Cross-Border Power Transfer Vision, Some Examples, Technical Issues

Invited Talk

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PPT slides will be available at www.saifurrahman.org
Cross-border Power Exchange in Europe

Europe to Middle East and North Africa
North Africa Power Grid

**Pan-Arab Grid**

The Authority is currently seeking out other opportunities to fully make the most of its US$ billion plus interconnection asset:

1. By exporting power to neighboring power pools:
   - EJILST Grid (Egypt, Jordan, Iraq, Lebanon, Syria and Turkey)
   - Pan-Arab Grid and henceforth the European Grid
2. Promoting the private utilities sector in the GCC region to interconnect to the GCC Grid.

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Gulf Cooperation Council Electric Power Interconnection

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Power Transfer Between Russia and Central Asia

Europe-Africa Power Interconnection
Southern Africa Transmission Projects

- 2015: 2nd DRC – Zambia 220 kV
- 2018: ZIZABONA - 330 kV
- 2018: Mozambique – Malawi 400 kV
- 2018: Zambia-Tanzania-Kenya 400 kV
- 2018: Morupule – Maun 400 kV
- 2020: MOZISA 400 kV
- 2020: Botswana-RSA 400 kV
- 2020: Namibia – Angola 400 kV
- 2020: Orapa – Pandamatenga 400 kV
- 2021: Mozambique STE – HVDC/AC
- 2024: Grand Inga Transmission – HVDC/AC

India to Bangladesh Power Transfer

Back-to-Back HVDC 400 KV Station in Bangladesh imports 800 MW of electricity from India
Issues of Interest:

- Technologies to facilitate GEI deployment
  - HVDC terminals (voltage/frequency issues)
- Stability and Market issues
- Security of transmission network across national boundaries

US-Mexico Interconnection

<table>
<thead>
<tr>
<th>CURRENT INTERNATIONAL INTERCONNECTION POINTS</th>
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<tbody>
<tr>
<td>Size of Interconnection Points to Import Capacity National Transmission Network</td>
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<tr>
<td>1,940 MW</td>
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<td>CAISO – Baja California</td>
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<th>IID – Baja California Project:</th>
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<tr>
<td>Interconnection point Mexicali – Imperial Irrigation District</td>
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<tr>
<td>Size of 220 MW, 16 Km Long, 230 kV of Voltage</td>
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<td>4.15 md investment. NPV of 68.4 md</td>
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<td>Recommended in 2017 with a 2 years estimate for construction</td>
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<th>Nogales Sonora – Arizona Project</th>
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<tr>
<td>Interconnection point Nogales Sonora – Nogales Arizona</td>
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<tr>
<td>Size of 150 MW, 27 Km Long, 230 kV of Voltage</td>
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<td>7.98 md investment. NPV of 81.96 md</td>
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<td>Recommended in 2016 with a 3 years estimate for construction</td>
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Capacity Balance Market

MECHANISM TO ADD IMPORTED CAPACITY INTO THE CBM

Power Plant in Foreign Territory Exclusively Connected to the Mexican Grid

- The Power Plant should have a generation permit issued by the CRE
- Represented by a generator with an energy-import permit in the Mexican Wholesale Electricity Market
- Certify the impossibility of the Power Plant of being connected to the foreign market
- Imported Capacity is credited to the net supply in the Mexican Capacity Balancing Market

Power Plant in Foreign Territory Connected to both Foreign and Mexican Grid

- Represented by a Market Participant with an energy-import permit in the Mexican Wholesale Electricity Market
- Agreement between the Power Plant and the foreign ISO or an existing agreement between CENACE and foreign ISO that guarantees the import of capacity under emergency conditions in the foreign market
- Exporters/Importers should coordinate energy bids according to their own ISO’s dispatch rules. Import capacity is credited to the net supply in the Mexican Capacity Balancing Market

Source: Cajeme Villarreal, SENER

Thank you for your attention

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