‘Waste to Energy Power Potential & Opportunities in Punjab’

Presented by

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• Pakistan Power sector – Key Players
• Promoting Private Power Projects – Punjab Initiative
• Solid Waste Sector in Punjab
• Integrated Solid Waste Management (ISWM) Approach – Framework Applicability
• Waste to Energy Prospects
• 40 MW WtE Power Project at Lahore & WtE Potential in Punjab
• WtE Challenges – Limiting Factors
• Way forward – WtE is a success in Regional Countries
Pakistan Power Sector – Key Players
Key players in the power sector

- National Electric Power Regulatory Authority (NEPRA)
- National Transmission & Despatch Co. Ltd. (NTDC)
- Central Power Purchase Agency (CPPA-G)
- Private Power Infrastructure Board (PPIB) / Alternative Energy Development Board (AEDB)
- Provincial Facilitators – Punjab Power Development Board (PPDB), Energy Department in Punjab
Promoting Private Power Projects – Punjab Initiative
Role of Provinces in Power Sector

- The Constitution of Pakistan allows provinces to construct or cause construction of power projects of any size based on any technology – clarification provided by CCI on April 28, 2011

- Punjab provides facilitation to power projects under Punjab Power Generation Policy 2006 revised 2009 – this policy is in full conformance with federal power policies

- Federal Power Policy, 2015 & Renewable Power Policy, 2006 fully recognize this facilitation role of provinces
Functions of PPDB

- Facilitate development of hydro, coal, solar, wind, biomass / solid waste potential in Punjab
- Award of private power projects in raw or solicited mode
- Facilitate private investors for setting up power projects in line with the provincial and national power policies
- Extend fiscal & financial concessions to projects under the policy
- Supervise Feasibility Studies through independent panel of experts
- Support to projects during project agreements and financial close
- Facilitation, in coordination with Federal counterparts, during project construction and operation
Recent Success Stories

In exercise of its constitutional & policy role and to mitigate the then prevailing severe power shortfall situation, Punjab initiated development of:

- Large imported coal projects of 3960 MW – 1320 MW Sahiwal Coal project has started commercial operation (CPEC)
- Quaid-e-Azam Solar Park 1000 MW – 400 MW has started commercial operation (CPEC)
- RLNG based power projects 3600 + 1200 MW – 3600 has started operation
PPDB Project Portfolio

<table>
<thead>
<tr>
<th>Technology</th>
<th>Capacity (MW)</th>
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<tbody>
<tr>
<td>Thermal Projects</td>
<td>3960</td>
</tr>
<tr>
<td>Renewable Projects</td>
<td>2719</td>
</tr>
<tr>
<td>Hydro Projects</td>
<td>274</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6953</td>
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</tbody>
</table>
Solar Power Project Bahawalpur

- Foreign Direct Investment (300 MW) - 450 million US$
- COD Achieved on May to July, 2016
Country’s Installed Fuel Mix – 33,414 MW (31st Dec 2018)

Source: NTDC
Submission of proposal by sponsor to PPDB

Evaluation on approved criteria by PPDB Committee

Approval by PPDB Board /Award of LOI to sponsor

Conduct of Feasibility Study by company including:

i. IEE/EIA & its approval by EPA, GoPb

ii. Grid Interconnection Study & its approval by NTDC

iii. Approval of Feasibility Study by POE of PPDB (return of BG in case of approval or non-feasible)

Application of tariff by project company to NEPRA (GoP)

Tariff approval by NEPRA after public hearing - notification by GoP

Application of Generation License by project company to NEPRA

Award of Generation license by NEPRA after public hearing

Tri-Partite Letter of Support (LOS) by AEDB/PPIB, PPDB & project company

Negotiation with power purchaser and execution of project Agreements;

i. Power/Energy Purchase Agreement (PPA/EPA) with CPPA-G/ DISCO

ii. Implementation Agreement (IA) with PPIB/AEDB

iii. Other Agreements (Land Lease Agreement, Water Use Agreement, Fuel Supply Agreement etc.)

Financial Close of project

- Start of construction
- Commercial Operation Date (COD)

Negotiation with lenders by project sponsor/company

Engineering, Procurement & Construction (EPC) of project
Solid Waste Sector in Punjab
Municipal Solid Waste Management

- As per World Bank Report 2016, Pakistan’s solid waste generation per capita per day 0.43 kg
- Total MSW generation of country is about 31 Million tons/year – Census 2018
- Punjab, the largest province having population more than 110 million generates more MSW amongst other provinces
- Waste Management Companies are established at larger populated cities like Lahore, Faisalabad, Gujranwala etc.
- Prime objective is for centralized collection of waste, collection & transportation to respective dumping/landfill sites
Solid Waste Profile at Lahore

- Solid Waste generation: 7000 TPD
- Solid Waste collection: 6500 TPD
- Commitment by LWMC:
  - RDF Plant to Cement Factory: 1000 TPD
  - Compost Plant: 500 TPD
- MSW available for Waste to Energy (WtE):
  - At Lakhodair landfill site: 2000 TPD
  - MRF at Sundar: 3000 TPD

Source: Lahore Waste Management Company (LWMC)
ISWM Approach - Framework Applicability
How Waste is Managed?
ISWM Approach

Waste avoidance

Generation

On-site storage

Collection

Transport and Transfer

Processing and materials recovery

Disposal Landfill

Waste minimization
ISWM Framework Applicability - LWMC

1. Hospital waste
2. Industrial waste
3. C & D waste
4. Municipal waste

User Charges:
1. Commercial
2. Residential
3. Industrial

1- Institutional Capacity Creation of LWMC

2- Collection / Transportation

3- Awareness

4- Waste Disposal

5- Legal Regulatory Framework

6- Financial Sustainability

SWM Act
Enforcement by City District Govt

1. Media
2. Public awareness
3. Institutional education

1. Sanitary land filling
2. Composting
3. Anaerobic digestion
4. RDF production
5. Incineration
6. Waste to energy
Waste Characterization Study by LWMC – 2011/14

- Biodegradable W., 56.32
- Nylon, 10.92
- Textile, 9.21
- Combustibles, 6.05
- Diaper, 5.06
- Elec.-Electronic W., 0.03
- Glass, 0.69
- Hazardous W., 1.33
- Non-Combustibles, 6.40
- Metals, 0.06
- Paper-Cardboard, 2.18
- Pet, 0.09
- Plastics, 0.63
- Tetrapak, 1.02
## Waste Characterization Study by LWMC – 2011/14

<table>
<thead>
<tr>
<th>Season</th>
<th>Calorific Value (kCal/kg)</th>
<th>Moisture Contents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2011</td>
<td>1428</td>
<td>53.07</td>
</tr>
<tr>
<td>July 2012</td>
<td>1657</td>
<td>47.01</td>
</tr>
<tr>
<td>November 2012</td>
<td>1481</td>
<td>62.69</td>
</tr>
<tr>
<td>Sep 2014</td>
<td>1711</td>
<td>43.62</td>
</tr>
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Waste to Energy Prospects
Backdrop of WtE - MSW Risks

- Serious threat to ambient air & underground water
- Hazardous Methane gas emissions from dumping sites
- Rain and Seepage cause underground water contamination - potential threat for drinking water
- Risk of air and water borne diseases - Hepatitis, Malaria, Gastrointestinal
- Perpetual need for new landfill sites if waste is untreated
Dumping/Landfill Site at Lahore

Mahmood Booti – Closed Dumped site
- 77 acre full of heaps of garbage
- 13 million ton waste is dumped
- More than 80 feet waste heap
- Site closed since September 2016

Lakhodair landfill site
- 130 acre reserved area
- Dumping started in October, 2016
- 6 million ton waste already dumped on 60 acre
- Area reserved for WtE project
Waste to Energy Prospects

- WtE power projects are considered as environment projects through scientific disposal/reduction of MSW – power generation additional benefit
- WtE help in saving precious public land that could otherwise be used for dumping waste at dumping site
- Other key benefits include:
  - Air quality improvement
  - Reduced health risks
  - Safeguard against contamination of underground water table
  - Long life of environmentally hazardous dumping / landfill sites
40 MW Waste to Energy Power Project at Lahore
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- Based on effective waste management supply chain at Lahore by LWMC, private sector was encouraged for WtE project
- Subsequently, LWMC provided waste assurance of 2000 TPD of MSW
- Private sector shown keen interest for development of approximately 40 MW WtE power project in IPP mode under Punjab Power Generation Policy
- After competitive process & fulfillment of procedural requirements, LOI was awarded by PPDB to international private company for conduct of detailed bankable Feasibility Study (FS)
- FS completed/approved including grid & environment studies
- Company has been awarded Upfront Tariff & Generation License by NEPRA
- Next steps are projects agreements under LOS before financial close
## Waste to Energy Power Potential in Punjab

<table>
<thead>
<tr>
<th>Waste Management Companies</th>
<th>Total Waste Generation (tons/day)</th>
<th>Waste Collection (tons/day)</th>
<th>Estimated Potential (MW)</th>
<th>Dumping sites status</th>
</tr>
</thead>
</table>
| Lahore Waste Management Company | 7000 | 6500 | 100 MW | • Mehmood Booti dumping site – 100% filled  
• Lakhodair landfill site  
• Sundar Material Recovery Facility |
| Faisalabad Waste Management Company | 1650 | 1150 | 25 MW | • Jaranwala Road Faisalabad |
| Gujranwala Waste Management Company | 1000 | 700 | 15 MW | • Gondlawa (operational -700 tons/day)  
• Sherakot (in pipeline) |
| Multan Waste Management Company | 850 | 510-550 | 10-12 MW | • Habiba Sial (operational) |
| Rawalpindi Waste Management Company | 850 | - | 10-12 MW | • Muza Losar (95% filled) |
Waste to Energy Challenges – Limiting Factors
Waste to Energy Challenges – Limiting Factors

- Mixed MSW contain all type of waste including biodegradable, C&D waste etc.
- Scavenging of high calorific value waste & recycling in absence of waste regulations
- Waste assurance limitation in general
- No mechanism in place for tipping /gate fee – generally provided to project developers on account of waste disposal
- Province wise ceiling of 50 MW to each province to avail Upfront Tariff
- Upfront Tariff regime in Pakistan has almost exhausted
- Introduction of competitive bidding for RE projects - New RE Policy is expected in few months
- No grid-connected WtE completed project in place so far
Way forward – WtE a success in Regional Countries
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- Countries like China is way ahead in incineration based WtE power projects - As per China National Renewable Energy Centre June 2017, China has completed 296 projects in 28 provinces with aggregate capacity of 6250 MW

- India has also installed 138 MW capacity of WtE projects and number of projects are under development – Ministry of New Renewable Energy (March 31, 2018)

- Similarly Thailand, Turkey & Japan have also established WtE projects

- In Pakistan, 40 MW WtE project at Lakhodair landfill site would be the 1st of its kind which is under development stage

- 60 MW WtE power project at Sundar near Lahore would be launched shortly by PPDB

- Private sector shown keen interest for WtE projects in other cities of Punjab
Thank you