OE ENERGY
MARKET SNAPSHOT
National – Data Through October 2016

Office of Enforcement
Federal Energy Regulatory Commission
November 2016
2016/2017 Winter Assessment
Markets Cautiously Optimistic Nearing Winter

- Natural gas and power prices are likely to be higher than last winter
- Normal to above average temperatures are expected
- Normal residential and commercial natural gas demand are expected, but lower power burn
- Falling production offset by plentiful storage with potential for imports from Canada
- New pipelines will reduce regional price differences
- New England and Southern California present challenges
- Renewables are changing California ramping requirements
- Entrants are small to mid-size generators and renewable projects, which are accompanied by new transmission projects
- Electric generation mix is changing
## Futures Prices Higher

<table>
<thead>
<tr>
<th>Location</th>
<th>2016^</th>
<th>2017*</th>
<th>△</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algonquin (New England)</td>
<td>$9.69</td>
<td>$7.71</td>
<td>-20%</td>
</tr>
<tr>
<td>Transco Zone 6 non-NY (Mid-Atlantic)</td>
<td>$6.21</td>
<td>$6.26</td>
<td>+1%</td>
</tr>
<tr>
<td>Chicago City-Gates</td>
<td>$2.62</td>
<td>$3.84</td>
<td>+47%</td>
</tr>
<tr>
<td>Transco Zone 6 NY (New York City)</td>
<td>$9.29</td>
<td>$8.95</td>
<td>-4%</td>
</tr>
<tr>
<td>Dominion South (Marcellus)</td>
<td>$1.97</td>
<td>$2.14</td>
<td>+9%</td>
</tr>
<tr>
<td>Southern California Border</td>
<td>$2.85</td>
<td>$3.79</td>
<td>+33%</td>
</tr>
<tr>
<td>Henry Hub</td>
<td>$2.77</td>
<td>$3.55</td>
<td>+28%</td>
</tr>
<tr>
<td>Massachussets Hub</td>
<td>$89.28</td>
<td>$78.93</td>
<td>-12%</td>
</tr>
<tr>
<td>PJM Western Hub</td>
<td>$50.56</td>
<td>$55.80</td>
<td>+10%</td>
</tr>
<tr>
<td>Northwest (Mid-C)</td>
<td>$24.88</td>
<td>$32.05</td>
<td>+29%</td>
</tr>
<tr>
<td>Southern California (SP-15)</td>
<td>$33.76</td>
<td>$41.18</td>
<td>+22%</td>
</tr>
</tbody>
</table>

^January - February 2016

^January - February 2017

*Power Note: Prices in $/MWh. Peak financial swap prices.

*Gas Note: Prices in $/MMBtu. Regional futures natural gas prices are the sum of the Henry Hub futures contract price plus the regional basis futures.

Source: Derived from NYMEX and Intercontinental Exchange
Forecasters Call for Broadly Normal Winter Temperatures

Source: National Oceanic and Atmospheric Administration
Gas Demand Likely to Rebound in 2016-17

Sources: Derived from Bentek, EIA

ResComm LNG Exports Industrial
Exports To Mexico Power Generation
Production Sees First Decline of Shale Era

Sources: Derived from Bentek, EIA
Strong Storage Inventories Keep Market Well Supplied

Sources: Derived from Bentek, EIA
Canada and LNG Imports Fill in Supply Gaps

Sources: Derived from Bentek, EIA

Winter

Canadian Imports

LNG Imports

Bcfd

Pipeline Additions Help Ease Market Area Prices

Sources: Derived from Velocity Suite, ABB Enterprise Software and Bentek, in MMcf/d
NYC has Nation’s Highest Winter Gas Prices ($/Mmbtu)

Transco Zone 6-NY
- Nov-16: $2.33
- Dec-16: $4.98
- Jan-17: $9.00
- Feb-17: $8.91
- Mar-17: $4.09

Algonquin City-Gates
- Nov-16: $3.25
- Dec-16: $5.42
- Jan-17: $7.73
- Feb-17: $7.69
- Mar-17: $4.97

Transco Z 6-Non NY
- Nov-16: $2.26
- Dec-16: $3.87
- Jan-17: $6.28
- Feb-17: $6.24
- Mar-17: $3.80

Columbia Gas TCO
- Nov-16: $2.79
- Dec-16: $3.01
- Jan-17: $3.14
- Feb-17: $3.14
- Mar-17: $3.12

Dominion South
- Nov-16: $1.23
- Dec-16: $1.75
- Jan-17: $2.10
- Feb-17: $2.19
- Mar-17: $2.10

Source: Derived from IntercontinentalExchange
Aliso Canyon Outage Stresses California Markets
CAISO: Adapting to the Widening “Duck” Curve

Sources:
Derived from Velocity Suite, ABB Enterprise Software
Recent/Upcoming Developments: Power Plants & Transmission

Sources: Data derived from U.S. Electric Transmission Projects ©2016 The C Three Group LLC and map created using Velocity Suite, ABB Enterprise Software; Note: Winter 2016-2017 Expected In-Service Transmission Projects
Historical Year-over-year Electric Capacity Change

Source: Derived from Velocity Suite, ABB Enterprise Software
Conclusion

- Supply and demand are balancing in the natural gas market.
- Prices in both power and natural gas have responded to rebalancing, but remain relatively low.
- New pipeline connections have strengthened deliverability.
- Gas storage leaves markets well supplied for winter.
- The Northeast and Southern California may experience localized challenges.
- Increased renewable generation requires flexible resources for evening ramp in CAISO.
- Transmission projects may help to relieve price divergences.
- Natural gas for electricity generation continues to increase.
National Slides
Cumulative HDDs by City
Apr 2016 – Oct 2016

City Location
This Year
Last Year
5 Year Average

Source: Bloomberg Weather (daily data summed quarterly)
Cumulative CDDs by City
Apr 2016–Oct 2016

Source: Bloomberg Weather (daily data summed quarterly)
2016 Spot Power Prices ($/MWh)

Mid-Columbia
$21.83
-4%

Indiana Hub
$33.13
-9%

NP 15
$30.60
-15%

Palo Verde
$25.55
-9%

SPP
$25.90
-5%

PJM West
$34.88
-24%

Mass Hub
$33.13
-37%

NYISO ZJ
$34.88
-34%

ERCOT North
$26.84
-15%

SOCO
$28.27
-12%

$ = Average 2016 Spot Price*
% Decrease from 2015

*Average On-Peak Day-Ahead from January to October
SPP Price is an average of the North and South Hubs
Source: RTO/ISO and ICE Data
Spot Natural Gas Prices Average ($/MMBtu) Apr 2016 – Oct 2016

- AECO: $1.57 -16%
- CIG: $2.28 3%
- El Paso Permian: $2.33 4%
- NGPL Tex-Okla: $2.45 2%
- SoCal Border: $2.47 3%
- HSC: $2.52 5%
- Henry Hub: $2.55 5%
- Algonquin Citygate: $2.60 5%
- Transco Z6-NY: $1.66 -24%
- Columbia TCO: $2.63 -13%
- FGT-Z3: $2.54 5%

Source: ICE

Pricing Point
- BOLD – This Year
- Green – % increase from previous year
- Red – % decrease from previous year

Updated Nov-2016

Source: ICE

- Pricing Point
  - BOLD – This year
  - Green – % increase from previous year
  - Red – % decrease from previous year

Updated Nov-2016

- PG&E Citygate: 448,201 (-26%)
- CIG: 32,633 (-25%)
- El Paso Permian: 222,467 (-13%)
- SoCal Border: 261,201 (-15%)
- NGPL Tex-Okla: 258,082 (-31%)
- Henry Hub: 212,221 (9%)
- HSC: 27,265 (22%)
- FGT-Z3: 106,309 (-17%)
- Transco Z6-NY: 70,631 (-10%)
- Columbia TCO: 28,000 (14%)
- Chicago Citygate: 371,498 (-21%)
- Algonquin Citygate: 8,819 (-89%)
- Updated Nov-2016
U.S. NG Supply and Demand


US Natural Gas Supply
Total Change in Supply -0.4%

- Net Dry Gas Production -0.4%
- Net Pipeline Imports 4.4%
- LNG Imports 14.5%

US Natural Gas Demand
Total Change in Demand 1.5%

- Power Generation 5.9%
- Industrial 2.1%
- Residential/Commercial -0.9%

Note: Balance includes all amounts not attributable to other categories.
Source: Derived from Bentek Energy data
Regional Imports from Canada

Source: Derived from Bentek Energy data

Updated Nov-2016
Total U.S. Natural Gas Demand All Sectors

Source: Derived from Bentek Energy data, derived from interstate pipeline flow and modeled data.
U.S. Natural Gas Consumption for Power Generation

Source: Derived from Bentek Energy data

Updated Nov-2016
EIA National Storage Inventories

Source: Derived from Bloomberg Data

Updated Nov-2016
National Natural Gas Market Overview: Natural Gas Storage Inventory

Federal Energy Regulatory Commission • Market Oversight • www.ferc.gov/oversight

EIA Regional Storage Inventories

EAST

WEST

PACIFIC

SOUTH CENTRAL

PRODUCING

Source: Derived from Bloomberg Data

Not

Updated Nov-2016
Rigs by Type

Baker Hughes Rig Count (Rigs)

Oil Rigs

Gas Rigs

Source: Derived from Bloomberg data

Updated  Nov-2016
Gas vs Coal

Source: Derived from Bloomberg data

Updated Nov-2016
Notes: Everett data includes flows onto the AGT and TGP interstate lines, plus estimates of flows to the Mystic 7 power plant, Keyspan Boston Gas, and LNG trucked out of the terminal. Excludes flows to the Freeport LNG which flows via intrastate pipelines and flows to the Mystic 8 and 9 power plants.

Source: Derived from Bentek Energy data
World LNG Estimated Landed Prices: Oct 2016

Note: Includes information and Data supplied by IHS Global Inc. and its affiliates ("IHS"); Copyright (publication year) all rights reserved. Landed prices are the monthly average of weekly trades from the prior month.

Updated Nov-2016
National Natural Gas Market Overview: LNG Competitive Price Hubs

Historical and Future World Gas Prices

Source: Derived from Bloomberg data

Updated Nov-2016
WTI vs Brent Crude Oil Price

Source: Derived from Bloomberg data

Updated Nov-2016
Infrastructure Report

Office of Energy Projects Energy Infrastructure Update

http://www.ferc.gov/legal/staff-reports.asp

(see “Energy Infrastructure” tab)
## Natural Gas Highlights

### Natural Gas Activities in September 2016

<table>
<thead>
<tr>
<th>Status</th>
<th>No. of Projects</th>
<th>Storage Capacity (Bcf)</th>
<th>Deliverability (MMcf/d)</th>
<th>Capacity (MMcf/d)</th>
<th>Miles of Pipeline</th>
<th>Compression (HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placed in Service</td>
<td>6</td>
<td>1,345.0</td>
<td>85.5</td>
<td>36,000</td>
<td></td>
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</tr>
<tr>
<td>Certificated</td>
<td>5</td>
<td>367.6</td>
<td>18.9</td>
<td>139,221</td>
<td></td>
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<tr>
<td>Proposed</td>
<td>2</td>
<td>0.0</td>
<td>23.2</td>
<td>0</td>
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</table>

### Natural Gas Activities through September 30, 2015

#### January through September 30, 2015

<table>
<thead>
<tr>
<th>Status</th>
<th>No. of Projects</th>
<th>Storage Capacity (Bcf)</th>
<th>Deliverability (MMcf/d)</th>
<th>Capacity (MMcf/d)</th>
<th>Miles of Pipeline</th>
<th>Compression (HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placed in Service</td>
<td>24</td>
<td>4,609.3</td>
<td>274.6</td>
<td>129,695</td>
<td></td>
<td></td>
</tr>
<tr>
<td>through September 30, 2015</td>
<td>16</td>
<td>5,505.7</td>
<td>203.5</td>
<td>127,925</td>
<td></td>
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<tr>
<td>Certificated</td>
<td>46</td>
<td>14,382.5</td>
<td>1,136.5</td>
<td>1,251,340</td>
<td></td>
<td></td>
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<tr>
<td>through September 30, 2015</td>
<td>26</td>
<td>7,541.0</td>
<td>360.6</td>
<td>247,078</td>
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#### Storage

<table>
<thead>
<tr>
<th>Status</th>
<th>No. of Projects</th>
<th>Storage Capacity (Bcf)</th>
<th>Deliverability (MMcf/d)</th>
<th>Capacity (MMcf/d)</th>
<th>Miles of Pipeline</th>
<th>Compression (HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>through September 30, 2015</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificated</td>
<td>0</td>
<td>11.4</td>
<td>53</td>
<td>4,800</td>
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</table>

#### LNG (Import & Export)

<table>
<thead>
<tr>
<th>Status</th>
<th>No. of Projects</th>
<th>Storage Capacity (Bcf)</th>
<th>Deliverability (MMcf/d)</th>
<th>Capacity (MMcf/d)</th>
<th>Miles of Pipeline</th>
<th>Compression (HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>through September 30, 2015</td>
<td>1</td>
<td>0.0</td>
<td>700</td>
<td></td>
<td></td>
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<tr>
<td>Placed in Service</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificated</td>
<td>4</td>
<td>10.2</td>
<td>3,181</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>through September 30, 2015</td>
<td>1</td>
<td>0.0</td>
<td>1,400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificated</td>
<td>4</td>
<td>10.2</td>
<td>3,181</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>through September 30, 2015</td>
<td>1</td>
<td>0.0</td>
<td>1,400</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Electric Generation Highlights

## New Generation In-Service (New Build and Expansion)

<table>
<thead>
<tr>
<th>Primary Fuel Type</th>
<th>September 2016</th>
<th>January – September 2016 Cumulative</th>
<th>January – September 2015 Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Units</td>
<td>Installed Capacity (MW)</td>
<td>No. of Units</td>
</tr>
<tr>
<td>Coal</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>14</td>
<td>364</td>
<td>77</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oil</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Water</td>
<td>0</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>Wind</td>
<td>0</td>
<td>0</td>
<td>34</td>
</tr>
<tr>
<td>Biomass</td>
<td>0</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Geothermal Steam</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Solar</td>
<td>16</td>
<td>601</td>
<td>225</td>
</tr>
<tr>
<td>Waste Heat</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Other *</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>965</td>
<td>403</td>
</tr>
</tbody>
</table>

**Sources:** Data derived from Velocity Suite, ABB Inc. and The C Three Group LLC which include plants with nameplate capacity of 1 MW or greater. The data may be subject to update.
## Electric Transmission Highlights

### Transmission Projects Completed

<table>
<thead>
<tr>
<th>Voltage (kV)</th>
<th>September 2016</th>
<th>September 2015</th>
<th>January – September 2016 Cumulative</th>
<th>January – December 2015 Cumulative</th>
<th>High Probability of Completion</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤230</td>
<td>41.5</td>
<td>15.1</td>
<td>285.9</td>
<td>694.3</td>
<td>2,654.3</td>
<td>5,122.9</td>
</tr>
<tr>
<td>345</td>
<td>36.0</td>
<td>82.0</td>
<td>199.4</td>
<td>1,230.5</td>
<td>2,208.9</td>
<td>3,734.7</td>
</tr>
<tr>
<td>500</td>
<td>0.0</td>
<td>0.0</td>
<td>43.0</td>
<td>355.0</td>
<td>925.3</td>
<td>2,884.3</td>
</tr>
<tr>
<td>Total U.S.</td>
<td>77.5</td>
<td>97.1</td>
<td>528.3</td>
<td>2,279.8</td>
<td>5,788.5</td>
<td>11,741.9</td>
</tr>
</tbody>
</table>

### Proposed Transmission Projects In-Service by September 2018

<table>
<thead>
<tr>
<th>Voltage (kV)</th>
<th>September 2016</th>
<th>September 2015</th>
<th>January – September 2016 Cumulative</th>
<th>January – December 2015 Cumulative</th>
<th>High Probability of Completion</th>
<th>All</th>
</tr>
</thead>
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<tr>
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<td>0.0</td>
<td>0.0</td>
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<td>355.0</td>
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<td>2,884.3</td>
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<tr>
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<td>97.1</td>
<td>528.3</td>
<td>2,279.8</td>
<td>5,788.5</td>
<td>11,741.9</td>
</tr>
</tbody>
</table>

### Sources

Data derived from Staff Database and U.S. Electric Transmission Projects ©2016 The C Three Group, LLC.

### Disclaimer

This Report contains analyses, presentations, and conclusions that may be based on or derived from the data sources cited, but do not necessarily reflect the positions or recommendations of the data providers.
# Installed Generating Capacity

## Total Available Installed Generating Capacity

<table>
<thead>
<tr>
<th>Source</th>
<th>Installed Capacity (GW)</th>
<th>% of Total Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>293.73</td>
<td>24.99%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>510.26</td>
<td>43.42%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>107.36</td>
<td>9.14%</td>
</tr>
<tr>
<td>Oil</td>
<td>44.98</td>
<td>3.83%</td>
</tr>
<tr>
<td>Water</td>
<td>100.35</td>
<td>8.54%</td>
</tr>
<tr>
<td>Wind</td>
<td>76.66</td>
<td>6.52%</td>
</tr>
<tr>
<td>Biomass</td>
<td>16.64</td>
<td>1.42%</td>
</tr>
<tr>
<td>Geothermal Steam</td>
<td>3.88</td>
<td>0.33%</td>
</tr>
<tr>
<td>Solar</td>
<td>19.39</td>
<td>1.65%</td>
</tr>
<tr>
<td>Waste Heat</td>
<td>1.17</td>
<td>0.10%</td>
</tr>
<tr>
<td>Other*</td>
<td>0.76</td>
<td>0.07%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,175.20</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

**Sources:** Data derived from Velocity Suite, ABB Inc. and The C Three Group LLC which include plants with nameplate capacity of 1 MW or greater. The data may be subject to update.