Southwest Power Pool Update

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RTOs/ISOs

Alberta Electric System Operator

Electric System Operator (IESO)

Midcontinent ISO (MISO)

New York ISO (NYISO)

New England ISO (ISO-NE)

California ISO (CAISO)

Southwest Power Pool (SPP)

Electric Reliability Council of Texas (ERCOT)

PJM

Regional Transmission Organizations

This map was created using Energy Velocity, November 2015
SPP Membership

Customer Load

- IOU: 16
- Coop: 19
- Muni: 14
- State Agencies: 8
- Fed Agencies: 1
- IPP: 15
- Marketers: 12
- Large Retail: 1
- Indep Trans: 11
Current Trends - Policy

• Holistic Integrated Tariff Team (HITT)
  • Resource Adequacy
  • Generation Interconnection Issues
  • Cost Allocation in Wind Rich Zones
    • (in parallel with Cost Allocation Working Group)
  • Congestion Hedging
  • Zonal Consolidation

• Value and Affordability Task Force (VATF)

• Western Energy Imbalance Market
Current Trends - Renewables

- **Wind**
  - Total Wind Generation Connected: Over 21GW
  - Wind Penetration Record: 63.9% (4/30/2018)
  - Wind Output Peak: 16.4GW (12/20/2018)
  - Additional Wind in GI Queue: 55GW

- **Solar**
  - Total Solar Generation Connected: .2GW (215MW)
  - Solar in GI Queue: 25GW

- **SPP Peak Load**: 50.6GW (7/21/2016)
Current Trends – Transmission Planning

Portfolio Total ($millions)

- 2012 ITP10: $1,500
- 2014 ITPNT: $622
- 2015 ITP: $521
- 2016 ITPNT: $590
- 2017 ITPNT: -$23
- 2018 ITPNT: -$37

Current Trends – Transmission Planning
Recent Projects

• Phase-Shifting Transformer – Woodward

• Second Windspeed Line – Woodward to Oklahoma City
Current Trends - Prices

2018 Spot Power Prices ($/MWh)

- Mid-Columbia $34 (32%)
- Indiana Hub $38 (8.5%)
- Mass Hub $48 (38.9%)
- PJM West $42 (26.2%)
- NYISO ZJ $46 (23.2%)
- ERCOT North $42 (56%)
- Into Southern $31 (3%)
- NP 15 $40 (4%)
- Palo Verde $40 (18.1%)

$ = Average YTD 2018 monthly day-ahead on-peak price
% = Percent increase from 2017 YTD
Source: RTO/ISO data and SNL Day-ahead Prices
### 2018 Integrated Marketplace Generation Totals

<table>
<thead>
<tr>
<th>Energy (MWh)</th>
<th>Gross Margin ($000)</th>
<th>Generation Margin ($/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>8,303,992</td>
<td>72,107</td>
</tr>
<tr>
<td>Combined Cycle</td>
<td>5,489,571</td>
<td>69,674</td>
</tr>
<tr>
<td>Gas Steam</td>
<td>2,136,900</td>
<td>14,207</td>
</tr>
<tr>
<td>Mustang CTs</td>
<td>962,780</td>
<td>13,438</td>
</tr>
<tr>
<td>Fossil PPAs</td>
<td>1,997,456</td>
<td>17,127</td>
</tr>
<tr>
<td>Wind</td>
<td>2,616,601</td>
<td>(10,702)</td>
</tr>
<tr>
<td>Total Generation</td>
<td>21,507,300</td>
<td>175,851</td>
</tr>
</tbody>
</table>

- Gross Margin calculated by subtracting variable cost from market settlements
- Positive Margin offsets load costs
- Wind includes both owned and PPA wind
  - Contractual price is considered variable costs for PPA wind where owned wind has minimal variable cost
Phase Shifting Transformer
Wind Speed