Got Gas?
How Fracking Restored the Inland Northwest Comparative Energy Advantage

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Topics

- Avista overview
- Markets and changing supply picture
- Electric markets and wind generation
- Transportation – natural gas and electric vehicles
- Inland Northwest Comparative Energy Advantage
Long-term needs don’t require major generation until 2019 except for renewable resource requirements.
2009 Natural Gas IRP
No Additional Resources Required for Some Time

Expected Case - WA/ID Existing Resources vs. Peak Day Demand
(Net of DSM Savings) November to October

Expected Case - Medford/Roseburg Existing Resources vs. Peak Day Demand
(Net of DSM Savings) November to October
Energy Markets
Historic AECO Cash Prices
1999 through March 2012

$14.00
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00

$/Dth

Western Energy Crisis
Winter Weather Event
Hurricane’s Katrina & Rita
?????

Jan/99  Jul/99  Jan/00  Jul/00  Jan/01  Jul/01  Jan/02  Jul/02  Jan/03  Jul/03  Jan/04  Jul/04  Jan/05  Jul/05  Jan/06  Jul/06  Jan/07  Jul/07  Jan/08  Jul/08  Jan/09  Jul/09  Jan/10  Jul/10  Jan/11  Jul/11  Jan/12
Fundamental Change to the Natural Gas Market

Fundamental Forecasts vs. Actual - March Update
Henry Hub

Actuals
Forecast

Consultant 1 - Mar 2012
EIA - Mar 2012
Consultant 2 - Mar 2012
Consultant 1 - Oct 2010
NYMEX - Apr 5, 2012
Consultant 2 Oct 2010
NYMEX - Oct 20, 2010
Natural Gas Exploration
An Unconventional Turn

Conventional wells - vertical drilling into porous saturated sandstone pockets

Unconventional wells – horizontal drilling into vast rock formations
The Shale Drilling Process

Tapping the Gas
Horizontal drilling and hydraulic fracturing have made it feasible to extract huge amounts of natural gas trapped in shale formations. Here’s how they work:

- **Tanker trucks deliver water for the fracturing process.**
- **A pumper truck injects a mix of sand, water, and chemicals into the well.**
- **A rig drills down into the gas-bearing rock, which can be 7,000 feet or more below the surface. The well is lined with steel pipe.**
- **The well is sealed with cement to a depth of 1,000 feet or more to prevent fluids or gas from seeping into the groundwater.**
- **Using a steerable motor or other means, operators extend the well horizontally 1,000 feet or more into the gas-bearing rock.**

**Gun charges blast holes through the well casing and into the surrounding rock.**

**Sand, water, and chemicals pumped in at high pressure further fracture the rock.**

**Gas escapes through fractures, carried open by sand particles and up to the surface.**

Recovered water is stored in open pits, then taken to a treatment plant.

Natural gas flows from well through pipeline system to processing facility.

Sources: Chesapeake Energy; Al Granberg; WSJ research
Natural Gas: Productivity Has Improved

Drilling Rig Productivity Has Dramatically Improved

<table>
<thead>
<tr>
<th>Metric</th>
<th>1st Quarter 2007</th>
<th>1st Quarter 2008</th>
<th>3rd Quarter 2010</th>
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</thead>
<tbody>
<tr>
<td>Time To Drill (Days)</td>
<td>20</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>Wells Per Yr Per Rig</td>
<td>18</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Average Lateral Length (Feet)</td>
<td>2,104</td>
<td>4,503</td>
<td>4,503</td>
</tr>
<tr>
<td>30 Day Ave. Prod Rate (Mcf/d)</td>
<td>1,006</td>
<td>2,439</td>
<td>2,439</td>
</tr>
<tr>
<td>Init Prod Additions Per Rig Per Yr (Mcf/d)</td>
<td>18,360</td>
<td>80,930</td>
<td>+341%</td>
</tr>
<tr>
<td>Drill &amp; Complete Costs ($MM)</td>
<td>$2.6</td>
<td>$2.8</td>
<td>+8%</td>
</tr>
</tbody>
</table>

Source: Southwestern Energy Financials
Forecasted North American Natural Gas Production

Actual  Projection


Bcf/d

U.S. Conventional  Canada Conventional  U.S. Unconventional  Canada Unconventional

Source: EIA & NEB historic data; Encana forecasts
AECO Gas vs. Mid-C On-Peak Prices
Northwest Wind Capacity Past and Future

Historical data provided by RNP website
Wind Fleet Locations

Source: RNP.org
Concerns

- How far will gas prices go down? Will the prices remain stable?
- Will the duration of the negative price excursions expand as the wind fleet grows?
- How will these issues affect long-term and short-term planning?
How will transportation choices affect the utility industry?

- Gasoline/Diesel
- Natural Gas
- All Electric
- Hybrid
Separation needs to be at least $1.40/gallon for large fleets to pencil out.

Source: U.S. Energy Information Administration (EIA), Dec 2010
Not Without Controversy

Figure 3. Natural gas wellhead price difference from AEO2011 Reference case with different additional export levels imposed

Source: U.S. Energy Information Administration, National Energy Modeling System
Global Penetration of Natural Gas Vehicles

The U.S. has less than 2% of global natural gas vehicles (NGV).

Countries with the highest NGV penetration rates generally have:

• Reasonably priced NGVs and/or efficient retrofit practices.

• Natural gas prices that are less than 50% of gasoline prices.

• Fueling infrastructure that is adequately dense yet disbursed to promote convenient availability.

• Favorable government policies or incentives.

Estimated worldwide NGVs: 9.6 million
Source: International Association for Natural Gas Vehicles

Sources: Wood Mackenzie, IANGV
Market Applications

Tier 1

**Very Profitable**

- **Resilient Fleets**
  - Large (>75 vehicle) transit or refuse fleets
  - Diesel drops below $2.25/gal
  - CNG vehicle maintenance costs increase 50%

- **Profitable* unless:**
  - VMT drops below 26,000 miles per year (transit) or 14,000 miles per year (refuse)
  - Vehicle incremental costs double
  - Various combinations of the above

Tier 2

- **Marginal Fleets**
  - All school bus fleets
  - Small (<75 vehicle) transit or refuse fleets

- **Precipitous drop in profitability if:**
  - Transit or refuse fleet drops below 30 vehicles
  - School bus VMT drops below 10,000 miles per bus

Tier 3

- **No-CNG Fleets**
  - Low annual fuel use
  - Access to unusually inexpensive diesel
  - Exceptionally high CNG vehicle and infrastructure costs

- Not Profitable

*Payback of less than 5 years

Source: NREL/TP-7A2-47919, June 2010
Electric Car & Plug In Hybrid Sales
Eastern Washington & North Idaho Service Area

Underlying assumption: In 2035, 63% of households have one PEV
Census data Spokane:
- no vehicle: 3,790
- 1 vehicle: 26,524
- 2 vehicles: 48,529
- 3 vehicles: 19,807
- 4 vehicles: 5,971
- 5+ vehicles: 2,545
Inland Northwest
Comparative Energy Advantage
The Energy Situation in the Inland Northwest

- We have among the lowest electricity and natural gas retail rates in the country.
- In most of the West, retail electricity prices are double the local price; in the case of California one-third to one-fourth.
- We have a location advantage in natural gas markets because we are right in the middle of three suppliers of low cost gas.
- Our renewable energy mandates are sensible at 25%, especially compared to California (33%).
Energy Retail Price Outlook in the Inland NW Electricity

- During the rest of this decade, our retail electricity prices are likely to increase **5% per year** from a base of 8.5 cents per kWh.
- Today in San Diego incremental retail electricity prices are about 30 cents per kWh and will increase **50% next year**.
Energy Retail Price Outlook in the Inland NW Natural Gas

- Locally, natural gas retail prices will increase 1-2% per year because the cost-of-gas component will remain stable for the decade.
- Projections of retail natural gas for the rest of the country are for moderate increases in the range of 5-10% per year from a higher base level.
Energy/Economy History

- In the 1960’s and 1970’s the Pacific Northwest and our Region enjoyed extraordinary low cost energy

- This in turn drew energy intensive industry to the area

- During the 1980’s and 1990’s some large blunders (largely nuclear on the electricity side) and strong demand (on the natural gas side) drove up energy costs rapidly

- The aluminum industry, mining and smelting and other natural resource industry exited during these decades
Energy/Economy Future

- Today, reasonable renewable energy targets and low natural gas prices for industry and electricity generation have dramatically shifted the balance of where onshore industry will relocate and offshore industry will return.

- We have the land.
- Labor will come to the jobs.
- Capital is not going to be an obstacle.
- Entrepreneurship seems to be everywhere.
- And our energy will be dramatically lower cost.

- Will we be ready for growth?
Questions