Decision-Making In A Time Of Uncertainty: Is There Ever A ‘Right’ Answer?

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Basic Truths About Electricity

“You Know What I Want More Than Cheap Electricity? I Want Electricity.” – Paul Patton, Former Governor Of Kentucky

“Juice From The Grid Now Penetrates Every Corner Of Our Lives, And We Pay No More Attention To It Than We Do To The Oxygen In The Air.” – National Geographic

“In Our Business We Build Plants For 40 To 60 Years, So We Have To See (Deep) Into The Future.”

-- Jim Rogers, CEO Of Duke Energy
How Go The Prognostications?

Source: U.S. Energy Information Administration

Forecast for 2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Projected Offshore Natural Gas Production in 2015 (Bcf)</th>
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<tbody>
<tr>
<td>2000</td>
<td>6,680</td>
</tr>
<tr>
<td>2012</td>
<td>2,130</td>
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How Go The Prognostications?

Source: U.S. Energy Information Administration

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The Fly In The Ointment

Henry Hub Spot Price

Henry Hub Futures Price

Source: EEI

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Snapshot Of Today’s Significant Utility Challenges

• Aging utility infrastructure
• Federal/state environmental/renewable requirements
• New technology deployment
  – Smart grid, alternative generation
• *Flat to marginal growth in power sales*
Aging Infrastructure

• Substantial Infrastructure Spending Requirements…
  – $1.8 trillion over 20 years for electric* --- 2.4 times net book value of current asset base
  – $335 billion over 20 years for water; $1 trillion, including waste water**

... As Utility Physical Plant Ages:
  – About 45% of total electricity generating capacity is greater than 30 years old; about 20% is greater than 40 years old
  – About two-thirds of coal capacity is at least 30 years old; about one-third is greater than 40 years old
  – About 70% of transmission lines are at least 25 years old

*Brattle Group estimates
**EPA estimates
EEI’s Capital Expenditure Forecast

![Bar chart showing U.S. Shareholder-Owned Electric Utilities (in $ billions) from 2003 to 2014](chart.png)

Source: Edison Electric Institute Finance Department, company reports, SNL Financial (June 2012)

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An Environmental Compliance Juggernaut

• Environmental Mandates
  – EPA Regulations
    ▪ Cross-State Air Pollution Rule (currently under legal challenge)
    ▪ MACT
    ▪ Cooling Water Intake (316(b))
    ▪ Ash Disposal
    ▪ Greenhouse Gas Restrictions

• Industry Response
  – Retrofit, repower, or retire virtually entire coal fleet (~53GW announced through 2022, ~34MW of which will be retired)
The Bull In The China Shop

Shale Gas Production

Source: Tristone Capital, Devon Energy

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Monthly Gas- And Coal-Fired Generation

Equal For The First Time (April 2012; 32%)*

*Preliminary; Source: U.S. Energy Information Administration
EIA’s Coal Plant Retirement Scenarios

Energy Information Agency,
July 31, 2012
The ‘Shale Gale’

• 93 gigawatts of gas-fired capacity additions over next ten years*
  – YTD 2012 electric sector consumption of gas increased 21% over 2011
  – 24,000 miles of pipeline will be necessary to transport the fuel to new gas plants
  – Adjustments may be necessary to traditional scheduling protocol: firm versus interruptible transportation contracts

• Incremental coal capacity is in doubt

• Renewable alternatives are substantially disadvantaged

*North American Electric Reliability Corp. estimate
Smart Grid

• Enables two-way flow of electricity and information, automates controls for a widely distributed energy delivery network

  – Implications
    ▪ An industry that is no longer primarily dependent on central station power and one-way power flow
    ▪ An industry that is increasingly dependent on distributed and central station renewables/storage
    ▪ Increased usage of demand response
Electric Utilities Ratings --- Emphatically High Grade, But…

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Credit Quality Has Eroded Considerably In 40 Years

% Ownership


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