

Theme 7
Good Practice

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Overview

- **Total land area:** 677,000 square km
- **Borders Countries:** China, Thailand, Lao PDR
India & Bangladesh
- **Capital:** Nay Pyi Taw
- **Population:** 57 millions
- **State and Region:** 7 States and 7 Regions

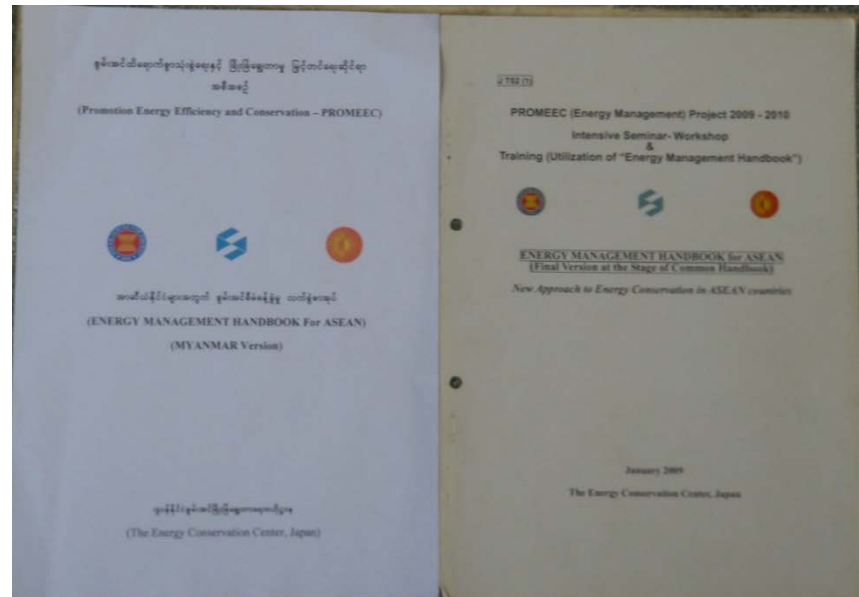


Country background



Energy Management Handbook for ASEAN

- Translation of “Energy Management Handbook for ASEAN” which is one of the tools to promote Energy Efficiency Activities under the PROMEEC Project.
- EMHB have already been printed and distributed to Energy relevant stakeholders, institutions, factories and organizations.



ASEAN Energy Awards

- ❖ Renewable Energy Project Competition
 - On-grid Category
 - Off-grid Category
 - Cogeneration Category
- ❖ Best Practices Competition for Energy Management
 - Industrial Category
 - Building Category
 - Special Submission Category (Industry)
 - Special Submission Category (Building)
- ❖ Best Practices Competition for Energy Efficient Buildings
 - Tropical Building Category
 - Retrofitted Building Category
 - New and Existing Building Category
 - Special Submission Category
- ❖ Green Building (New category for 2014)



	Description	Competition	Level	Prized Awarded
1	Kanbawza Bank (Head Office) (2002)	EEB (Sp.Sub)	ASEAN	Winner
2	Popa Mountain Resort Woodland Hotel (2005)	EEB (Tropical)	ASEAN	Winner
3	Rural Electrification with Rice Husk Gasifier (Linn Tha) (2006)	RE Project (Off grid)	ASEAN	2 nd Runner Up
4	Mingalar Garden Resort (Pyay) (2007)	EEB (tropical)	ASEAN	Winner
5	Bay of Bengal Resort (Ngwe Saung) (2008)	EEB (Tropical)	ASEAN	1 st Runner Up
6	Shwe Inn Tha Floating Resort (Inle) (2009)	EEB (Tropical)	ASEAN	Winner
7	Belle Resort (Chaung Tha) (2009)	EEB (Tropical)	ASEAN	2 nd Runner Up
8	Mamya Dam (2009)	RE Project (Off Grid)	ASEAN	Winner
9	Multi-Purpose Biomass Gasifier (Kaung Kyaw Sae Co., Ltd) (2010)	RE Project (Off Grid)	ASEAN	1 st Runner Up
10	Solar Lighting & Solar Water Pumping Project at Auk Pyun Wa Village (FMI Cons) (2010)	RE Project (Off Grid)	ASEAN	2 nd Runner Up
11	Community Nased Bio Gas Electrification Project (MOST) (2013)	RE Project (On Grid) Community Based	ASEAN	1 st Runner up
12	FAME Pharmecuaticals (2013)	EM (Sp,Sub)(Industry)	ASEAN	Winner
13	No.8 Spinning Factory (Pywe Bwe) (2013)	EM (Industry) (SMI)	ASEAN	Winner
14	Bamboo High School / Storm Shelter, Akare Chaung Wa Village, Ayeyawady Delta (2013)	EEB (Sp: Sub)	ASEAN	2 nd Runner up
15	(2014)		ASEAN	

Outline

- Policy back ground
- Energy resources in Myanmar
- Electrification of rural area
- Local success stories
- World good practices

Energy Policies Framework

- * To maintain the status of energy independence
- * To Promote wider use of new and renewable sources of energy
- * To promote energy efficiency and conservation
- * To promote use of alternative fuels in household

Why do we need to take up Renewable Energy Sources instead ?



Vice President U Nyan Tun emphasizes cost-effective and environmentally-friendly quality energy services. —MNA

According to the vice president, the individual use of electricity in the country is 180 kilowatts per hour, whereas wood and charcoal make up 76% of the total energy use.

Myanmar Forest Policy

(Forest Department)

- **PROTECTION** of soil, water, wildlife, bio-diversity, and environment
- **SUSTAINABILITY** of forest resources to ensure the perpetual supply of both tangible and intangible benefits accrued from the forest for the present and future generation
- **BASIC NEEDS** of the people for fuel, shelter, food and recreation
- **EFFICIENCY** to harness, in the socio-environmentally friendly manner, the full economic potential of the forest resources
- **PARTICIPATION** of the people in the conservation and utilization of the forests
- **PUBLIC AWARENESS** about the vital role of the forest in the well being and socio-economic development of the nation

Government's Renewable Energy Policies

- NEMC is formulating the Renewable Energy policy & Act (2013)
- Myanmar has rich natural resources, including arable land, forests, minerals, natural gas, and freshwater and marine
- 70 % of Myanmar population lives in rural area, but only 27% of the population has access to the national power grid
- Grid accessibility is very limited, growth of energy demand is increasing, and a large number of energy exploitation projects will have negative impacts on the environment
- Therefore, development and application of RE Technology in Myanmar is one of the best ways to solve the problems
- the use of renewable energy and fossil fuel energy has increased in the 10 years from 2000
- the total installed capacity of RE is now 150 MW, and MOE is targeted an additional 500MW of RE by 2015, representing 15% of the current installed capacity.

New Electricity Law

- Differentiates projects into “small” (up to 10 MW), “medium” (between 10MW to 30 MW) and “large” (upwards of 30 MW).
- Private sector involvement in the implementation of :
 - off-grid small scale projects: Freely
 - mid-sized projects: Requires approval of State/Regional governments
 - large scale projects: Requires approval by the Government.
- The Draft Electricity Law stipulates the creation of the Electricity Regulatory Commission (ERC)
 - ERC to formulate a national electricity policy
 - ERC define a modern and systematic formulation of power rates
 - the draft Law seem to encourage development of IPPs with involvement of both overseas and local partners as eg. BOT projects and also to ensure the final corporatization of YESB and MESB

1. The encouraging governmental regulatory Frameworks and mechanisms concern with Energy and Environment are under preparation and coming out soon.
2. The newly drafted Myanmar National Energy Policy (MNEP) is now ready for publication.
3. It is necessary to have combination effort of adaptation and substantial, sustained reduction in Greenhouse Gas emissions.
4. It is necessary to do awareness for people to prevent the Environmental impacts.

Rural Electricity Access by MOLFRD

- ❑ In order to escalate the rural development and poverty reduction activities, on August 8, 2013, Ministry of Livestock, Fisheries was reorganized as the **Ministry of Livestock, Fisheries and Rural Development (MOLFRD)** and assigned as the Focal Ministry.
 - ❑ **Vision:** In Line with MDG, to develop rural area, to improve socioeconomic life of rural populace and to narrow down the development gap between urban and rural areas.
 - ❑ **Policy:** (1) Sustainable rural development,
(2) Food Security,
(3) Food Safety.
-
- DRD is main implementer for Rural Electrification both Off-grid and On-grid
 - On-grid is implemented in Rural Area by cooperating with MOEP
 - DRD is responsible on all rural Infrastructures First priority is Rural Electrification
 - Policies and laws are really needed to make a successful plan
 - Laws and regulations for Rural Electrification are started drawing
 - The Myanmar Electrification Law will be enacted soon

Types of Rural Electrification in Myanmar

On-Grid

- ☐ National Grid Extension

Off-Grid System for Remote Area

- ☐ Solar System
- ☐ Mini- Hydropower
- ☐ Biogas/ Biomass
- ☐ Generator

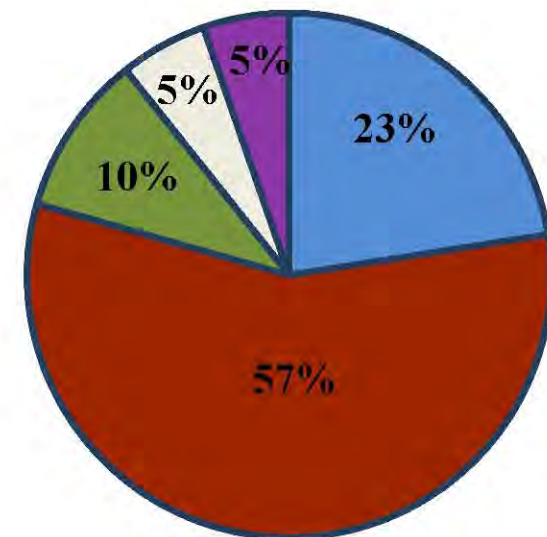
Relevant Ministries on Myanmar Rural Electrification

- ☐ Ministry of Livestock, Fisheries and Rural Development
- ☐ Ministry of Electrical Power
- ☐ Ministry of Industry
- ☐ Ministry of Science and Technology
- ☐ Ministry of Agriculture and Irrigation

Current Situation of Rural Electrification in Myanmar

23034 villages out of 64917 villages are electrified in Myanmar up to 2013~2014 Fiscal Year

- National grid - 5178 villages, (23%)
- Generator - 13086 villages, (57%)
- Mini-Hydropower - 2295 villages, (10%)
- Solar system - 1251 villages, (5%)
- Bio-mass/ gas - 1224 villages, (5%)



from 2014~2015 to 2015~2016

(30)Month plan - 20000 villages

Long-term - Goal Universal Access in Myanmar by 2030 in line with MDG

■ National Grid
■ Mini-Hydro
■ Bio Gas/Mass

■ Generator
■ Solar

Potential Sources of Rural Electrification

Solar Energy

- Myanmar can get abundant sunshine especially in central dry zone and potential for solar energy is around 51973.8 Tera Watt-hour per year.
- 36% of the total area of the country receives high annual solar radiation in the range of 18-19 MJ/m²-day.
- Sun shine all year round, especially in the Central Myanmar Dry Zone Area

Wind Energy

- Myanmar has abundance for providing rural electrification with coastal strip 2832 km and other feasibility onshore projects for wind energy.

Biomass Energy

- Agricultural Wastes
- Energy Crops
- Industrial Wastes
- Municipal Wastes
- Animal wastes

Micro-hydro Energy

Hydropower potential of Myanmar

No.	Region (State or Division)	Number of Sites	Potential (MW)
1	Kachin State	51	20778
2	Kayah State	8	954
3	Kayin State	22	7075
4	Chin State	12	7
5	Sagaing Division	30	2848
6	Taninthayi Division	23	735
7	Bago Division	15	543
8	Magway Division	13	370
9	Mandalay Division	14	1424
10	Mon State	10	303
11	Rakhine State	14	769
12	Shan State	91	13414
	Total	303	40220

The most suitable places to implement for hydropower including small and micro scale are Kachin State (Northern part), Shan State (East part) and Kayin State (Southeastern part) in which rural communities are living most.

Rural Electricity Access

DRD under Ministry of Livestock, Fisheries and Rural Development (MLFRD) as the leading Ministry

Two Ways of Rural Electrification in Myanmar

➤ Grid Electrification

- Extend distribution from the Grid
- Implement by the local or villages themselves programs
 - Ministry of Electric Power involves only in constructing the project

➤ Off- Grid Electrification

- Diesel Generator
- Solar
- Mini- Hydropower
- Bio-Gas/ Mass

Present Policies and Institutional Structure for Electricity Access

To promote off-grid rural electrification as the following:

- (a) Organizing rural electrification committee,
- (b) Conducting rural development committee in village & township,
- (c) Surveying the community needs,
- (d) Allocating the budget according to the parliament's decision, and
- (e) Cooperation with private sectors – UN agencies, INGO, NGO – to achieve the electrification target.

Implementing System to Develop Rural Electrification System

- ☐ Getting the international investment grant and loan;
- ☐ Cooperating with NGO, INGOs and donors;
- ☐ Improving allotment of the government budget;
- ☐ Cooperating with the private and public partnership, and
- ☐ Cooperating between government and people as forming the committee from the village community.

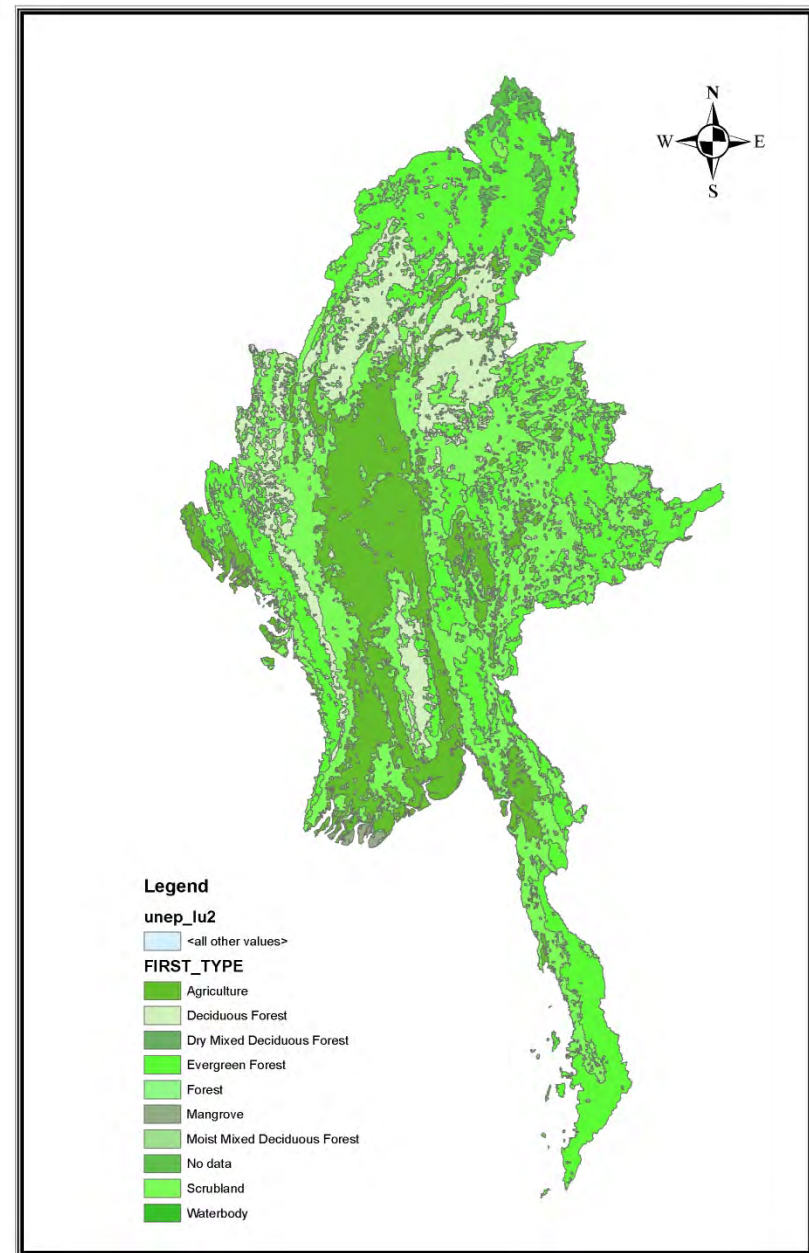
Promotion of Rural Electrification to Fulfill in 3Es

Possible Solutions for Electricity access in the rural areas

- Main potential areas are hydropower and biomass energy. Myanmar has abundant renewable energy sources. Solar, wind, geothermal and oceanic energy potentialities can also be exploited.
- Large-scale hydro electric power will surely continue to be developed as a main power source. Micro-hydropower development will also continue for electrifying small villages.
- Solar power its initial investment cost is high, but it is good potential for community size projects.
- Wind power, it has a poor prospect since favorable sites for wind power generation are very few, but can be used with solar system in hybrid applications.
- Biogas can produce from municipal and agricultural waste and disseminate as the Biogas Technology in order to implement the low cost family size biogas plant for cooking and lighting in rural area.
- More development works with appropriate technologies are required in renewable energy application.

Good Practices in Energy Efficiency and Conservation

There are 38 natural protective areas which comprises 5% of the country's area. Present time, Department of Forestry has been making efforts to extend the protection up to 10% of the whole country.



Primary Energy Resources and their Potentials

1	Crude Oil (Offshore & Onshore) (Proven + Probable)	609.39 MMBBL
2	Natural Gas (Offshore & Onshore)(Proven+ Probable)	166.13 TSCF
3	Hydro	108,00 MW
4	Coal	711 Million Metric Tons
5	Biomass	52.5 % of total land area covered with forest potential available annual sustainable yield of woodfuel-19.12 Million Cubic Ton
6	Wind	365.1 TWH per year Coastal strip of 2832 Km with South-westerly wind -9 months North-easterly wind-3 months
7	Solar Power	51973.8 TWH per year
8	Geothermal	93 Locations

Existing Energy Installations

<u>Source of Power</u>	<u>Existing Nos.</u>	<u>Existing Capacity</u>
Small hydro (< 10 MW)	11	34.04 MW
Mini hydro (< 1 MW)	17	5.23 kW
Micro hydro (< 100 kW)	29	378.5 kW
Pico hydro (< kW)	6 + many individual	35 kW + many individual

Solar

Solar Energy Potential in Myanmar

36% of the total area of the country receives annual solar radiation in the range of 18-19 MJ/m²-day. Only a few percents of the area with less solar radiation (< 15 MJ/m²-day).

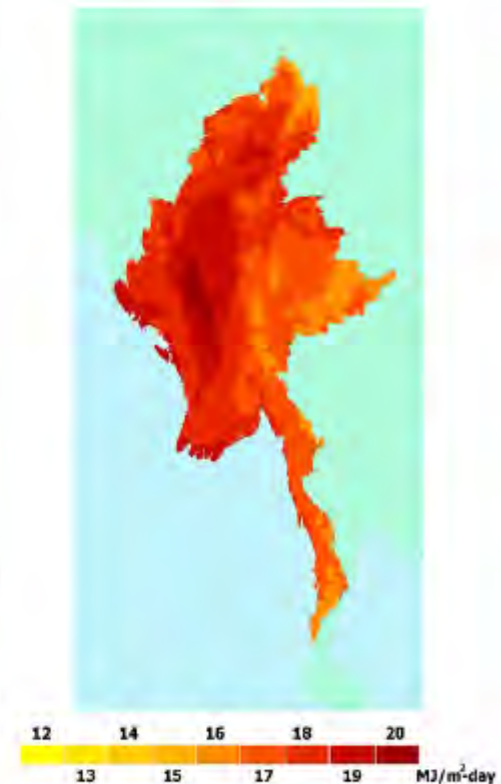
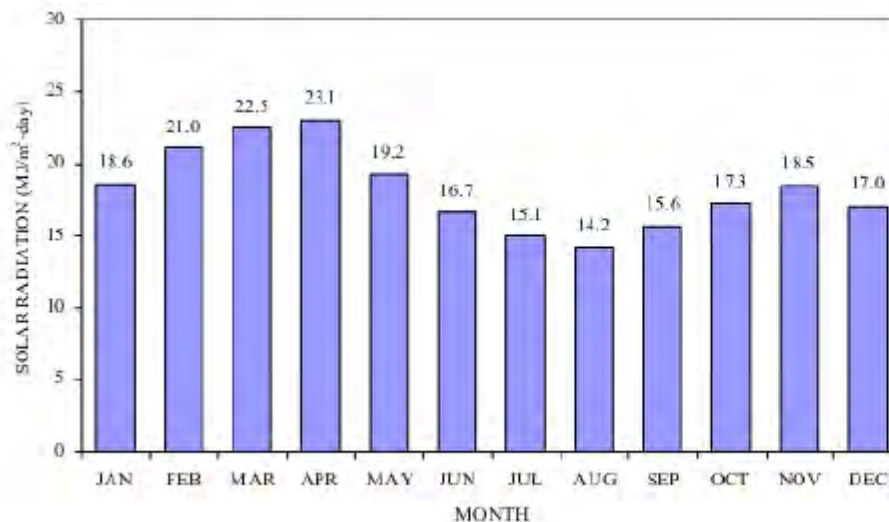


Fig. 4.29 Yearly average of daily global radiation over Myanmar



Functions of the Ministry of Industry



Solar Power Home System at several villages
in Sagaing Region



Functions of the Ministry of Industry



Smart ECO Ray of the Sun System	
Model	KP01E-002
Output voltage	110V AC
Installed capacity	3KW
Rated voltage	24V
Lot number	10-050000 (00)
Open date	2012.03.30
Gross weight	1200kg
Use warranty period	Use warranty period 24 months
KD POWER	
Customer service Center : KP-80-773-8880	
Foundation for Quality System ISO 9001 Certified www.kdpower.co.kr	

2012/11/28

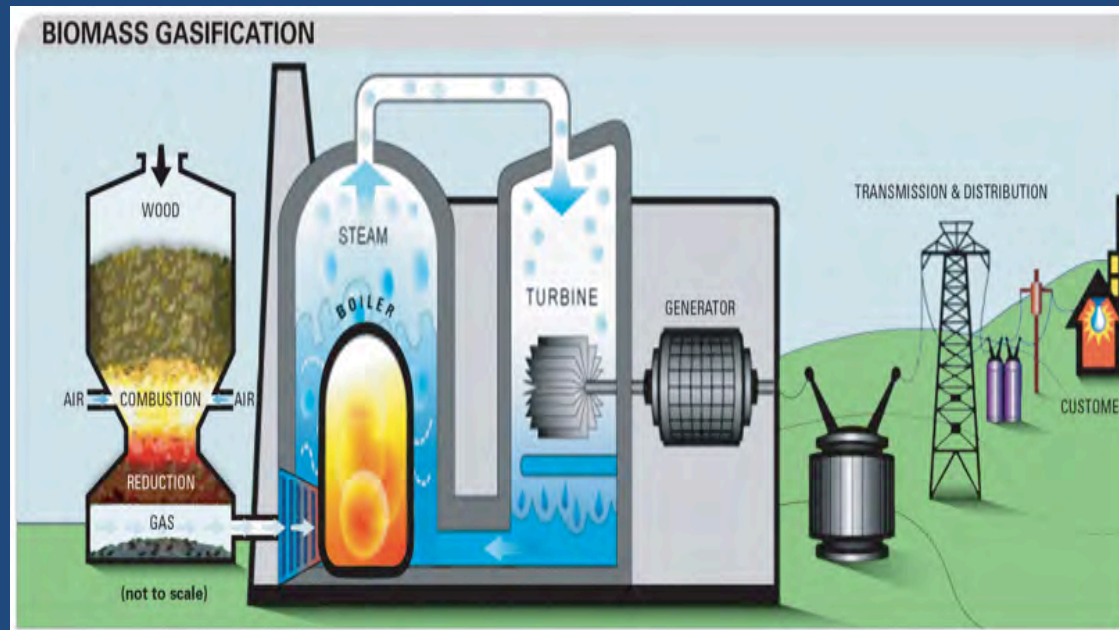


3 KW, 13.6 Am Solar Station System in
Mandalay Division,
Sate Tain Village by Korea KD Power

Local assembled PV refrigerator for vaccine storage



Renewable Energy (Biomass Gasification)



Paddy
30 million
Ton/yr

Rice Husk
6 million
Ton/yr

Energy
35
GWh/yr

Biogas

- Since **2002**, community size biogas digesters for village electrification have been constructed and utilized in **Central region** - Mandalay, Sagaing, Magway Region and Northern Shan State.
- These digesters are **25, 50, 100 cubic meter** in size, **Fixed Dome Type** electricity producing biogas plants with installed capacity of 5-25 KW, serving **185 villages** with 4 hours per day of electricity.

Constructed and Using Biogas Plants in States and Regions, 2012

No.	States / Regions	No. of Constructed Digester		Total
		Digester for Village	Digester for Family	
1.	Nay Pyi Taw	8	15	23
2.	Mandalay	109	3	112
3.	Sagaing	23	2	25
4.	Magway	9	-	9
5.	Shan (North)	1	-	1
6.	Shan (South)	2	1	3
7.	Shan (East)	1	1	2
8.	Kayar (Loikaw)	1	-	1
9.	Ayeyarwady (Pathein)	-	2	2
10.	Kachin	-	3	3
11.	Rakhine	-	1	1
12.	Yangon	1	-	1
13.	Mon	-	1	1
14.	Chin	1	-	1
	Total	159	26	185

Success Story

Investment US\$ 6000



- Supply 50 households
- Lighting – US\$4/month
- 20 TV – US\$ 12/month



Profit US\$ 100/month

Mini Gasifier (20 KW)



Gasifier for Rice Mill (300 kVA at Kyeik Latt)



Gasification



Saw Dust



Gas Generator



Gasifier Units (Saw Dust)



Gasifier (Rice Husk)



Gasifier (Rice Husk)

Bio-gas



Almost completed biogas tank in a village



Final finishing



Erecting the lighting posts

Source: Myanmar Engineering Society, Myanmar



Generator utilizing biogas

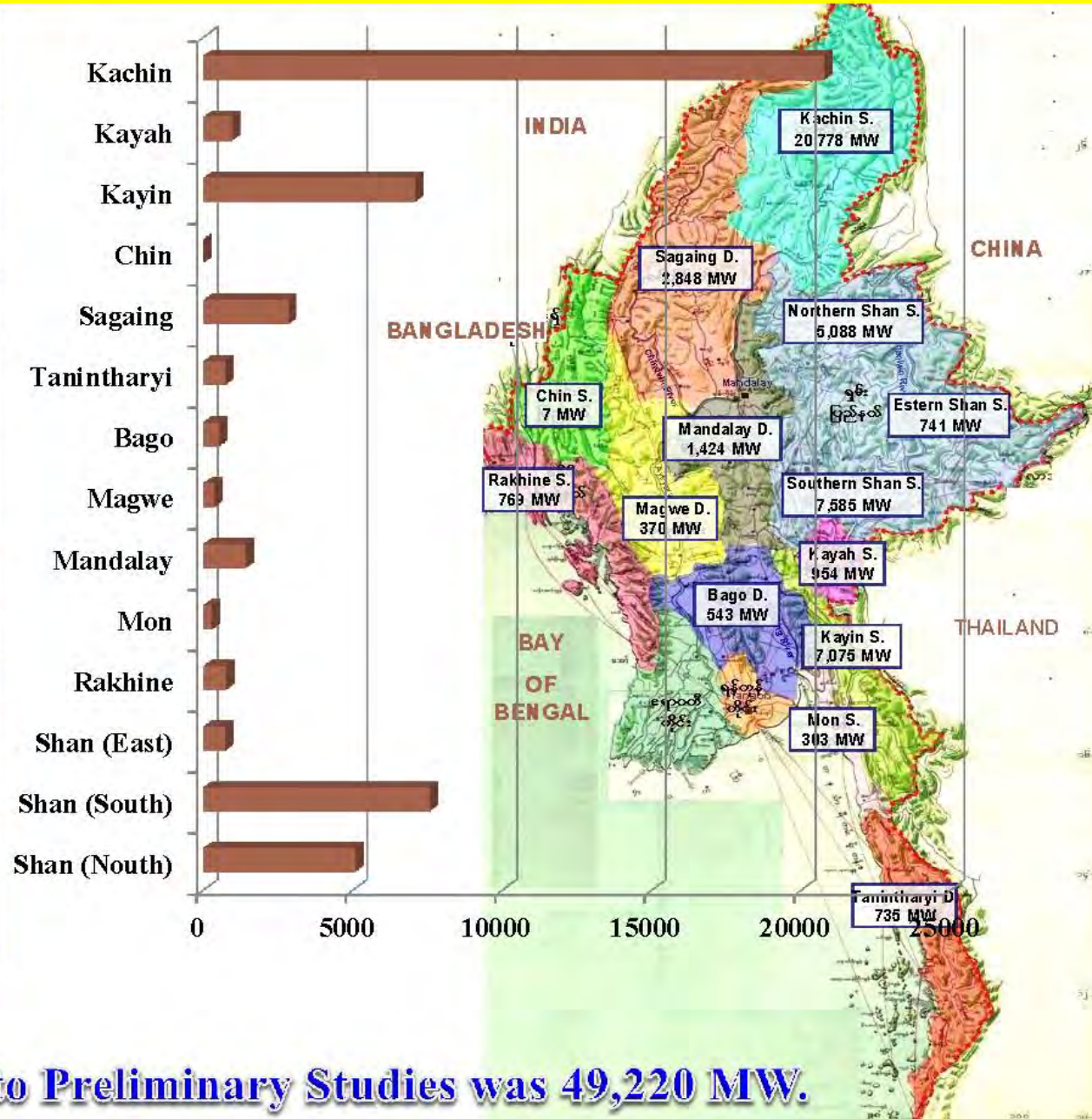


Hydro power for rural area application

- Clean and green energy
- High potential
- Barrier – seasonal
- Environmental impact

REGIONAL HYDROPOWER POTENTIALS OF MYANMAR

State / Division	Number of Sites	Potential (MW)
Kachin	51	20,778
Kayah	8	954
Kayin	22	7,075
Chin	12	7
Sagaing	30	2,848
Tanintharyi	23	735
Bago	15	543
Magwe	13	370
Mandalay	14	1,424
Mon	10	303
Rakhine	14	769
Shan (East)	24	741
Shan (South)	27	7,585
Shan (North)	40	5,088
Total	303	49,220



•According to Preliminary Studies was 49,220 MW.

Hydropower Projects (2015-2016)

No.	Project	Location (Region/State)	Installed Capacity (MW)	Annual Energy Generation (GWh)	Completion Year	Weighted Progress
1	Chipwinge	Kachin State	99	599	2012-13	100.00%
2	Phyu Chaung	Bago Region	40	120	2013-14	89.53%
3	Nancho	Mandalay Region	40	152	2013-14	78.92%
4	Thaukyegat-2	Bago Region	120	604.7	2012-13	90.07%
5	Baluchaung-3	Kayah State	52	334	2013-14	74.13%
6	Upper Baluchaung	Shan State	29	120	2014-15	34.33%
7	Upper Paunglaung	Mandalay Region	140	454	2014-15	61.64%
	Total		520	2383.7		



MOE



BOT



JV/BO

Source:

MOEP

On going Hydropower Projects (2020-2021)

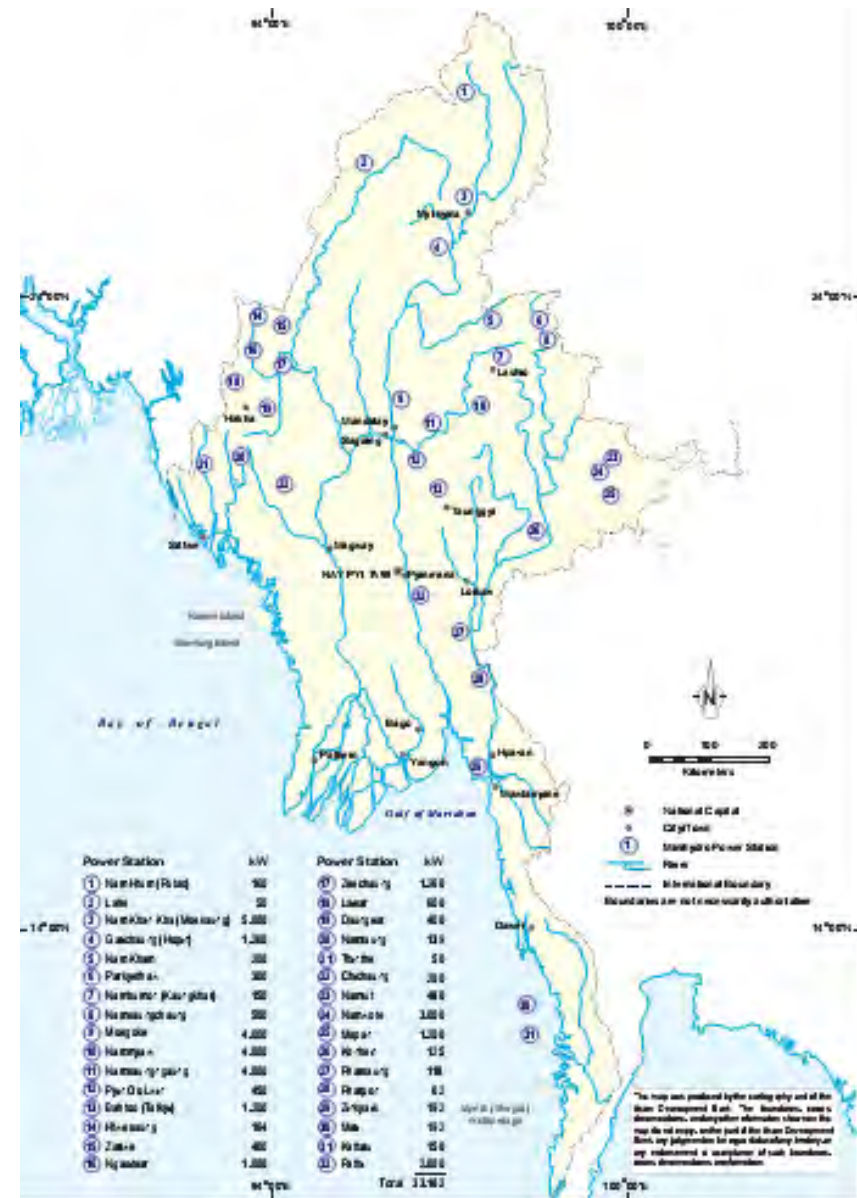
No.	Project	Location (Region/State)	Installed Capacity (MW)	Annual Energy Generation (GWh)	Completion Year	Weighted Progress
1	Ann	Rakhine State	10	44	-	18.69%
2	Thahtay	Rakhine State	111	386	2018-19	23.04%
3	Upper Kengtawng	Shan State(S)	51	267	2018-19	11.33%
4	Upper Yeywa	Shan State (N)	280	1330	2019-20	5.00%
5	Shweli-3	Shan State (N)	1050	3500	2020-21	2.32%
6	Bawgata	Bago Region	160	500	2020-21	Preliminary Works
	Total		1662	6027		

Source:
MOEP

Micro Hydro Power

- Micro-Hydropower and Pico-Hydro power are the most familiar in Myanmar. Village-owned hydro power plants are moderately installed especially in the villages of Shan and Chin State.
- The Micro-Hydro power is mostly generated by utilizing the stream water and the dam type hydro power system.
- Nearly suitable 60 sites Total - 170 MW output
- Developed in 33 sites - 35.97 MW

Source: MES (As of 5th October 2009)





(ဆ-၃) 1000 W Propeller
တာဘိုင်ယူနစ်ပုံ



(ဆ-၅) 1000 W Propeller
တာဘိုင်၏ရေထွက်ပေါက်၏ပုံ



(ဆ-၄) 1000 W Propeller
တာဘိုင်၏ပန်ကာဒလက်များ၏ပုံ



(ဆ-၆) 1500 W Propeller ၏ပုံ



(ဆ-၁) 1000 W Propeller
တာဘိုင်တပ်ဆင်ထား ပုံ

Small scale hydro turbine project
for rural area application



(ဆ-၂) 1000 W Propeller
တာဘိုင်၏ Dynamo ပုံ

Wind Power

- 2832 Km costal strip facing the bay of Bengal and Andaman sea.
- Potential available wind energy- 365.10 TWh/Yr (NEDO, 1997)
- Only on R & D Phase
- Individual scale of water-pumping, wind mill & generate electricity in rural area.
- 2832 Km costal strip facing the bay of Bengal and Andaman sea.
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- Only on R & D Phase
- Individual scale of water-pumping, wind mill & generate electricity in rural area.

Yearly Average Wind Velocity (m/sec)



Recent Initiatives

Chaung Thar Hybrid Power Supply System Project

Objective: Demonstrative research on a grid-connected PV systems

NEWJEC, INC

Dept. of Electric Power, MOEP

US\$ 5 million



Chaung Thar Hybrid Power Supply System Project

- Street lighting contributing to the extension of villagers' economic and productive activities
- Clinic lighting, more vaccine refrigeration and more power for medical equipment usage.
- Approx. **98.8 ton** of **carbon dioxide reduction** in a year

Population		6325/ 1307 households	
Public Facilities:	1	High School	
	2	Monasteries with 2 Community Halls	
	1	Hospital with 16 Beds	
	1	Police Station	
	1	MEPE office	
	1	Post & Telecom Office & Street Lighting	