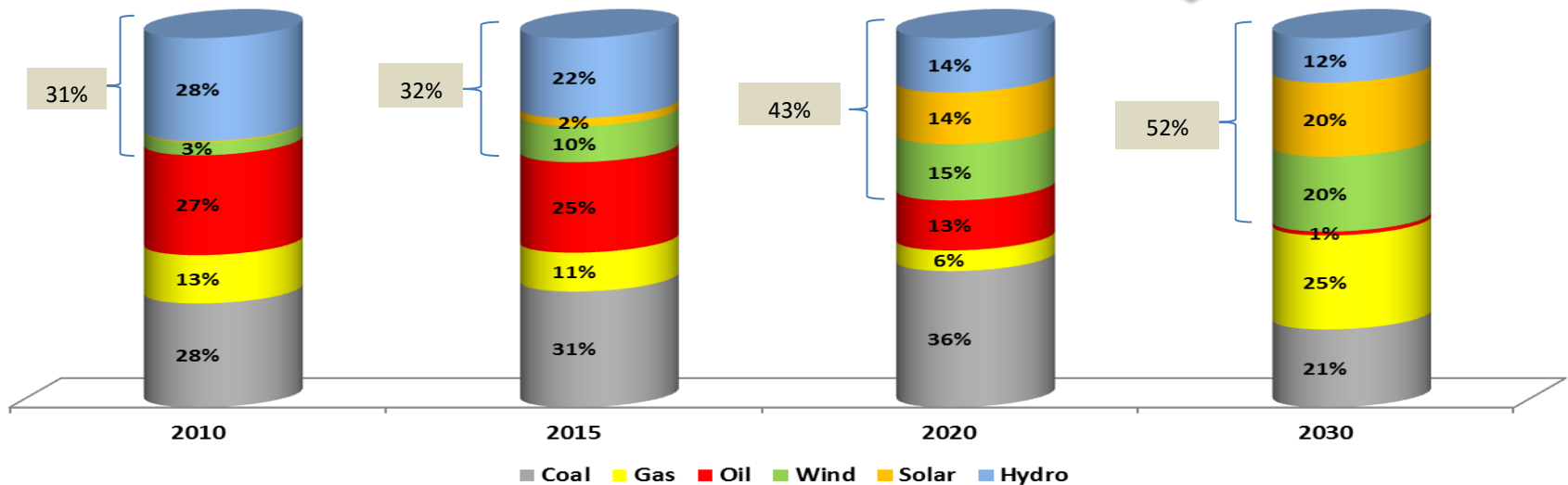
4 fundamental objectives

Generalization of access to energy at the best prices

Security of supply and availability of energy

Prevention of Environment

Demand Management



HISTORY OF RURAL ELECTRIFICATION IN MOROCCO

Rural Electrification by the interconnected network before the PERG

The decree of 14 April 1975 instituted an entity called "Special Fund", dedicated to rural electrification.

The first phase of PNER was completed between 1982 and 1986 and led to the electrification of 287 villages, amounting to some 80 000 households. PNER I was funded by 50% by the Government and by 50% by local authorities.

1975

1982-1986

1991-2000

1995

1996

2002

2014

Rural Electrification after the PERG

Acceleration of the rural electrification

98,86% as rural electrification rate

38.396 villages electrified through the national electricity network & 3 663 villages electrified by PVs ;

- 12 million citizens have benefited from this program;
- Investing more than 20 billion of MAD ;
- Creating of 100,000 jobs

18% of the rural population had access to electricity.

**Lunching of «Global Rural Electrification Program » (PERG);
Initial Objective : Generalization of the electrification by 2010.**

CHARACTERISTICS OF PERG

- ❑ The Moroccan government launched the Global Rural Electrification Program (PERG) in January 1996.
- ❑ The program has clear objectives to promote and facilitate social and economic development as well as rural world advancement, satisfying three levels:
 - **Territorial:** To provide an electricity supply to all rural habitations of the kingdom in a short term.
 - **Technical:** To examine all the electrification techniques available to meet the requirements of each Moroccan habitation in acceptable techno-economic conditions.
 - **Financial:** To maintain PERG responsibility for all financial resources.
- ❑ An inter-ministerial Committee for Rural Electrification Program was established to approve ONEE's Master Plan, which had to satisfy several predetermined criteria; the principle of village selection for electricity supplies is least-cost per habitation.
- ❑ Local Committees were implemented for the technical and financial approval of the PERG.

ONEE'S MASTER PLAN

- ❑ **Surveys were required to establish a database of demographic, social, economic and administrative details for each village, and to collect and establish geographical information on the existing electricity supply networks;**

- ❑ **Rational decisions regarding the needs of each community were based on the following issues:**
 - ✓ Number and location of each village to be included in the program
 - ✓ Source of scheme finance
 - ✓ Means of affording a supply (for example, connected to ONE's network or a renewable energy source)
 - ✓ Project timing (proposed year for village electrification)
 - ✓ Estimated cost of the scheme to supply the village
 - ✓ Impact on the village community.

- ❑ **The techno-economic evaluation used to determine the PERG Master Plan considered three important issues:**
 - ✓ Population density based on the average distance between habitations of a same village or between small groups of habitations.
 - ✓ Regional balance. ONEE financed the construction of networks in regions where the existing networks are deemed inadequate. This decision enabled the existing distribution networks to be extended and reinforced in a manner designed to accelerate PERG.
 - ✓ Internal profitability rate of each project.

INSTITUTIONAL APPROACH

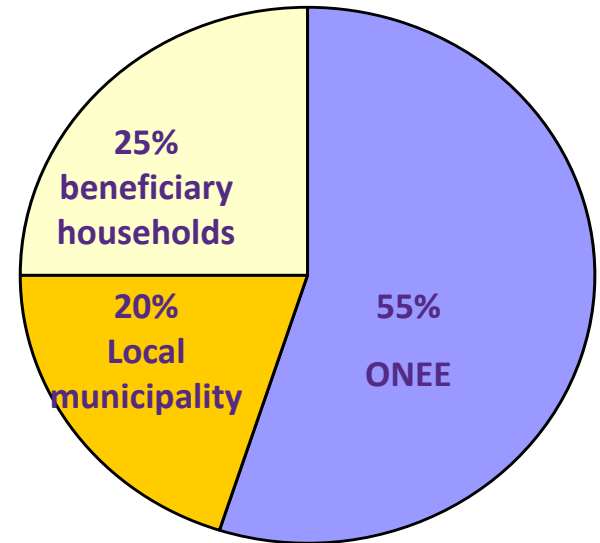
- Rural electrification via the power grid covered 40,600 villages by 2014 according to the following schedule:
 - 1996-2002 : Step 1 and Step2 (Cost/Home \leq 10 00 DH) RER* : 55%
 - 2002-2004 : Step 3 (Cost/Home \leq 14 000 DH) RER : 72%
 - 2004-2006 : Step4-1st part (Cost/Home \leq 20 000 DH) RER : 87%
 - 2006-2017 : Step4-2nd part (Cost/Home \leq 27 000 DH) RER : 99,9%
- Rural electrification via PV has enabled to electrify 3,663 villages so far.

*: RER stands for Rural Electrification Rate

CHARACTERISTICS OF THE PERG

❑ **Three sources — local communities, beneficiary habitations and ONE — provide the funding for PERG. The agreed contributions paid by each party are evaluated as follows:**

- ✓ Local communities pay 2085 Dirhams (DH) (US\$181) per habitation or 500 DH (US\$43) per habitation per year for a five-year period.
- ✓ Beneficiary habitations pay 2500 DH (US\$218) per habitation or 40 DH (US\$3.5) per habitation per month for a seven-year period.
- ✓ ONE pays the outstanding balance for each village scheme.



❑ **Other partners can also participate in the funding of PERG. For example: Village Associations, Development Agencies and Private Companies.**

❑ **Role of the key players**

- ✓ ONE is the project owner
- ✓ Municipality is the partner and co-funder
- ✓ MINISTRY OF INTERIOR: Monitoring -Approval- co-financing.



PLANNING OF THE PERG:

LOCATION OF THE VILLAGES/MV NETWORK

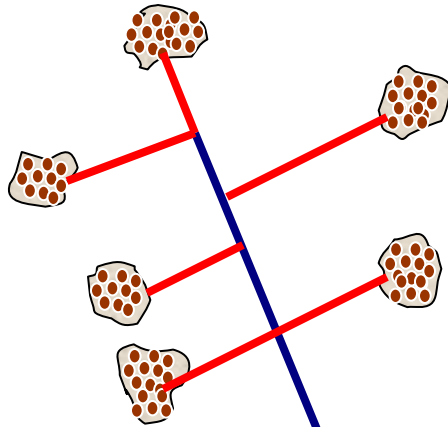
Geographical location	Electrification option
Grouped village located near the MV network	Grid connection
Dispersed village regardless of the location / MV network	Stand alone PV Kits
Isolated grouped village, but far from the MV network	Decentralised Grid
Distant villages with grouped habitat	Grid connection

ELECTRIFICATION MODE

• Grouped Villages



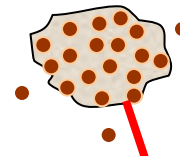
• Grid



• Grouped & Near MV



• Grid

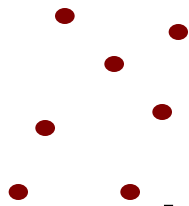


• MV line

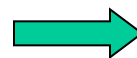
• Dispersed



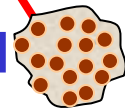
• PV Kits



• Grouped & far MV



• Decentralised Grid



THE PROGRAM'S SCHEDULE

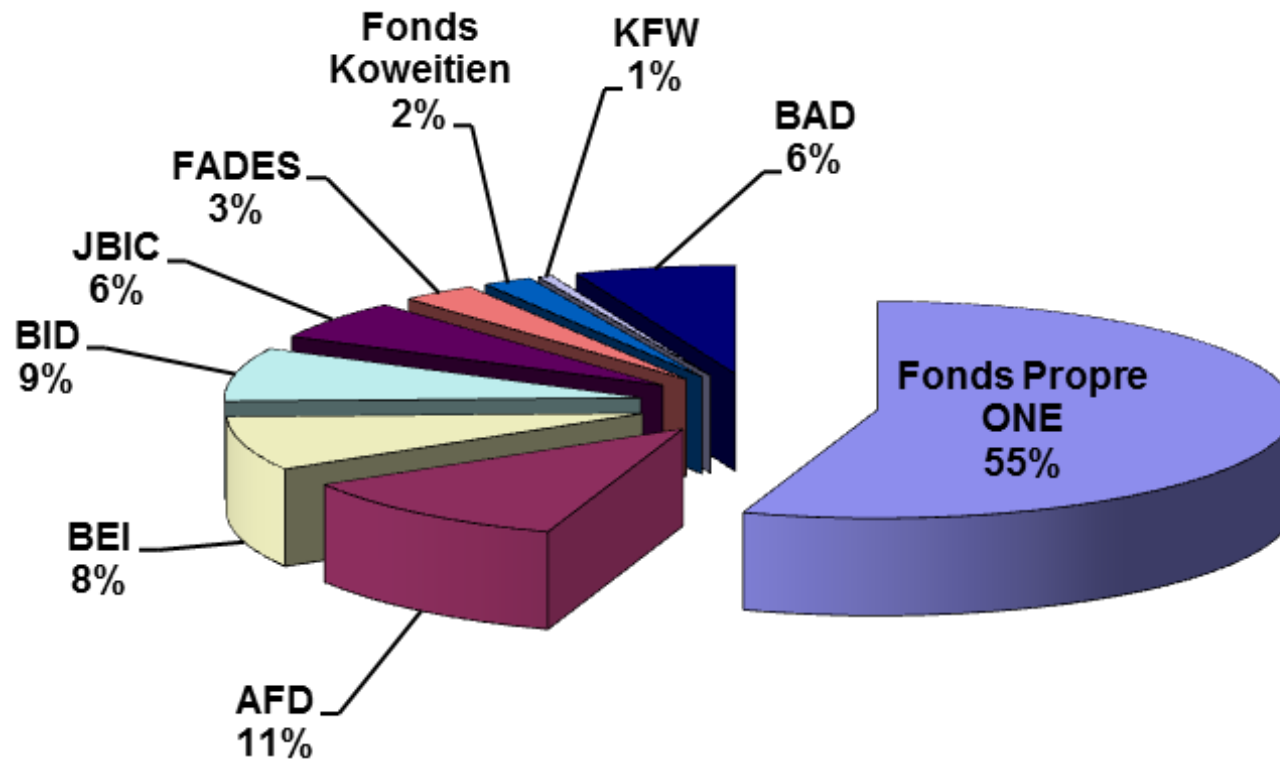
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FUNDING OF THE PROJECT

Global Budget: 2.5 billion US\$



Electrification through PV

- The use of PV has been dictated by the need of achieving a less expensive and faster electrification of remote areas.
- There have been three ways of implementing PV in Morocco:
 1. **Fully Grant-Based Model:** ONEE delivers the whole package (equipment+assembly+O&M);
 2. **Operation-Maintenance PPP model:** ONEE purchases the equipment but submits it to a subcontractor that ensures the assembly and O&M as well as receiving the payments from customers on behalf of ONEE;
 3. **The 3th way is called “Fee For Service”.**

FEE FOR SERVICE APPROACH (FFS)

The current achievements for photovoltaic option are mainly based on a **Fee For Service approach**:

- **Objectives of FFS approach :**
 - Accelerate the achievements;
 - Ensure a sustainable service, adapted and with lower cost;
 - Involvement of the private sector.

- **Services provider ensures :**
 - Identification and sensitization of the potential customers;
 - Supply and installation of all equipment;
 - After sale service and renewal of the material under guarantee during 10 years;
 - Advances and monthly payments collect during 10 years;
 - Intervention in less than 48 hours in case of breakdown;
 - Recycling of the batteries.

- **ONEE is the owner of equipment during 10 years**

- **Environmental aspect: Collection and recycling of batteries are the responsibility of the service provider.**

FEE FOR SERVICE CONTRACT

ONEE → Grants subsidies + Monitors

Customer → Cash advance + monthly payments/ 10 years

- ❑ From a technical standpoint, two systems are proposed to the customer:
 - 75 Wc for lighting and audiovisual applications;
 - 200 Wc for lighting, audiovisual applications and refrigeration.
- ❑ The financial package for Fee For Service includes participation by ONEE according to the system installed (75 or 200 Wc), payable to the service provider after completion and commissioning of the installation.
- ❑ The beneficiary household participates by payment to the services provider of an advance upon taking out of a subscription and monthly payments over a period of 10 years.

TRANSACTIONS UNDER “FEE FOR SERVICE”

	Sizes available	Customer's part (US\$)	ONE's subsidy (US\$)
<u>Transaction – 1 –</u> ✓ 16,000 units; ✓ Start up in 2002;	- 50 Wc, - 75 Wc, - 100 Wc.	- 82+ 7,5/month - 212 + 11/month - 365+15/month	635
<u>Transaction – 2 –</u> ✓ 12,000 units; ✓ Start up in 2003;	- 50 Wc, - 75 Wc, - 200 Wc.	- 82+ 7,5/month - 212 + 11/month - 590 +27/month	425 to 1725 depending upon the system
<u>Transaction – 3 –</u> ✓ 37,000 units; ✓ Start up in 2004;	-75 Wc, - 200 Wc.	- 106+ 7,5/month - 470+ 18/month	645 1290
<u>Transaction – 4 –</u> ✓ 40,000 units; ✓ Start up in 2005; ✓ .	-75 Wc, - 200 Wc.	- 106+ 7,5/month - 470+ 18/month	645 1290

51,559 homes have been provided with PV under “Fee For Service” contracts

SOCIO ECONOMIC OUTCOMES

- A widespread access to appliance equipments:
 - TV(24% in the past while 90% after 10 years);
 - Fridge(15% in the past while 70% after 10 years).
- Trading: set up of small businesses, higher incomes, extension of working time(activity no longer ends at 6pm it ends at 10pm from now and on), new activities start to emerge.
- Agriculture: more wells are connected to electricity;
- Creation of jobs: 18,000 to 22,000 permanent jobs.

ACHIEVEMENT OF THE PERG

The PERG, a program launched by ONEE in 1996, is an example of success for Morocco in the field of rural electrification

A program based on two modes of electrification

- **connection to the interconnected grid**, for most of the rural villages
- **decentralized rural electrification**, mainly photovoltaic equipment for remote grid or sparsely populated

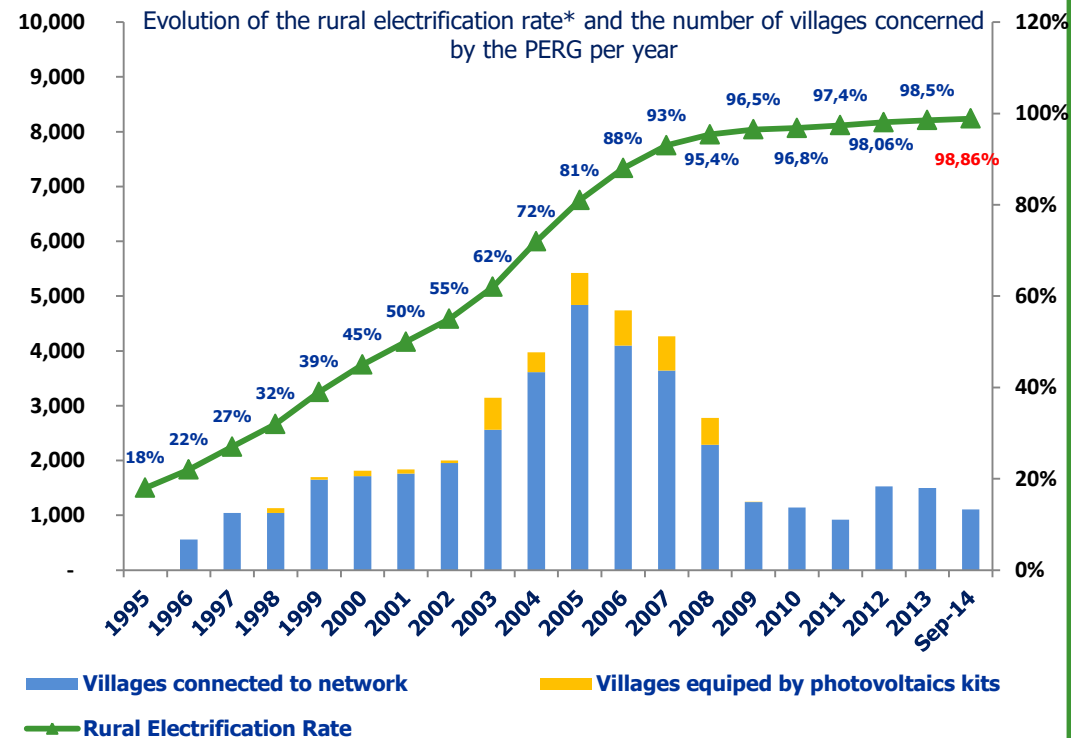
38 208 villages
connected to the
national grid

3 663 villages with a
decentralized
electrification

**Rural
Electrification
Rate***

98,86%

Morocco among the 20 countries that have experienced the most accelerated pace of electrification in the past 20 years



(*): Number of electrified villages among the total number of the villages over the country

THE PERG : PROVEN RESULTS

▪ Success Factors :

- ✓ Support of Government ;
- ✓ Management of the project by the National Operator ;
- ✓ A tailored space-time program ;
- ✓ Implementation flexibility ;
- ✓ Support of Lenders ;
- ✓ A tremendous effort in technical and cost optimization ;
- ✓ Benefiting from an innovative, participative and well designed scheme.

- The PERG going jointly with the National Initiative for Human Development (INDH) conducted under the high supervision of His Majesty King Mohamed VI, to achieve both economic and social developments :
 - ✓ Better living standards ;
 - ✓ Improving living conditions, particularly for female gender ;
 - ✓ Better hygiene, sanitation and safety conditions in villages (thanks to public lighting) ;
 - ✓ Improvement of education by extending the time spent at school and at home ;
 - ✓ More than 100.000 jobs created ;
 - ✓ Development of domestic companies specialized in electrical fields ;
 - ✓ Many small businesses have flourished ;
 - ✓ Increase income through diversification of activities ;
 - ✓ Mitigation of rural exodus.



FACTORS OF SUCCESS

- **Strong political will coupled with a clear vision**
 - ✓ PERG was government-initiated and enjoyed consistent government support throughout implementation. It had a clear vision – the global electrification of rural Morocco – and a competent lead agency guided by a detailed road map that included a funding scheme.
- **Multi-stakeholder business model**
 - ✓ The financing was split between the three main stakeholders, ONE (55%), municipalities and communes (20%) and households (25%).
 - ✓ The commitment of both ONE and Municipalities through conventions;
 - ✓ An effective involvement of municipalities during the validation process and at the definition of the scope of projects.
- **Effective institutional setup**
 - ✓ The program managed and coordinated all resources for rural electrification, including those provided by the IFI's. A standard list of equipment, streamlined pre-qualification of contractors, and competitive tendering and bidding processes ensured high-quality implementation while keeping costs at a record low
- **Consultation and involvement of industrial partners:**
 - ✓ Professionalism of partners;
 - ✓ Consultation, sharing and continuous improvement.

PART II
SOME LOCAL INITIATIVES

Local Initiatives in Southeast Asian Countries

Electricity access in Southeast Asian Countries

Country	Electrification rate (%)	Un-electrified population (Million, approx.)
Myanmar	26.0	44.4
Cambodia	24.0	10.6
Lao PDR	78.0	1.4
Indonesia	73.7	62.4
Philippines	89.7	9.5
Vietnam	97.3	2.1
Thailand	99.3	0.5
Malaysia	99.4	0.2
Brunel	99.7	0.0
Singapore	100.0	0.0

Source: ACE 2012

POLICY FRAMEWORK FOR OFF-GRID RURAL ELECTRIFICATION

Rural electrification planning in Vietnam

- ✓ The task of planning and promoting offgrid rural electrification is assigned to each province;
- ✓ The district governments and the local communities are requested to support the project developers or consultants to conduct site surveys and prepare off-grid rural electrification proposals for target communities;
- ✓ In case the projects request for a grant and/or national budget support, they are submitted by the provincial government to the central government for appraisal and approval
- ✓ This collaboration-based approach can be credited with making it possible to move forward with the off-grid rural electrification effort on all fronts, and possibly much faster than what could have been achieved by relying on the resources and capabilities of one central entity

POLICY FRAMEWORK FOR OFF-GRID RURAL ELECTRIFICATION

Community Selection Approach in Lao PDR

- ✓ The Rural Electrification Master Plan (REMP) in Lao PDR sets a National Electrification Target of 94.7% on household basis by 2020, which will be achieved by on-grid systems, i.e. grid extension (90.9%) and by off-grid systems using mini/micro hydropower and SHS (3.8%).
- ✓ In order to select a suitable village for off-grid rural electrification, the criteria are set as follows:
 - Average distance from the village to the existing medium-voltage grid is more than 3 km;
 - There is no existing plan for grid connection in the next 5 years;
 - Road accessibility to the village is ensured throughout the year;
 - Affordability of the installation fee and monthly tariff for villagers is given; and
 - Management skills are prevalent in the village.
- ✓ REMP considers affordability as the most important criterion. Therefore, it is requested that at the initial stage, the project developer visits the village with a sample of SHS kit, and, in detail, explains its technical features and applications as well as the payment scheme to the villagers. Then, potential customers are listed.
- ✓ If the percentage of candidates, that is able to pay, is less than 50% of total households, this village will not be selected for SHS-based electrification.

FINANCING MECHANISMS AND REQUIRED SUPPORT POLICIES

Rural Electrification Fund (REF) in Cambodia

- ✓ Rural Electrification Fund (REF) in Cambodia provide financial support to achieve Cambodia's electrification targets.
- ✓ Renewable energies play a certain role in its program. Mini hydro plants and solar home systems are eligible to receive subsidies up to 25% of total investment costs. The International Development Association (IDA) and Global Environmental Facility (GEF) provide financial support to the REF.
- ✓ REF's activities include:
 - Grant assistance of US\$ 45 per connection (subsidy) to Rural Electricity Enterprises to increase household connections based on eligibility criteria such as location, distance from national grid, licenses, price/kWh, etc.;
 - Financial support to 12,000 SHS rent-to-own program: around US\$ 3.85 million of which US\$ 1.2 million is grant and US\$ 2.65 million is loan;
 - The repaid loans were used for the project "Power to the Poor", to provide poor households a US\$ 100 soft-loan (no interest) to pay for the grid connection. This loan should be paid back over a two-year period with the monthly electricity bill. Households that are not connected one year after the construction of the grid, or households headed by females, are considered for this loan.
- ✓ REF has started a pilot project in Kampong Speu with the first US\$ 10,000 repaid from the 12,000 SHS rent-to-own program. The target of this pilot project is 1,000 households.
- ✓ A similar project has been very successful in Lao PDR.

SOCIO-ECONOMIC ASPECTS AND COMMUNITY INVOLVEMENT

Creation of Village Energy Committee in Lao PDR

- ✓ The shared-pico hydropower project was implemented in 2009 by the Lao Institute for Renewable Energy (LIRE) in Angsang Village, Huaphan province.
- ✓ The key success factor learnt from the project was the creation of the **Village Energy Committee**.
- ✓ Through it, the local people got involved in project planning and implementation, and were trained to manage the system themselves. The Committee nominated two local representatives to receive further training to operate and maintain the system.
- ✓ The Committee also sets the tariff (in the case of Angsang Village, there are two types of tariffs – a low one and a high one, allowing villagers to chose their power needs and pay accordingly).
- ✓ The tariff shall be decided in such a way that it generates enough income for the system maintenance and the expenditures of the Village Energy Committee and the two people trained to operate the system.
- ✓ The underlying concept is that power should be as cheap as possible, but the operational costs need to be covered. The Village Energy Committee is given clear guidance and support with respect to the range of viable tariffs, so it is a feasible and reasonable local decision for them.

CAPACITY BUILDING AND TRAINING

Capacity Building and Training in Vietnam

- ✓ The Vietnam-Sweden Rural Energy (VSRE) Program aimed at increasing the access of Vietnam's rural population to reliable, affordable, appropriate and sustainable rural energy services. The program focused in off-grid rural electrification.
- ✓ One of the key factors contributing to the success of the program was capacity building and training.
- ✓ During a period of 3 years, about 38 CB&T events with more than 1,150 participants had been organized. They included 13 workshops, 12 seminars, 2 study tours and 11 trainings.
- ✓ The stakeholders involved in capacity building and training varied from policy makers/government officials to the power plant operators.
- ✓ The CB&T topics included policy, technical and financial issues, project planning and implementation, O&M and business management.
- ✓ Priority was given to training on power plant O&M, and business management.
- ✓ A three-step approach was used for training personnel selected from 4 pilot projects.
 - In a first step, VSRE trained the personnel in basic principles of power plant operation and maintenance and business management.
 - Then, an in-depth classroom training was conducted by a local vocational school for 4 months.
 - Finally, the personnel was trained by the equipment suppliers and contractors during construction and equipment installation.



الأمم المتحدة
اللجنة الاقتصادية والاجتماعية لغربي آسيا

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