

Capacity and Institutional Strengthening for Rural Electrification and Development-Decentralized Energy Options

Rural Electrification by Renewable Energy in Cambodia



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BACKGROUND

- Territory: 181,035 sq. km
- Population: 13.3 million in 2004 (83% in rural areas)
- GDP: US\$280 per capita
- Electrification rate : 17% (urban~54% and rural~13%)
- Energy consumption: 55 kWh per capita
- Electricity cost, ranging from about US\$ 0.14/kWh in EDC's grid to US\$ 0.30 – US\$ 0.92 per kWh in rural areas served by REE
- Generation in 2004 : 200 MW and 1,000 GWh
- Projection in 2015 : 750 MW and 3,000 GWh
- Main generation source: Diesel Oil & Heavy Fuel Oil
- High potential of hydro source : more than 10,000 MW

Current Situation of Energy Use for Lighting in Rural Area

Base on the survey of 2000 showed:

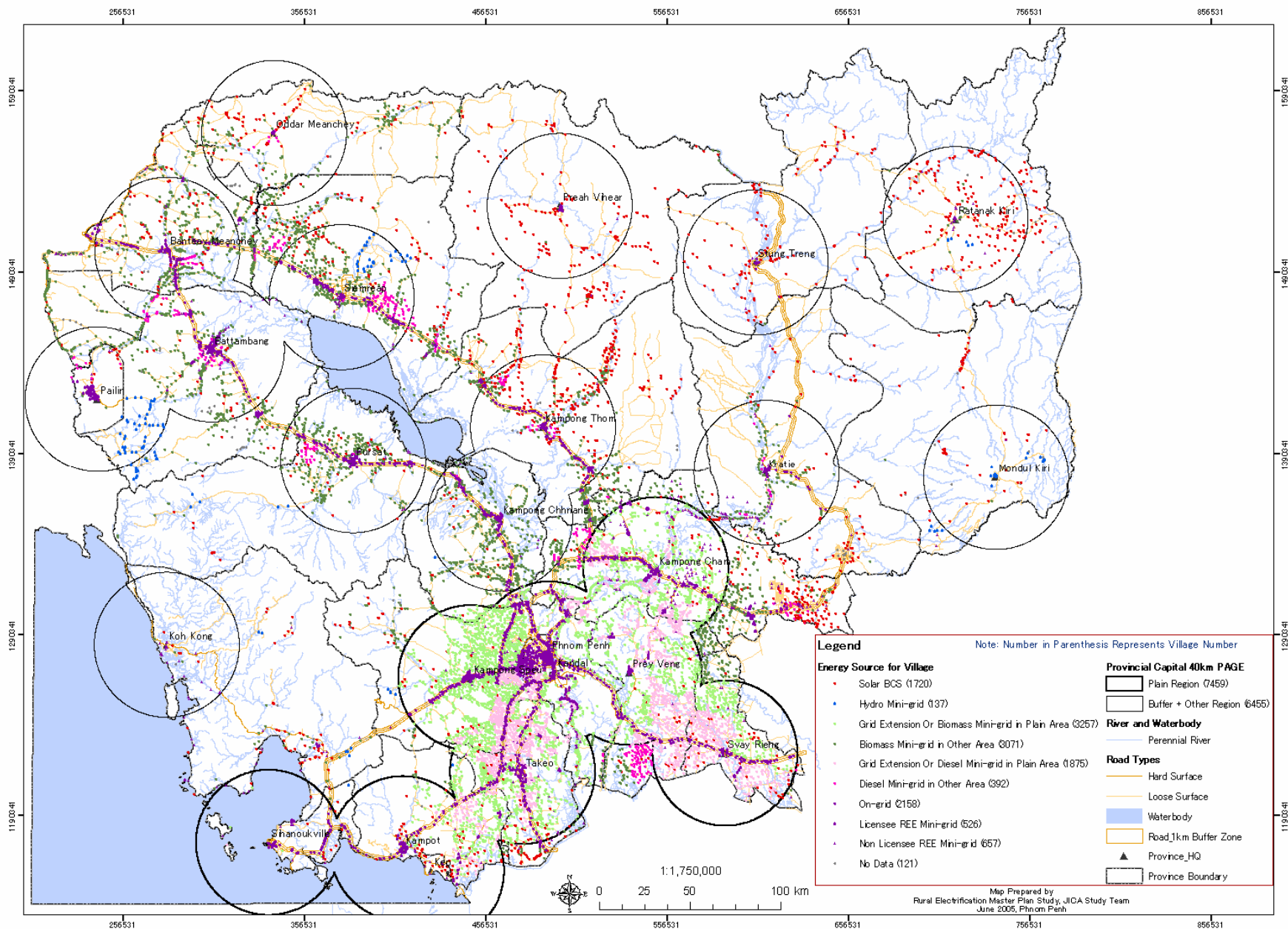
- Batteries 55%
- Dry Cell Batteries 24%
- Candles 11%
- REE 04%
- Small Genset 03%
- EDC Grid 02%

NOTE: In most of the cases, kerosene is used as a standby means for lighting.

POTENTIAL ENERGY RESOURCES

- **Solar Energy**: the average sunshine duration of 6-9 hours per day, giving an average of 5kWh/day. thus, considerable potential of solar energy.
- **Wind Energy**: The southern part of the great lake Tonle Sap, the mountainous districts in the southwest and the coastal regions, such as Sihanoukville, Kampot, Kep and Koh Kong have the annual average wind speed of 5m/s or greater; thus the introduction of wind power generation system in these areas is promising.
- **Hydro**: The potentiality (10.000MW, but current contribution to electricity production less than 20MW).
- **Biomass**: The report prepared by NEDO on “the Assistance Project for the Establishment of an Energy Master Plan” identified significant biomass energy resources from a variety of agricultural residues such as rice husk., Cassia, Cassava, Mulberry, Coconut, SEM, Pro.....
- **Biogas**: The effectiveness of small scale biogas has been demonstrated in Cambodia by a number of different projects. The use of animal wastes to generate high quality gas for cooking has significant economic, health, social and environment benefits for poor rural households.

Candidate Energy Sources by Village



National Policy On Renewable Energy

- Endeavour to provide access to reliable, safe and environmentally clean electricity services to rural areas, at an affordable cost to the national community;
- Act as a market enabler and encourage private sector participation in providing rural renewable electricity services;
- Provide effective legal and regulatory framework for enabling access to reliable, safe and clean electricity services to rural areas, at an affordable cost to the national community;

National Policy on Renewable Energy (cont.)

- Encourage the most efficient systems for generation, transmission and distribution of electricity from clean and renewable energy sources, to enable a rational electricity tariff policy through promotion of differentiated tariffs based on cost recovery principles;
- Promote renewable electricity systems for rural applications, as part of a national portfolio of grid and off-grid technologies, provided they are the least-cost option for the national communities; and
- Ensure adequate resources and appropriate institutional mechanisms to empower the poor, particularly those in rural areas.

RURAL ELECTRIFICATION STRATEGY COMPONENTS

- **Goals:** by *2020*, all villages will have access to electricity of different forms; and the year *2030* -70% of all rural H'holds will have access grid quality electricity.
- **Main components of the Rural Electrification Strategy:**
 1. Grid expansion from the existing
 2. Diesel stand-alone, Mini-Utility Systems
 3. Cross-border Power Supply from neighboring countries (Thailand, Vietnam and Lao PDR)
 4. Renewable Energy (Solar, Wind, Mini-micro hydro, Biomass, Biogas, Bio-fuel, etc...)

MASTER PLAN ON RENEWABLE ENERGY

Purpose – To identify and evaluate the Renewable Energy Potential for the whole Kingdom of Cambodia

MASTER PLAN STUDY ON RURAL ELECTRIFICATION BY RENEWABLE ENERGY

- **GOAL** -To improve the current level of electrification and for the poverty reduction as well as enhancing education and medical treatment in the rural areas.
- **PURPOSES**
 - Study of policies to promote electrification in those areas not yet serviced
 - Introduction and development of Renewable Energy Technologies
 - Study of institution and organization for sustainable operation and maintenance supported by the appropriate business model, including the financial procurement plan.
- **TARGET** -To achieve 100% Electrification of Rural Villages by the year 2020.

National Strategy on Renewable Energy

The basis of the proposed strategy is :

- Widely expand the access for electricity services to the rural population through development of appropriate programs and action plans to promote the Renewable Energy Technologies (RET);
- Expand the supply base for renewable energy services by motivating and promoting the participation of private entrepreneurs so as to provide efficient and cost-effective services, which will benefit the whole community;
- Facilitate systematic market and institutional development in renewable electricity sector by creating a comprehensive legal and regulatory framework to enable effective participation of government, private and community based entities in providing electricity services to the rural consumers;

National Strategy on Renewable Energy (cont.)

- Ensure a wide and equitable access of electricity services to all sections of the rural population by developing appropriate tariff policies and instituting a rational tariff regime;
- Promote environmentally sustainable small power technologies including RET in on-grid and/or off-grid mode in order to create wide access for rural consumers to affordable electricity services; and
- Contribute to empowerment of the rural poor by creating economic opportunities and uplifting standards of living through electricity services, and through involving them in planning, operation, maintenance and management (OM&M) of programs providing those services.

RENEWABLE ELECTRICITY ACTION PLAN (REAP)

- REAP MISSION
- REAP GUIDING PRINCIPLES
- REAP LONG TERM TARGET
- THE 5 YEARS REAP
- FINANCIAL RESOURCES

RENEWABLE ELECTRICITY ACTION PLAN(1)

REAP MISSION

The REAP Mission is to formulate the effective plan for the development of affordable and reliable electricity from renewable energy sources

To improve the living standard of Cambodian people, especially the rural communities, by working together and sharing knowledge and information with all involved stakeholders.

RENEWABLE ELECTRICITY ACTION PLAN(2)

REAP GUIDING PRINCIPLES

Poverty reduction- together with sustainable development-these two critical elements are included in all project components:

- Use renewable energy where economically and environmentally least cost
- The RGC, through its ministries, act as a market enabler
- Private sector firms invest in and supply the market
- Market alone would not attract private sector in rural areas: for equity reasons and not penalizing rural poor, flexible incentive schemes must be introduced
- Although subsidies should be used cautiously to avoid market distortions, these are necessary for RE and notably for RET implementation

Availability of Funds for subsidy: dependent on the international communities for the first 10-years period, while the RGC is doing every effort to establish its own

RENEWABLE ELECTRICITY ACTION PLAN (3)

REAP LONG TERM TARGET

The RGC has established Four long-term objectives for electricity generating renewable energies technologies:

- 5% of new electricity generation or 6 MW of mini hydro & 850kw of village hydro
- 50 000 households (HH) will be supplied by electricity from renewable technologies on a competitive basis
- 12 000 households will be served by Solar Home System
- A sustainable market for renewable electricity systems

RENEWABLE ELECTRICITY ACTION PLAN (4)

THE 5 YEAR REAP

The RGC adopts a phased implementation approach:

- Phase 1 for market preparation, already done, practically
- Phase 2 for early growth, will last three years
- A pilot phase is effected in order to refine the operations, which will be based on lessons learnt during this period.

The rural electrification (RE) using the Renewable Energy Technologies (RET) has two main characteristics:

- The un-awareness of the Cambodian public in general
- The RGC/WB and the International Community have to promote the RET, in competition with the traditional sources of electricity generation.

Rural Electrification-Mechanism

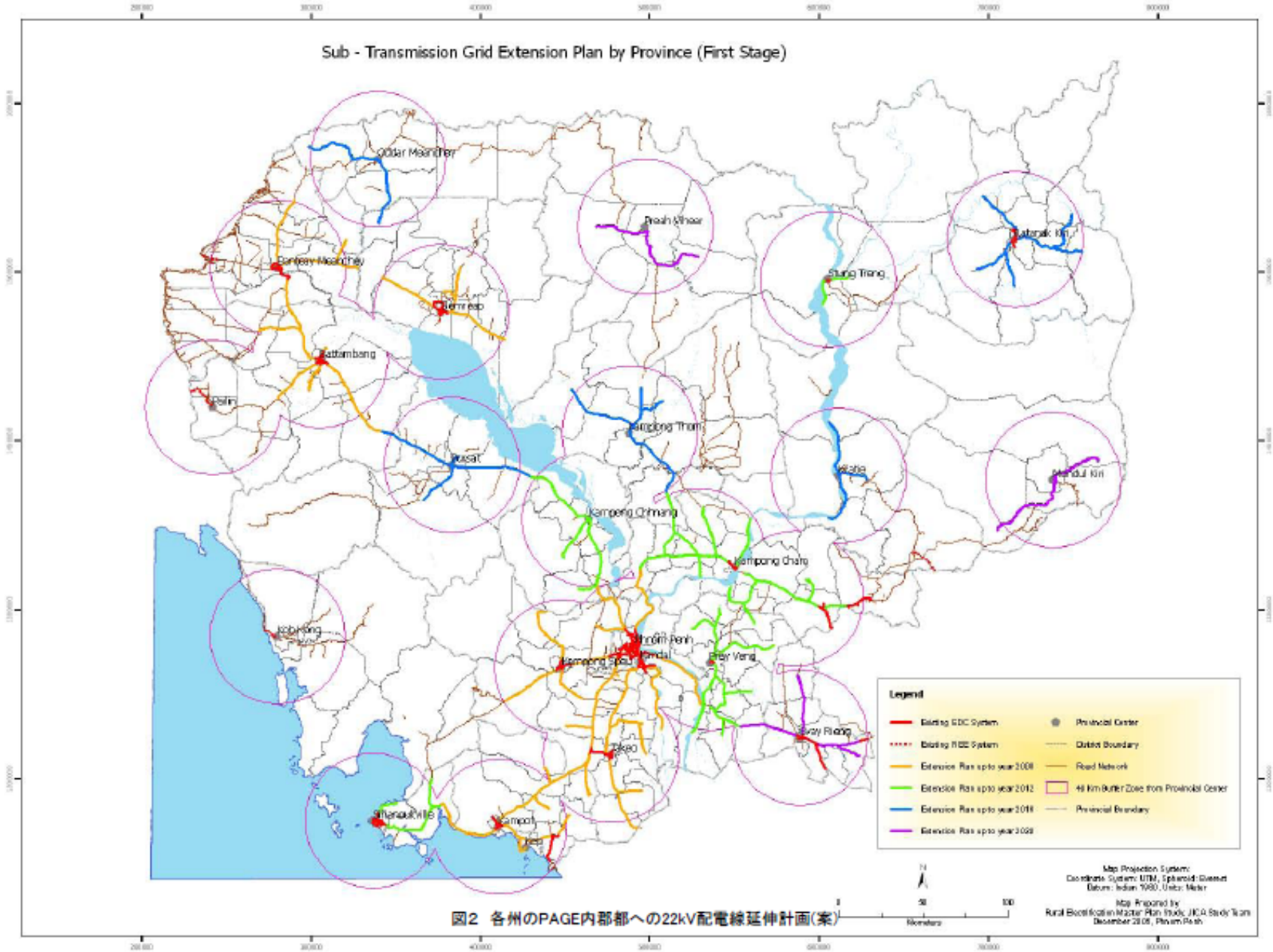
To implement and to achieve the goals set up by the policy, strategy and action plan, the RGC must first establish the Rural Electrification Fund (REF): *the Royal Decree establishing REF is already promulgated on 4th December 2004.*

- REF is the creation of the Royal Government of Cambodia and the World Bank, with the goal of encouraging the private sector for investment in electricity supply to the rural population, with smart subsidies and Smart credit scheme for reason of social equity.
- Subsidy & various incentives will minimize investment cost, making (a) electricity price affordable to rural population, and (b) rural electrification entrepreneurs' businesses sustainable.
- Investment Fund will come from grants and long term loans with low interest rate from various credit and financing institutions (banks and MFI).

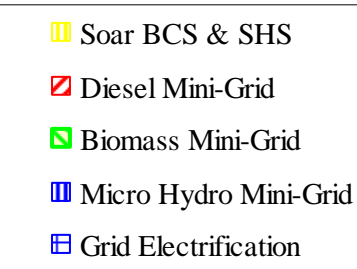
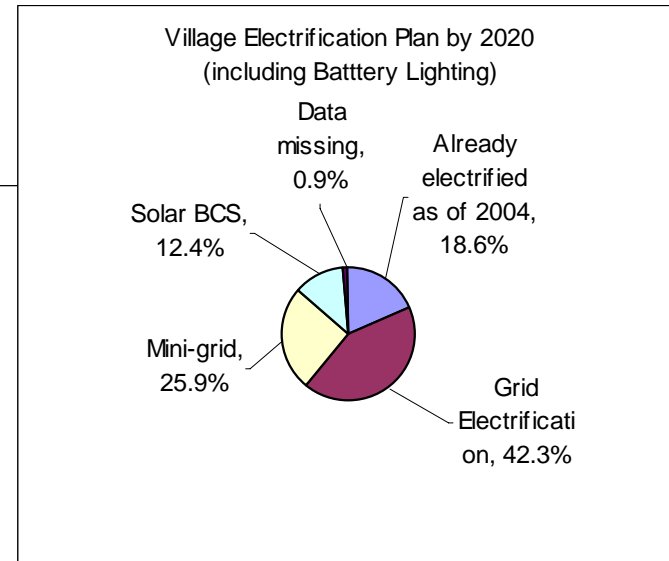
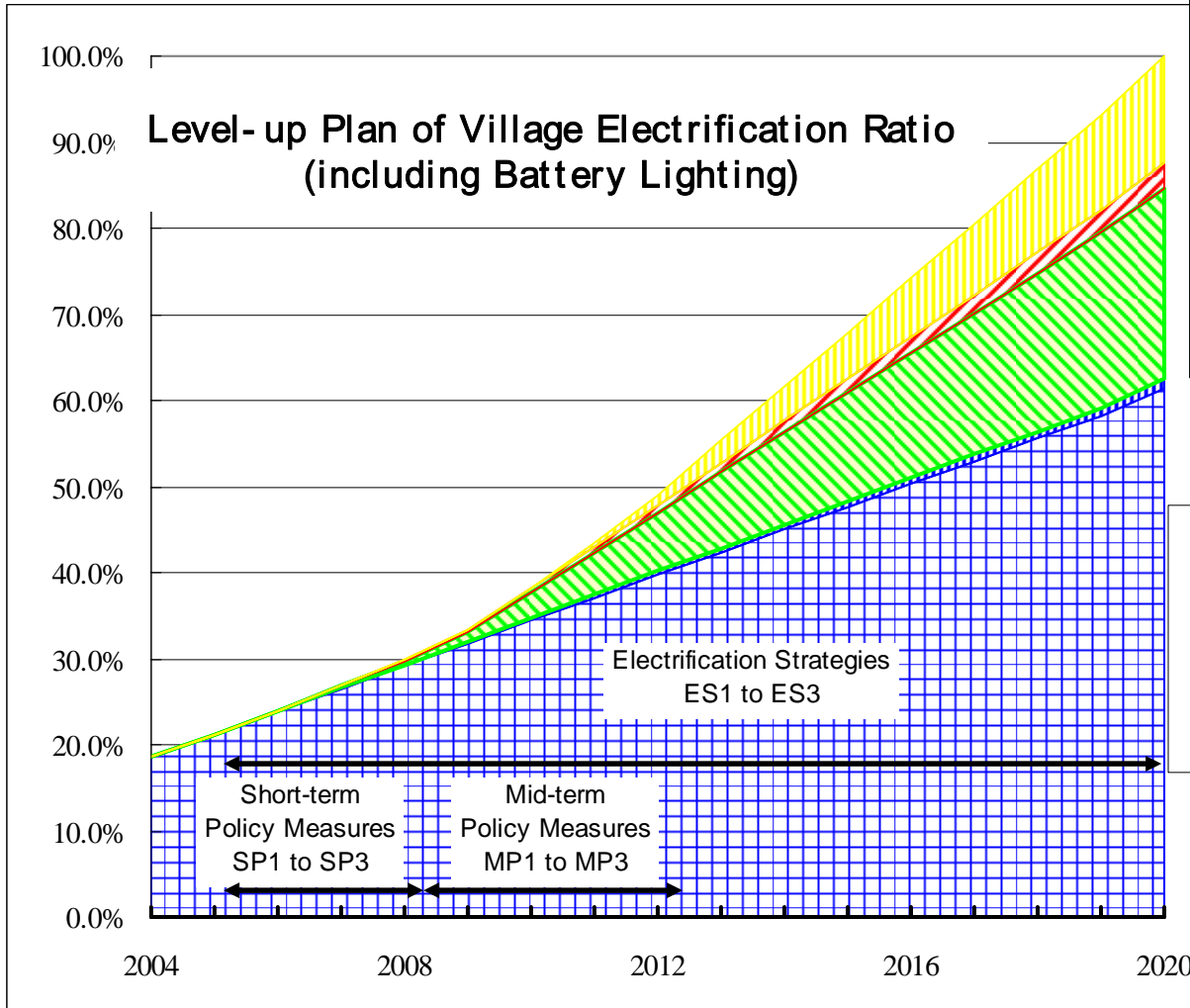
OTHERS...

- Promote and encourage Rural Electrification Entrepreneurs (REE) to participate by support with various schemes, i.e. ideas, “subsidies”, training for awareness and understanding of renewable energy. The next step would be to reduce, even to stop/discard using Diesel Generation sets and to replace these by Renewable Energy Technologies (RET).
- Create Community Business Associations or Organizations (CBA) in order to develop activities in villages and communes – *such as income generation activities* -, particularly in remote areas, where private sector is not yet aware of or cannot yet reach.
- Necessity to create NGO, agents, associations, etc. in order to accelerate the development and to reach the targets set by the RGC in terms of RE for the years 2020 (*all villages electrified*) & 2030 (*70 % rural HH with grid quality electricity*).

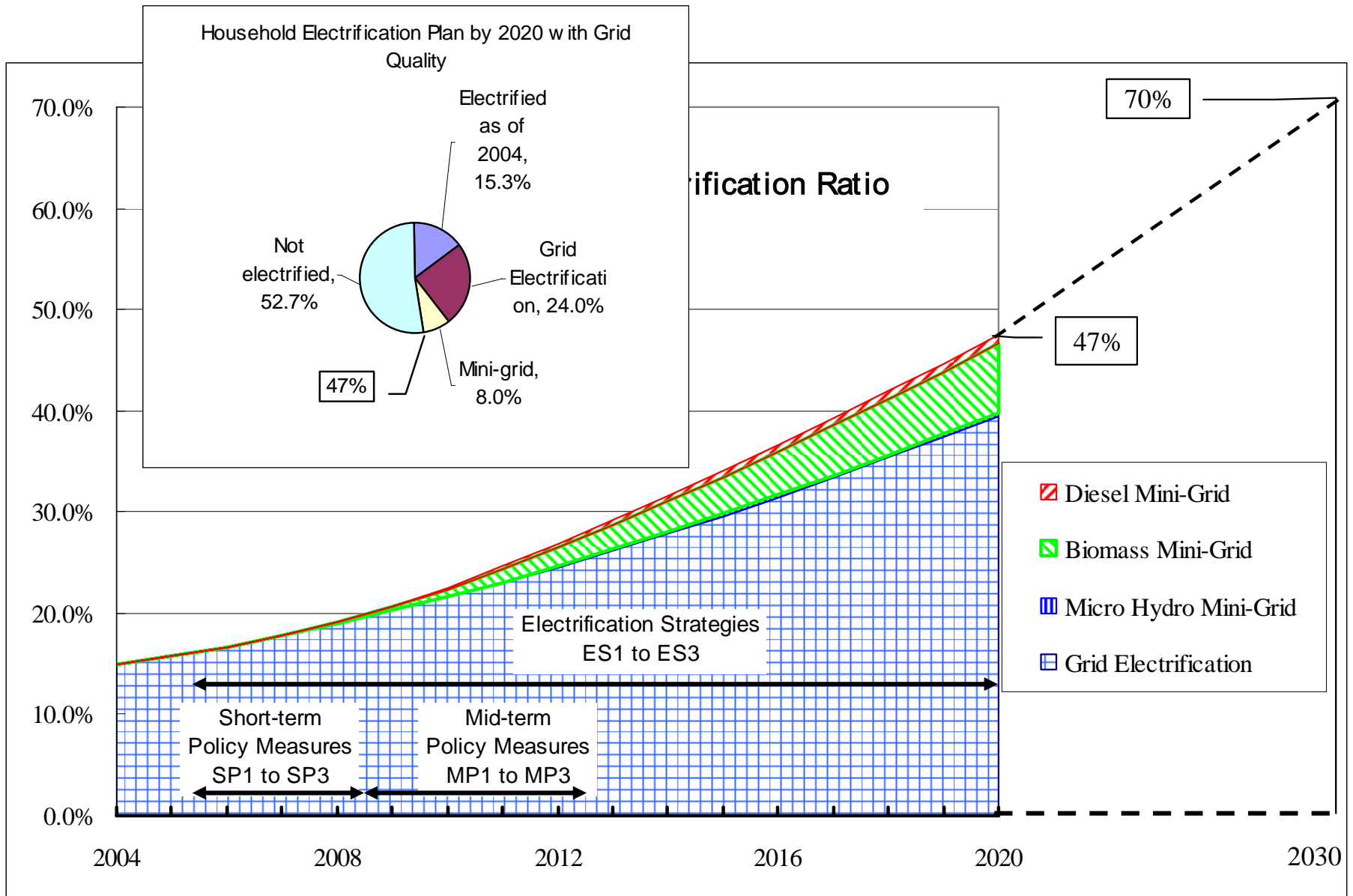
Proposed Extension of Sub-transmission Lines



Village Electrification Plan



Household Electrification Plan



Summary of Off-grid Electrification

Name of Representative Regions	Energy Sources	Number of Villages	Number of Households	Target Number of Households for Electrification by the Year 2020
Off-grid Area (2020)				
Northeast, Southwest and mountainous areas	Micro hydro, hybrid	137	18,541	9,000 (50% of left)
Tonle Sap coastal region, etc.	Biomass gasification	3,071	501,636	168,000 (33%)
	Diesel	392	69,390	23,000 (33%)
Sub-total of mini-grids		3,600	589,567	200,000
Northeast or North provinces	Solar BCS/SHS	1,720	237,570	60,000 12,000

End of Presentation



Thank you for your attention.