Analyzing Affordable Clean Energy Policy Choices in Bangladesh

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Outline

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  • Need for Energy Policy Analysis

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• Conclusion
Background

- **Catalyzing Clean Energy in Bangladesh (CCEB)**
  - 5-year program (2012-2017), ~US$15 MM, funded by USAID
  - Goal is to promote clean energy development
  - 5 areas of support, includes power sector improvements, energy efficiency, and clean cook stoves
  - Implemented by Deloitte (prime), ICF International (sub) and others
  - For more information - http://www.cleanenergy-bd.org/

- **ICF International** (www.icfi.com)
  - Provides professional services and technology solutions; founded in 1969
  - World-class domain expertise in energy, environment, transportation, health care, IT
  - Diverse client base – US Federal, state, local, commercial, international
  - Over 5,000 employees, ~$1B in revenue
  - 70 offices worldwide, HQ in Washington, DC metro area
Need for Energy Policy Analysis

- **Bangladesh faces significant challenges in electricity generation**
  - 10% annual growth rate in electricity demand projected for the foreseeable future
  - Goal is to provide electricity for all by 2021

- **Bangladesh also faces significant climatic challenges**
  - IPCC predicts significant loss of landmass due to sea level rise
  - Severe hit to agriculture due to changes in precipitation

- Are meeting the needs of both “mutually exclusive”?
  - Can we improve energy security and physical security simultaneously?

- Need data and tools to analyze these important questions
  - Tools created under CCEB are intended to inform these policy questions
Power Sector Policy Analysis Model (PSPAM)

- **Goal is to find mutually consistent energy development scenarios**
  - Options that meet the energy needs while lowering emissions
  - Added “co-benefit” will be improved air quality (reduced air pollution)

- **Analyze multiple “what-if” type national-level scenarios**
  - Assumptions about demand growth, fuel mix, power imports, etc.
  - Bottom-up accounting of power fleet GHG emissions

- **Provides impacts on multiple levels**
  - System costs, fuel requirements, generation mix, power prices, GHG emissions

- **Not a substitute for generation planning tools**
  - Supplements capacity planning needs, with a less rigorous scenario planning model, adequate for high-level policy discussions
OVERVIEW

PSPAM Development

Phase I: Design and Develop Tool
- Understand Needs/Capabilities
- Collect Data
- Develop Model

Output: PSPAM, v2.1

Phase II: Ongoing Training
- Analyse Scenarios
- Select Viable Scenarios

Output: PSPAM Updated with Refined Scenarios

Phase III: Moving Forward
- Produce Policy Papers

Output: Policy Papers to Enhance Power Sector Development Options
PSPAM Inputs

- Scenarios can be created by changing a variety of input parameters
  - Fuel prices
  - Technology costs and performance
  - Electricity demand
  - Plant efficiency (capacity factors)
  - Financial assumptions (capital charge rates, exchange rates, etc.)

- Inputs can be dynamically adjusted to reflect changing national and/or global conditions
  - Also allows for easy sensitivity analyses
  - Modeling period extends to 2030, consistent with other GOB modeling (but can be further extended)

- Model provides flexibility of combining different parameter values for potentially unlimited number of policy scenarios
PSPAM Outputs

- Results are mostly presented graphically
  - Easy to compare year-by-year variations

- Results focus on high-level impacts on power system
  - Generation types, costs, power prices, CO2 emissions
  - Goal is to aid in policy discussions, not to “predict” precise impacts
PSPAM Outputs

- Shows the undiscounted annual and cumulative costs for the scenario analyzed
  - Provides a quick way to compare costs across scenarios
Analyzing Policy Choices with PSPAM

- Current work focuses on setting up a series of scenarios in consultation with policymakers
  - Data obtained from various government entities
  - Data can be updated easily by policymakers in government
  - Results are mostly illustrative, intended to spur discussions on potential policy options
  - Important conclusions can be drawn by comparing results across scenarios

- Both demand and supply side options are being analyzed
  - Comparing trade-offs between investing in reducing demand vs. building new capacity
  - Optimum policy choices may include investing in both demand and supply
# Representative Scenario Results

<table>
<thead>
<tr>
<th>Name of Scenario</th>
<th>2030 Results</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Generation Cost (BDT/kWh)</td>
<td>CO2 Emissions (MMT)</td>
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<tr>
<td>MP fuel diversification with PSMP costs – RC¹</td>
<td>8.4</td>
<td>125</td>
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<tr>
<td>RC with updated fuel costs</td>
<td>8.83</td>
<td>125</td>
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<tr>
<td>RC with updated capital costs</td>
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<tr>
<td>Updated RC (fuel costs and capital costs)</td>
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<tr>
<td>Updated RC with demand side options</td>
<td>9.11</td>
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<tr>
<td>Updated RC with biomass co-firing for coal plants</td>
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<td>105</td>
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<tr>
<td>Updated RC with liquid fuel replaced with LNG²</td>
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<tr>
<td>Updated RC with natural gas replaced with LNG³</td>
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<td>Updated RC with cross border promotion</td>
<td>8.58</td>
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<tr>
<td><strong>Hybrid – Low Hanging Fruit⁴</strong></td>
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<tr>
<td><strong>Hybrid – Longer term choices⁵</strong></td>
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<tr>
<td>Updated RC with 100% coal</td>
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<tr>
<td>Updated RC with 100% NG</td>
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<td>99</td>
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</tbody>
</table>

1. PSMP = Power System Master Plan, 2010; RC implies Reference Case
2. Assumes LNG price = $18/MMBtu
3. Assumes LNG price = $14/MMBtu
4. Assumes significant investments in technology upgrades to switch fuel (about one-third of the fuel costs); biomass fuel costs one-third of coal per unit of energy
5. Assumes significantly higher power imports at higher than current costs; increased investments in EE

BDT = Bangladesh Taka (US$ 1 = BDT 80)
Choosing Appropriate Policies

- Potentially promising clean energy options exist for Bangladesh
  - Choices that can reduce emissions cost effectively – “win-win”

- Certain options might be relatively easy to implement in short run
  - Fuel switching from liquid fuel (diesel, furnace oil) to liquefied natural gas (LNG)
  - Biomass co-firing at existing or new coal generation
  - Increasing cross border power imports under current arrangements (power purchase agreement)

- Some choices may require more long term view but are still effective in reducing emissions at comparable costs
  - Reducing load growth through electricity demand reduction measures
  - Investing in significantly higher power imports (e.g., investing in tapping hydro resources in Nepal, Bhutan)
Questions?

Bansari Saha  
+1-617-250-4286  
Bansari.Saha@icfi.com