



ISLAMIC REPUBLIC OF PAKISTAN

Presentation on

Regulatory Frame work related to Renewable Energy with specific Emphasis on On-grid Biogas Projects & Progress of Existing and Planned On- Grid Biogas Projects in Pakistan



SAARC Seminar on Application of on-grid Biogas
Technologies

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1. Introduction to NEPRA



- ❑ Independent quasi-judicial Regulatory Body, Established through NEPRA Act in December, 1997.
- ❑ Mandate: to develop and pursue a legal framework for provision of safe, reliable, efficient and affordable electric power to the electricity consumers of Pakistan.
- ❑ NEPRA Authority consists of Chairman and four Members represented from each province.
- ❑ Determination of tariffs by NEPRA can not be changed by the Government (may only request review)
- ❑ Financial Independence: Ensured by raising its own budgetary needs through license & tariff fees

2. NEPRA's Mandate



- ❑ As per section 7 of NEPRA Act: It is exclusively responsible for:
 - Granting Licenses for Generation, Transmission & Distribution of electricity.
 - Determining Tariffs
 - Prescribing Performance Standards
 - Resolving disputes between Licensees and consumers

3. Participatory Approach by NEPRA



- ❑ NEPRA adopts a participatory approach while drafting its rules, regulations and procedures
 - Process is widely advertised for soliciting stakeholders participation;
 - Public hearings while determining tariffs and issuing licenses where necessary;
 - All decisions in writing, giving reasons;
 - All regulatory decisions open to public and posted on website

4. NEPRA's Instruments Specifically for Renewable Energy Technology



- ❑ In order to encourage and facilitate renewable energy & its alternatives, NEPRA has developed following set of documents;

NEPRA Act No. XL 1997:

NEPRA Act is to provide for the regulation of generation, transmission and distribution of electric power and matters connected therewith and incidental thereto.

NEPRA Upfront Tariff (Approval & Procedure) Regulations, 2011;

Under these Regulations, NEPRA has announced Upfront Tariff for Renewables such as Wind, Solar, Small Hydro and Bagasse. The detail is also given in below slides.

4. NEPRA's Instruments Specifically for Renewable Energy Technology



NEPRA (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulations, 2015, notified on September 1, 2015:

Regulations deal with the sale of surplus power to be generated by any type of consumer through any of the renewable/alternative source by establishing distributed generation facility to be interconnected with the distribution system of the Distribution Company under Net Metering Regime.

NEPRA (Sale of Electric Power by Renewable Energy Companies) Guidelines, 2015, notified on January 26, 2015:

These guidelines not only allow renewable energy companies to sell power to utilities or National Grid but also make them responsible for financing, construction and operation of the interconnection facilities.

4. NEPRA's Instruments Specifically for Renewable Energy Technology



NEPRA (Interconnection for Renewable Generation Facilities) Regulations, 2015:

These guidelines shall streamline the process of power evacuation from renewable energy power projects, specially those situated in geographically remote areas. Further, these also define maximum transmission loss and minimum power from bus bar of renewable projects.

Draft NEPRA Wheeling Regulations, 2016:

NEPRA Regulations on Wheeling of Electricity and sale to Bulk Power Consumers allow projects to enter into direct (bilateral) sales contracts with end-use customers to sell all or a part of the power generated by them to their direct customers, and the rest to the utility for general distribution.

For direct sales, they shall be required to pay 'wheeling' charges for the use of the transmission and/or distribution network used to transport the power from one point to another.

4. NEPRA's Instruments Specifically for Renewable Energy Technology



Grid Code Addendum-I for integration of Wind Power Plants 2010:

In order to resolve the issues regarding reactive power and black start capability of Wind Power Plants at the time of integration, the Grid Code Review Panel (GCRP) was activated as per clause CM-3 of the Grid Code and after meetings of the GCRP, Grid Code Addendum-I for grid integration of Wind Power Plants was approved by NEPRA in April, 2010.

Grid Code Addendum-II for integration of Solar Power Plants:

Keeping in view the growing trend of Solar Power Plants to cope the maximum power demand in country and to facilitate the investors, there is a need of Code of Conduct for integration of Solar Power Plants into the national grid based on specific study. In this regard, GCRP meetings were held and finally, Grid Code Addendum-II for integration of Solar Power Plants was approved by NEPRA in 2014.

5. Renewable Energy Potential in Pakistan



Sources	Capacity (MW)
Wind*	340,000 (Theoretical)
Solar*	2,900,000 (Theoretical)
Hydro (Small)**	3100 (approx.)
Bagasse Cogeneration**	2000 (approx.)

*National Renewable Energy Laboratory (USA) Study conducted in 2006

** Figures taken from Alternative Energy Development Board (AEDB), Pakistan

5. Current Status



Source	Under Implementation/ LOIs Issued	In Operations
Wind*	1760 MW	306 MW
Solar**	2328	100 MW
Bagasse*	380	140 MW
Small Hydro*	877	128 MW

* Figures taken from AEDB

** Figures taken both from AEDB and Private Power Infrastructure Board

6. Regulatory Initiatives



UPFRONT TARIFF (WIND)

Tariffs	Project Cost (USD million per MW)	Capacity Factor (%)	Levelized Tariff (US Cents/kWh)
2011	2.60	31	14.6628
2013	2.46	31	13.5244
2015	2.15	35%	10.4481

6. Regulatory Initiatives



UPFRONT TARIFF (SOLAR)

Tariffs	Project Cost (USD million per MW)	Capacity Factor (%)	Levelized Tariff (US Cents/kWh)
2014	1.90	17.5	16.3063
2015	1.56	17.5	14.4096
2016	1.23	18	10.8920

6. Regulatory Initiatives



UPFRONT TARIFF (Small Hydro & Bagasse)

Technologies	Project Cost (USD million per MW)	Capacity Factor (%)	Levelized Tariff (US Cents/kWh)
Small Hydro	3.945 (Low Head, i.e. up to 20 meters)	65%	10.8892
	2.794 (High Head, i.e. more than 20 meters)	50%	10.0597
Bagasse	0.9795	45%	10.7291

7. Meaning of On-Grid Biogas



❑ On-Grid Biogas is also called as Biogas-Grid Injection. This means the injection of biogas into the methane grid (natural gas grid), using the grid to transport the gas to:

- Customers
- Electricity and
- Heat

can be used for on-site generation resulting in a reduction of losses in the transportation of energy.

8. Applications of On-Grid Biogas Technology



- ❑ The Utilization of On-Grid Biogas is versatile such as:
 - Biogas processed into natural gas quality and feed into the gas grid.
 - Biogas Used as a Fuel for Combined Heat and Power Engines
 - Biogas can be fired directly into a steam or hot water boiler

9. Biogas Potential in Pakistan



- ❑ 51 million animals (Buffaloes, Cows and Bullocks) in Pakistan;
- ❑ 19.125 Million M3 biogas can be produced daily by anaerobic fermentation of dung by installation of about 3.825 million family size biogas plants;
- ❑ Could meet the cooking needs of about 50 million people
- ❑ Total population of Pakistan is about 180 million, around 68% reside in the rural areas;
- ❑ Hence, can meet the cooking / heating requirements of 44% rural masses from this single source of energy (biogas)

9. Biogas Potential in Pakistan



- ❑ besides, producing 57.4 million Kg of nitrogen enriched bio-fertilizer per day or 21.00 million tons of bio-fertilizer per year, which is an essential requirement for sustaining the fertility of agricultural lands.

Source: www.pcret.gov.pk

10. Existing & Future Biogas Projects in Pakistan



- ❑ Initially, 1200 family size biogas plants on Public-Private cost sharing basis were launched.
- ❑ Keeping in view the positive response of public, Govt. of Pakistan launched the project of installation of 2500 biogas plants in 2007.
- ❑ Out of which 2000 units have so far been installed successfully, whereas, work on other 500 units is in progress.

Source: www.pcret.gov.pk

11. Purpose of Biogas Plants



- ❑ Originally biogas plants were constructed for cooking purpose only.
- ❑ But in view of the current energy crises i.e.
 - rise in fossil fuel prices
 - increase in electric utility tariff and
 - heavy load shedding

Possibilities are being worked up for utilization of biogas on commercial scale.

- ❑ Thus over the period, Govt. of Pakistan came forward to make possible the usage of biogas in generation of power.

11. Purpose of Biogas Plants



- ❑ Besides the galloping prices of diesel coupled with its irregular supply has compelled agriculturist to use biogas as duel fuel (Diesel + Biogas) for running their tube wells.
- ❑ For this purpose, bigger size biogas plants have been designed and installed in Sialkot, Narowal, Jhang and other places of Pakistan.

12. Licences Granted by NEPRA For Biogas Power Plants



❑ NEPRA has issued following two licenses based on Biogas fuel;

- (i) **Pak-Ethanol (Pvt.) Limited**
Gross Capacity: 9.132 MW
Fuel: Biogas
License Issued: August, 2012
- (ii) **Shakarganj Mills Limited**
Gross Capacity: 8.512 MW
Fuel: Biogas
License Issued: November, 2007
- (iii) **Bismillah Energy Limited (Under Process)**
Gross Capacity: 6MW
Fuel: Biogas (Solid Waste)

13. Tariff Structure For Biogas Power Plants

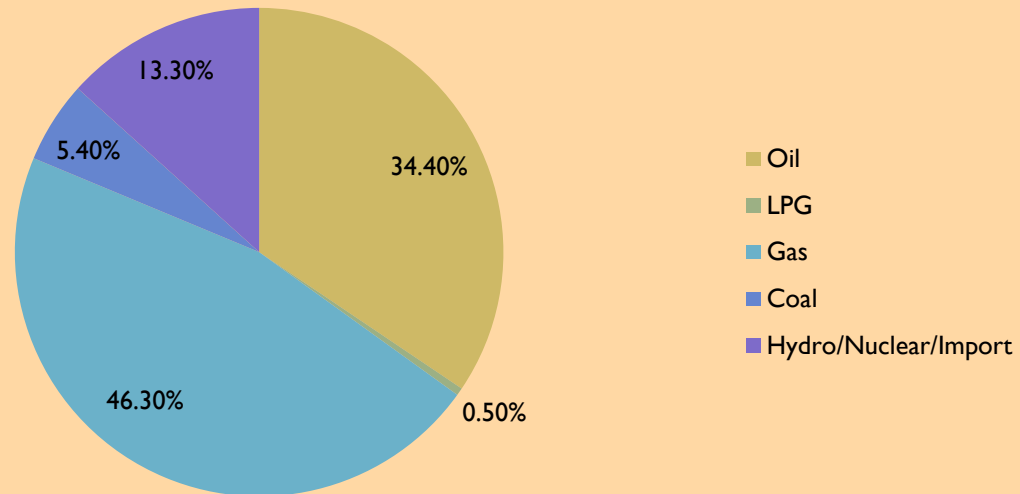


- ❑ Following main parameters are involved in determining tariff for Biogas Power Projects:
 - Fuel Cost;
 - Reference Gas Price / mmbtu;
 - Current Gas Price / mmbtu;
 - Fixed Cost Component

14. Energy Mix in Pakistan



Primary Energy Supplies by Source



Source: Pakistan Energy Year Book 2013-14

15. Organization Specifically working on Biogas Technology



- ❑ Pakistan Council of Renewable Energy Technology (PCRET) is specifically working on Promotion of Biogas Technology.
- ❑ Pakistan Council of Renewable Energy Technologies (PCRET) under took propagation of Biogas Technology as early as in 1976.
- ❑ Since NEPRA is exclusively Power Regulator, therefore, we do not expect on-grid biogas projects, however, NEPRA is mainly focusing on Power Projects and plays a role of facilitator in its launching based on renewable energy and its alternatives.

16. Options for Future And Way Forward



- i) In view of the prevailing situation, promotion of the biogas technology (B.T.) is one of the best options which could;
 - Partially offset the fossil fuel
 - Fuel Wood Consumption
 - Recycling of agro-animal residues as a bio-fertilizer
- ii) Moreover, being clean and renewable, it would also contribute towards;
 - Environment protection,
 - Sustenance of ecosystem and
 - Conservation of biodiversity.

16. Options for Future And Way Forward



- i) **Pursuance of GoP's Directions to PECRET:** Government of Pakistan has asked PECRET to launch mega project on the biogas technology in all over the country to not only cater the needs of cooking but also for agriculture and commercial purpose.
- ii) Biogas Technology can be promoted by creating awareness and exchange training programs within the SAARC countries.
- iii) Cooperation & Capacity Building of professionals of SAARC countries is the most important factor for encouraging Biogas Technology.



THANK YOU

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