

SAARC Seminar on Application of On-grid Biogas Technologies



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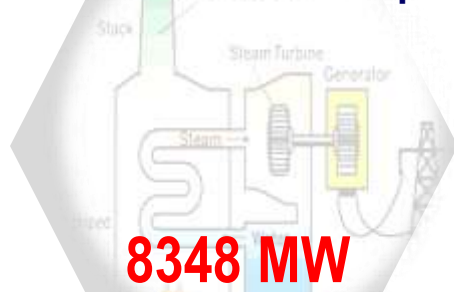
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Power Generation Scenario (April 2016)



12399 MW

Installed Generation Capacity



8348 MW

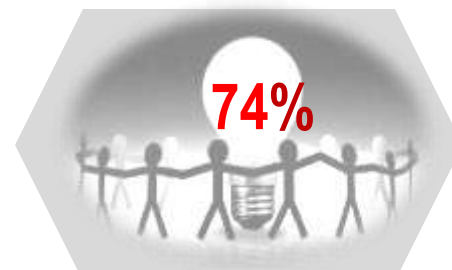
Maximum Generation



Electricity Growth

13.5%

System Loss (T&D)



74%

**Access to Electricity
(including off grid Renewable)**

9695 km

Transmission Lines



326000 km

Distribution Lines

17.8 million



Total Consumer

3.74~11.85 Cents/kWhr

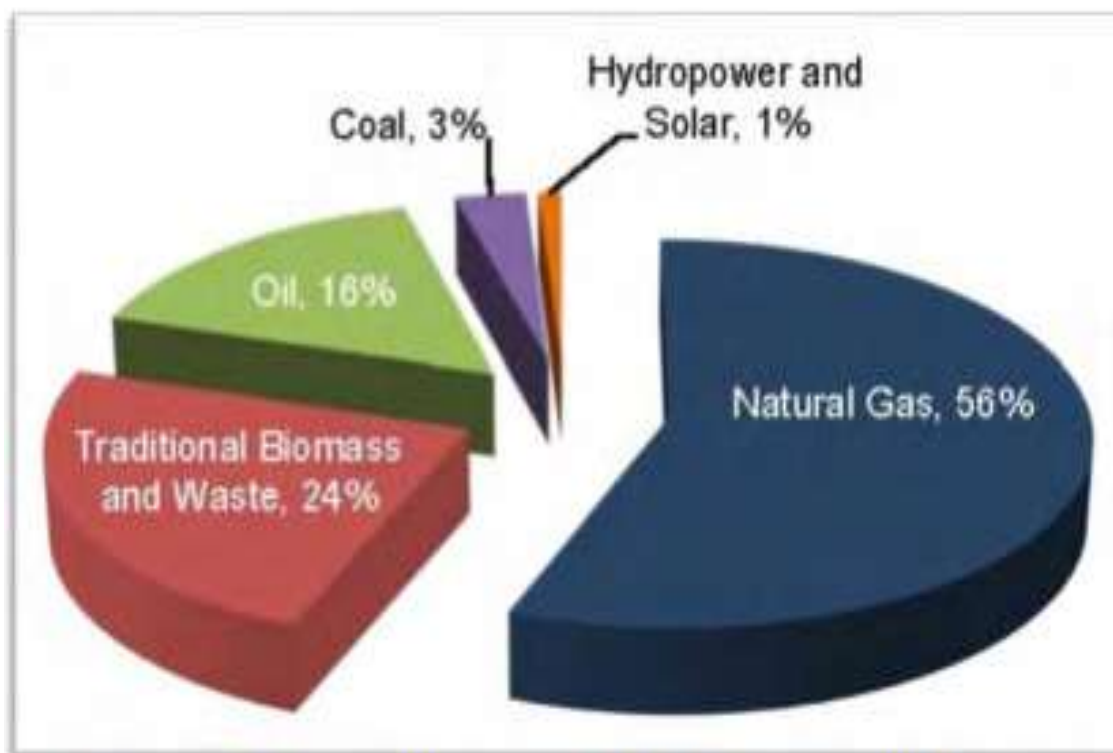
371 kWh

**Per Capita Generation
(including Captive generation)**



Retail Tariff

Primary Energy Consumption



Source: U.S. Energy Information and Administration (EIA)
<http://www.eia.gov/countries/country-data.cfm?fips=bq>

RE Installation- Present Status



Category	Total Installed Capacity (MW)
Solar Home System (SHS)	163 MW
Solar Roof-top System (In Govt/semi Govt organizations)	5 MW
Solar Roof-top System (By consumer for getting new electricity connection)	13 MW
Solar Mini grid	1 MW
Solar Irrigation Pumps	3 MW
Wind Power	2 MW
Biogas	5 MW
Biomass to electricity	1 MW
Hydro	230
Total =	423 MW

Year wise Target for RE Development



Types of RE	2015	2016	2017	2018	2019	2020	2021	Total
Solar PV	222	253	422	237	195	203	208	1740
Wind	0	20	250	350	350	200	200	1370
Biomass (Biogas to electricity)	1	16	6	6	6	6	6	47
Biogas	1	1	1	1	1	1	1	7
Hydro (mini/micro)		2	2					4
Total	224	292	681	594	552	410	415	3168

Renewable Energy Policy (RE Policy 2008)



Objectives

- To harness huge potential of RE and larger dissemination.
- Enable, encourage and facilitate both public/private sector investment.
- RE to meet 5% of power demand by 2015 and 10% by 2020

Institutional Arrangement

- Setting up of SREDA as focal agency for RE development

Program development

- Mutually agreed tariff for projects less than 5 MW
- Usage of existing transmission lines on payment of wheeling charge

Incentive support

- Exempted from 15% VAT
- SREDA will provide subsidies for installation of solar, wind etc
- Assistance in identification and acquisition of land
- Incentive tariff of 10% more than highest purchase price of utility
- Tax benefit for first 5 years

Regulatory perspective

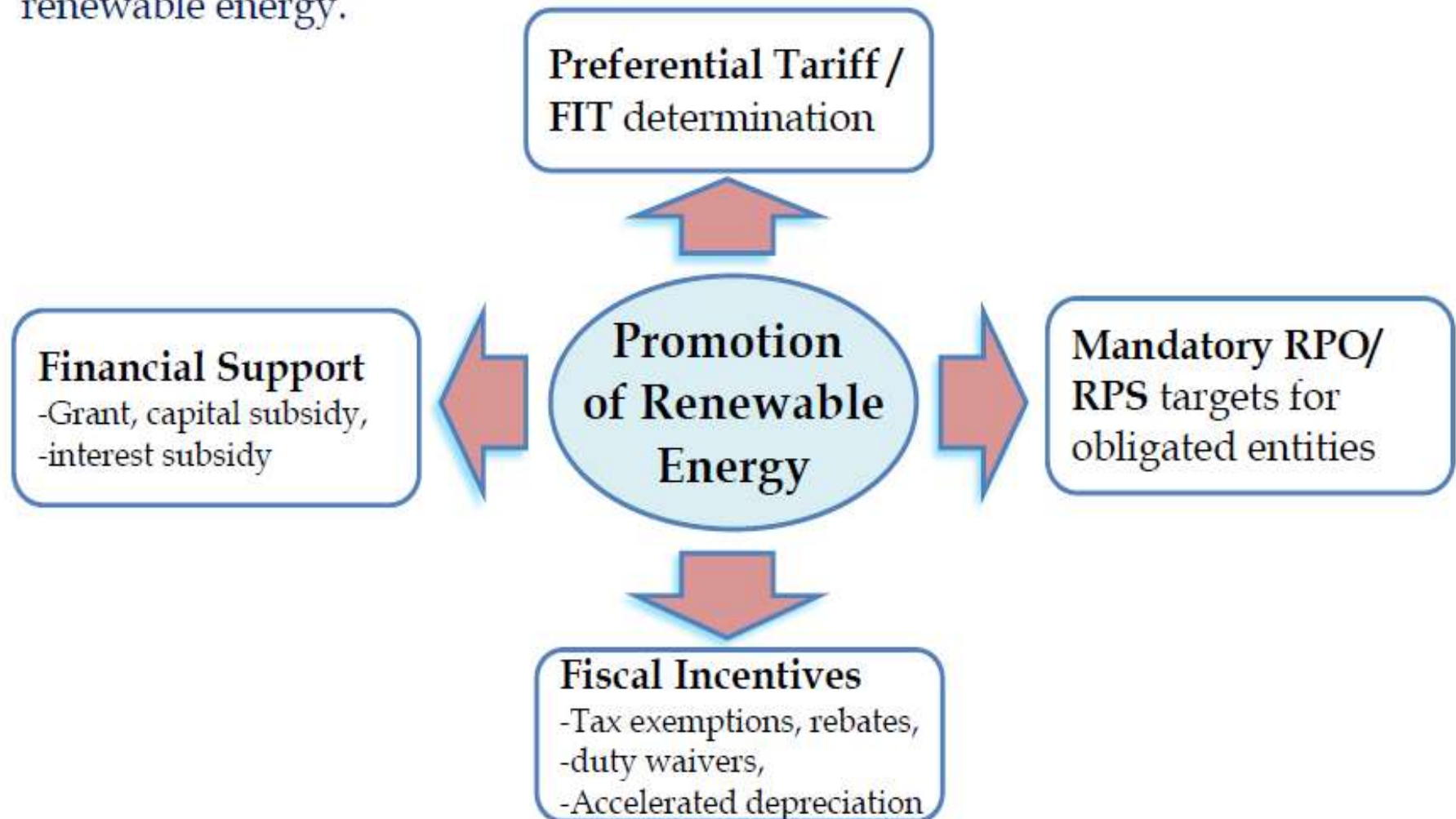
- To require license from BERC if capacity more than 5 MW
- BERC shall approve tariff for plants >5MW

The RE Policy mandates RE to contribute 5% of energy demand by 2015 and 10% by 2020

Policy and Regulatory Measures



- Number of policy measures and regulatory instruments exists for promotion of renewable energy.



Fiscal Incentives in RE Policy



- Import Duty exemption (Full/ Partial) for certain technology and equipment.
- Duty exemption for 16 items of solar panel.
- Plants & equipments [full value] & spare parts (10% of original plant cost) without payment of customs duties, VAT & any other surcharges.
- Exemption from corporate income tax for 10 years.
- Tax exemption & repatriation facilities on royalties & technical assistance fees.
- Repatriation of equity along with dividends.
- Avoidance of double-taxation on the basis of bilateral agreements.
- Implementation Agreement (IA) & Power Purchase Agreement (PPA) ensure fair and reasonable risk allocation and payment by the purchaser is guaranteed by GoB.
- Special Act for processing project proposals.

Financial Scheme for biogas



IDCOL Biogas Program

- ❑ For Domestic Biogas Program, loans are channeled through its Partner Organizations (POs) up to 80 % with a interest rate 6% for a tenure 7 years including 1 year grace period
- ❑ For Biogas Projects, loans amount is up to 80% of the project cost with a interest rate 6%-9% for a tenure 8 years including 1 year grace period
- ❑ For Biomass Projects, loans amount is up to 60% of the project cost with a interest rate 6% for a tenure 8 years including 1 year grace period

Bangladesh Bank's "Sustainable Financing Program"

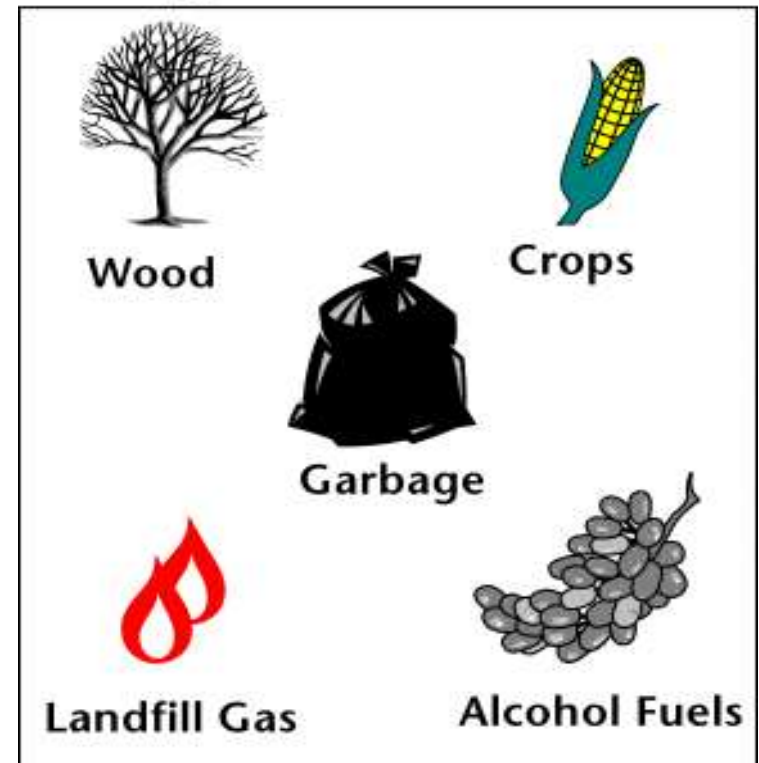
- ❑ The Government is providing concessionary loan for commercial biogas plant through the central bank's "Sustainable Financing Program" and extending fiscal incentives to promote bio digester made from fiber glass.

Sources of Biomass energy



- **Agro-residues**
- **Waste biomass**
- **Energy crops**
- **Municipal Solid waste(MSW)**
- **Virgin wood from forest**
- **Aquatic biomass (Algae)**

Types of Biomass



TECHNOLOGY OPTIONS



Agricultural Residue

- ✓ Improved Rice Parboiling System
- ✓ Charcoal & Briquette making
- ✓ Gasification (Rice husk gasifiers)
- ✓ Co generation - bagasse and rice husk based

Animal Manure

- ✓ Biogas Digesters
 - Two types-
 - 1. Fixed stove type (Chinese)
 - 2. Floating gas holder type (Indian)
- ✓ Anaerobic digestion
- ✓ Gasification for electricity generation

Municipal Solid Waste

- ✓ Mechanical- Biological treatment
 - 1. Dry Fermentation
 - 2. Wet Fermentation
 - 3. Plug Flow
- ✓ Thermal Treatment
 - 1. Incineration
 - 2. Pyrolysis
 - 3. Gasification
 - 4. Plasma Process
 - 5. Oiling Process

Biogas plants installed by different organization



Biogas plants installed between 1980-2005

Agency	No of Plants	Success Rate	Plants in Operation	Installed Capacity (Avg) m ³ /day	Actual Production m ³ /day
BCSIR	23,000	55%	12,650	3	37,950
LGED	1,500	30%	450	3	1,350
Other GO and NGO	1,000	25%	250	3	750
Total (1980-2005) =	25,000		13,350		40,050

Source: Biogas generation and demand survey report supported by JICA

❖ *Biogas technology implementation started in Bangladesh during 1970ies.*

❖ *The first floating-drum biogas plant based was constructed in 1972 at the premises of Bangladesh Agricultural University*

Biogas plants installed by different organization



Biogas plants installed between 2006-2014

Agency	No of Plants	Success Rate	Plants in Operation	Installed Capacity (Avg) m ³ /day	Actual Production m ³ /day
IDCOL	37,000	90%	33,300	2.5	83,250
Grameen Shakti	8,000	90%	7,200	5	36,000
Impact	4,100	90%	3,690	3	11,070
BCSIR	4,400	90%	3,690	3	11,880
Individual and NGO's	1,000	90%	900	10	9,000
Total (2006-2014) =	80,000		62,400		191,250

Source: Biogas generation and demand survey report supported by JICA

Biogas plants installed by different organization



Total Biogas plants installed between 1980-2014

Agency	No of Plants	Success Rate	Plants in Operation	Installed Capacity (Avg) m ³ /day	Actual Production m ³ /day
BCSIR	27,000	61%	16,610	3	49,830
LGED	1,500	30%	450	3	1,350
IDCOL	37,000	90%	33,300	2.5	83,250
Grameen Shakti	8,000	90%	7,200	5	36,000
Impact	4,100	90%	3,690	3	11,070
Other GO and NGO	1,000	25%	250	3	750
Individual and NGO's	1,000	90%	900	10	9,000
Total (1980-2014) =	80,000		62,400		191,250

Source: Biogas generation and demand survey report supported by JICA

Support form different Organization



- ✓ Around 80,000 biogas plants have been installed in the country so far.
- ✓ At present, more than 300 biogas based engine generators are running.
- ✓ There are many private companies by now constructing biogas plants
- ✓ Biogas programs are being supported by many NGO's and IDCOL over a long period. Development partners like World Bank, GIZ, DFID, SNV, IFC are supporting domestic biogas program in Bangladesh
- ✓ Production of electricity by using biogas is still to be flourished in Bangladesh.
- ✓ Lack of R&D in biogas sector except some research work in IFRD, BCSIR.

Biogas generation and demand survey-

A case study



Survey area- 51 districts of Bangladesh

Sample-453 (Quantitative survey): Poultry farm----- 236

Dairy farm-----181

Other organic waste----36

- ❖ The total technical potential from the available feedstock for household sized biogas plants is estimated to be 3 million systems.
- ❖ There is an estimated potential demand of 46,800 MWh electricity/day in rural areas.
- ❖ At the existing poultry and dairy farms, based on their existing raw materials (potential capacity) and willingness of the farms around 73.05 MWh electricity/day could be generated.

Biogas generation and demand survey- A case study



Type of Fuel used by farm

Division	Grid	Solar Average Use	Kerosene Average Use	Diesel Average Use	LP gas use (Note 1)	Biogas total use	Wood total use	Cowdung total use	Rice husk total use
	Average Use KWh /farm /month	Average Use KWh /farm /month	Average Use Liter /farm /month	Average Use Liter /farm /month	Average Use Kg /farm /month	Average Use m ³ /farm /month	Average Use Kg /farm /month	Average Use Kg /farm /month	Average Use Kg /farm /month
Barisal	162	45	2		12	63.00	40		
Chittagong	343		5	37		81.00	154	114	
Dhaka	220		2	19		54.00	40		
Khulna	201	60	5	72		37.50	250	152	
Rajshahi	227	120	3	39		70.50	180		80
Rangpur	152		2	7	12	63.00	40	5	
Sylhet	204		4	68			187		
Country Average	215.55	75.00	3.35	40.09	12.00	61.50	127.28	90.33	80.00

Note 1: 1 Cylinder LP Gas =12kg considered

Source: Biogas generation and demand survey report supported by JICA

Biogas generation and demand survey-

A case study



Grid Electricity and biogas used by farm

Fuel Type	Unit	Monthly Consumption at a Poultry Farm	Monthly Consumption at a Dairy Farm
Grid Electricity	KWh	259.95	167.24
Biogas	m ³	49.50	72.6

Source: Biogas generation and demand survey report supported by JICA

Biogas generation and demand survey- A case study



Return of Investment



Source: Biogas generation and demand survey report supported by JICA

National Perspective of municipal waste to biogas & Compost



Total waste generation	20,000	Ton/day
Percentage of organic waste	70	%
Total organic waste	14,000	Ton/day
Biogas potential of waste/kg	0.04	m ³
Expected quantity of biogas/day	560,000	m ³
Value of gas/day (BDT. 20/m ³)	112,00,000	BDT
Value of gas/year	408,80,00,000	BDT
Fertilizer production rate/kg waste	0.20	Ton
Expected quantity of fertilizer/day	2,800	Ton
Fertilizer per year	10,22,000	Ton

Co-benefit of Recycling of Waste



A Community based Waste to biogas plant at Gaibandha



Income – Expenditure report (February, 2014)

Plant Constructed: 2012, Capital investment: BDT. 18,00,000

Plant Capacity: 80m³

Raw Material: Feedstock



Expenditure Item	Unit Cost	No. of Unit	Total
Labour cost for Waste collection and Processor	4000	9	36,000
Repair and maintenance	L.S		7000
Supervision cost			12000
Total Expenses *			55,000

Income	Unit Cost	No. of Unit	Total
Service charge (avg.)	30.6 BDT/ family	1003 family	33,682
Gas users fee	600 BDT/ family	28 family	16,800
Slurry/ Compost	4.00 BDT/kg	2570 kg	10,280
Total Income *			60,762

Uniqueness of the biogas plant at Gaibandha



- **Based on studies and experience of other pilots**
- **Integrated, holistic and inclusive approach**
- **Market Driven – Social Business Approach**
- **Livelihood of existing waste collectors/workers – carefully addressed**
- **Waste, Environment and extreme poverty consideration**
- **Municipality – I/NGO – CBO partnership**
- **Contributory (financing and kind)**
- **Local capacity building and women participation – strong element**

Barriers



Technical Barriers:

- Lack of knowledge & technical expertise on biomass technologies
- Challenge of grid connectivity
- Transportation and quality of biomass (in terms of heat value)
- Lack of database or resource mapping on biomass energy potential
- Absence of quality assurance and standard for biogas plants.

Financial Barriers:

- Lack of fund or lack of aid/grant or concessional loan
- Rate of interest on loan is still a bit high for domestic biogas plants
- Custom, duties and taxes on equipments used in biogas plants are still high
- No attractive tariff exist for biogas/biomass to encourage the investors.
- Subsidy exist for chemical fertilizer but no support for bio-fertilizer

Barriers



Institutional Barriers:

- As a new organization SREDA has taken few steps for the development of biomass energy. There are a few no of institutions who are working at present.
- Need to develop expertise and training facilities in this sector
- Lack of awareness and motivational activity about the use of biomass with efficient technology
- Absence of R &D on biomass/biogas technologies.

Policy Barriers:

- Need to update RE Policy by giving more concentration on biomass energy
- No Action plan for biomass to energy and biogas related project
- Absence of guideline for biomass to energy and power.
- Low price of electricity and gas

Some Pictures



Biogas for cooking

Some Pictures



Compost from biogas

Some Pictures



Biogas based irrigation & threshing

Some Pictures



Biogas plant by Paragon Poultry Farm running a generator of size 206 kW



Community based Kitchen waste biogas plant in Gaibandha



Thank You!

