



Financing Biogas Projects in SAARC Countries : Challenges and Opportunities

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**SAARC Workshop on
Application of on-grid Biogas Technologies**

May 16-17, 2016
Kabul, Afghanistan





Objectives of the Workshop

- Share and discuss the Biogas potential in South Asia;
- Existing on-grid biogas power generation projects in South Asia;
- Policy and Regulations available in the SAARC Member States;
- Tariff structure for Biogas generation power plants;
- To facilitate Biogas power generation related technology transfer and sharing of regional and international best practices;
- To facilitate capacity development in Biogas power generation in SAARC Member States.

Bio-Methanation Process



Bio-Digester

Raw Biogas



Scrubbers for H₂S and CO₂ Removal



Bio-manure

Purified Biogas



Power Generation



Cooking



Industrial Applications



India Potential on Biogas

1. India is world's third largest food and farm producer.
2. India is world's second largest producer of fruits and vegetables out of which hardly 2% production is processed.
3. India has about 550 sugar Mills
4. Several ETPs
5. Several Cities MSW
6. Pulp and Paper (300 Units)
7. Tanneries (2000 Units)
8. Dairy Industry Waste: 60-70 million lit /day



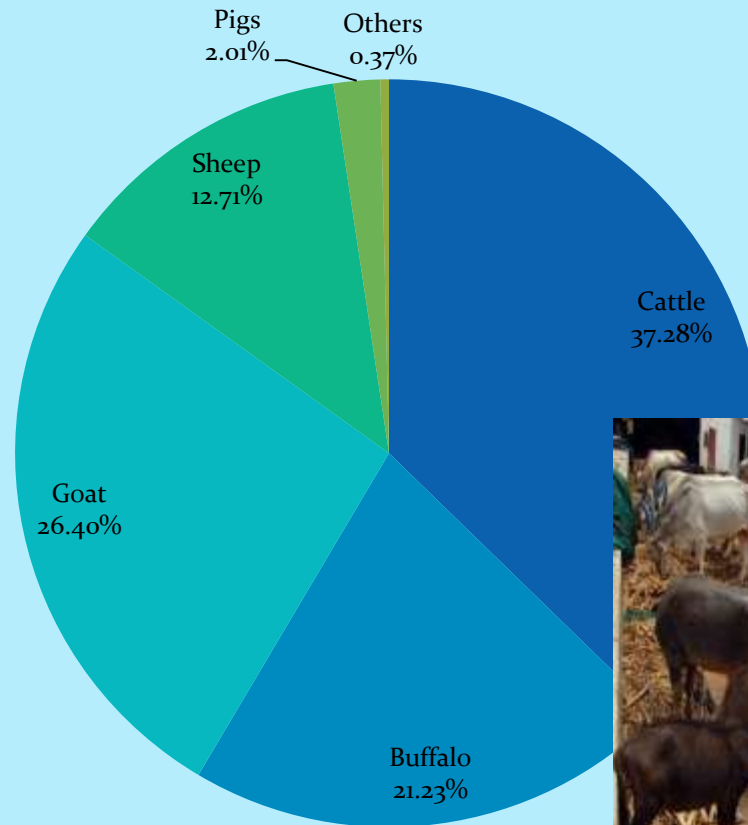
India : 19th Livestock Census-2012

Livestock Population

2007 : 529.70 million

Livestock Population

2012 : 512.05 million
(↓ by 3.33%)





Indian Potential of Biogas Plant- from cattle

- ❑ Total number of cattle / bovines in India: 500 million
- ❑ Assuming 10 Kg cow dung/cow/day, total cow dung available: 5000 million Kg = 5 million Tons
- ❑ Assuming 50% of cattle dung can be collected and utilized for generation of biogas, 10,000 MW of Biogas Power Generation is possible.
- ❑ A dairy farm having 2000 buffalos can operate a 1000 m³ biogas plant easily.



India : 19th Livestock Census-2012

Poultry Population

2007 : 649 million



Poultry Population

2012 : 729 million
(↑ by 12.40%)





Indian Potential of Biogas Plants- from Poultry

- ❑ Total number of cattle / bovines in India: 729 million
- ❑ Assuming 10,000 chicken produce 1 T of litter, total 72,900 T of litter
- ❑ Assuming each Ton litter produce 160 m³ of Biogas, it can produce 1,000 MW.



PROJECT VIABILITY



Key Factors affecting the profitability of the project

- ❑ Availability of Raw Material
- ❑ Availability of Water
- ❑ Landed Cost of Raw Material
- ❑ Demand for Biogas and Bio-manure
- ❑ Selling price of Biogas and Bio-manure
- ❑ Technology of Biogas Generation, purification and bottling / distribution of Biogas
- ❑ Fixed cost of BGFP project
- ❑ Availability of Govt Capital subsidy
- ❑ Collection and marketing of Carbon Dioxide from Biogas



Clearances Required

- CLU (Change of Land Use) from DTP (District Town Planning Authority)
- Forest Clearance
- NoC from Gram Panchayat
- Consent to Establish from State PCB (Pollution Control Board)
- NoC from PESO (Petroleum and Explosives Safety Organisation (PESO))
- PPA – for Power generation

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IREDA / FI Norms

- Loan : Upto 70% of the Project Cost
- Equity : Minimum 30%
- Interest Rates : 10.6% pa - 11.90% pa (Gr-I to Gr-4)
- Repayments : 10-15 years
- Moratorium Period: 1- 2 years
- Securities : Mortgage of Project Land, Hypothication of the Equipment, Personal Guarantees, Post Dates Cheques, Pledge of Shares; Collateral Security (10-20% of the loan amount)



IREDA Norms

- Internal Rate of Return (IRR) : Min 12% pa
- Debt Service Coverage Ratio (DSCR):

Minimum during any year: 1.2 : 1

Average during repayment period : 1.4 : 1



GOI – Central Financial Assistance (CFA)

S No	Technology	Capital Subsidy (INR)	Capital Subsidy (USD)
1.	Power generation from Municipal Solid Waste	Rs. 20 Million / MW (Max. Rs.100 million / project)	US\$ 300,752 Max US\$ 1.51 m
2.	Power generation from biogas at Sewage Treatment Plant or through biomethanation of Urban and Agricultural Waste / residues including cattle dung or production of bio-CNG.	Rs. 20 Million / MW or bio-CNG from 12,000 m ³ biogas / day (Max. Rs. 50 million / project)	US\$ 300,752 Max US\$ 751,880
3.	Biogas generation from Urban, Industrial and Agricultural Wastes/residues	Rs. 5 million / MWeq. (12,000 m ³ biogas /day) (max Rs. 50 million / project)	US\$ 75,188 Max US\$ 751,880
4.	Power Generation from Biogas (engine / gas turbine route) and production of bio-CNG for filling into gas cylinders	Rs. 10 million / MW Or bio-CNG from 12,000 m ³ biogas (Max. Rs.50 million /project)	US\$ 150,376 Max US\$ 751,880

Source: MNRE, GOI



Indian Govt – Central Financial Assistance

S No	Power generating Capacity (Only Cattle based)	Biogas plant capacity	Capital Subsidy
1.	3-20 kW	25 m ³ to 85 m ³	Rs 40,000 per kW (USD 602 per kW)
2.	>20 kW up to 100 kW	Any combination of above plants or approved alternate capacity / design	Rs 35,000 per kW (USD 526 per kW)
3.	>100 kW up to 250 kW	- Do -	Rs 30,000 per kW (USD 451 per kW)

Source: MNRE, GOI



Challenges to finance Biogas Projects

- High Project Cost per MW
- Not much lucrative tariff from Discoms
- Long term PPA or Long term off take of CNG
- Not many local suppliers to supply the equipment
- Availability of Input at one point for MW scale project
- O & M Capacity of the Project Owners
- Banks not comfortable to finance the Biogas Projects



Opportunities to finance Biogas Projects

- High Yield RE Project to compact Climate Change
- Bi-laterals / Multi lateral coming forward to offer LoCs to Local Banks at Low cost funds
- Environmental considerations has started driving Govts encouraging waste treatment plants
- Bio CNG as a fuel is getting popular for heat applications / cooking applications
- By-products are making the project more viable.
- Viable in places where grid power is not available



Tariff Determination

- Madhya Pradesh ERC Tariff Order(Feb 2015)
- Capital Cost Rs 9.25 Cr / MW (USD 1.5 m)
- PLF : 70% 1st year; 80% from 2nd year onwards
- Plant Life : 20 Yrs
- Auxiliary Consumption: 10%
- Cost of Fuel : Rs 175 / MT (USD 3); escalation: 5% per year
- Return on Equity :20% pre tax
- Fuel: Cow Dung
- Spl Fuel Consumption: 10.70 Kg per unit
- O & M Cost : 4% of the Capital Cost, with escalation of 5.72% per year



Tariff Determination

- Madhya Pradesh ERC Tariff Order (Feb 2015)
- Working Capital Allowed:
 - (A) Operation & Maintenance expenses for one month.
 - (B) Receivables equivalent to 2 (Two) months of Energy Charges sale of electricity calculated on the normative PLF.
 - (C) Raw material cost for 4 (Four) months.
 - (D) Maintenance of spares @ 15% of O&M expenses.
- Interest Rate: 12.50% p a
- Debt Equity Ratio : 70 : 30
- Interest Rate for Working Capital : 13.2% p a



Tariff Determination

- Tariff Design: Levelized
- Depreciation: 7% per annum for the first 10 years and remaining is spread over the remaining useful of Plant from 11th year onwards
- Less: Income from manure : Rs. 1.5 per Kg (USD 2.5 Cents) with escalation of 5% per annum
- Discount Rate for Levelized tariff: 10.2%
- Reactive Energy Charges : Rs 0.27 / unit
- Wheeling Charges : 2% from Developer + 4% from State Govt
- CDM Benefit : 100% to developer in 1st Yr, 90% in 2nd year....50:50 from 6th Yr onwards
- Tariff: Rs 4.20 Per Unit (USD 7 cents / Unit)



Economic Decision to Prefer to Bio CNG

	Electricity	Bio CNG	Remarks
1 m ³ of Biogas	2 kWh	0.4 Kg	
Rate of Sale (Net)Tariff	Rs 5 / kWh	Rs 40 per Kg	Manure extra
Value	Rs 10	Rs 16	60% more revenue for Bio CNG



GEF supported Demo Projects did wonders in India!

- KfW LoC to IREDA (2009)
- UNDP/GEF assisted : Bio-methanation Projects for Urban and Industrial Wastes -Development of High Rate Biomethanation Processes as means of Reducing Greenhouse Gases Emission (2006)
- USAID/GEF assisted Canal Hydro (1990)
- UNDP/GEF assisted Hilly Hydro (1995)
- USAID/GEF assisted Co-generation in Sugar Plants (1995)
- UNDP/GEF assisted EE improvement in Steel Re-Rolling Mills (2004)



Conclusions

- ✓ Initial Cost of Biogas Projects are on higher side.
- ✓ Biogas Projects are very much Viable.
- ✓ Availability of Input and market for sale of final products is the key for success of the project.
- ✓ Central Financial Assistance play a vital role in making biogas purification and bottling plant financially more viable.
- ✓ Selling price has major impact on profitability of biogas plant.
- ✓ Collection and marketing of Carbon Dioxide increases the profitability of bigger biogas plant.
- ✓ Improve in technology and use of High Rate Digesters to increase the biogas generation also results in higher profitability of the biogas plant.



Opportunities for SAARC Countries to Work together to Promote Biogas Sector

- ✓ Huge Opportunity for SAARC Countries to share the knowledge of Biogas Projects, Policies across the region.
- ✓ SAARC Countries should indigenize Biogas Technologies to bring down the cost of Biomass Projects and make Biogas Projects compete with other RE projects.
- ✓ SAARC Countries should look for developing model Investment Projects with support from GEF/ UNDP/USAID/UNIDO as Demonstration Projects for Biogas Sector.
- ✓ SAARC Countries should look for sourcing low cost funds from International LoCs to make the projects viable.
(WB / ADB / AFD / KFW / JICA / EIB / GCF/ NDB)



Thank You

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