The Energy Industry Update

Highlights of Recent Significant Events and Emerging Trends

Winter 2012–2013

Vol. 13, Issue 2
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Executive Summary

Decision Time

The November 2012 elections did little to change the dynamics in Washington, and fiscal issues continue to dominate the national debate, as energy policy is overshadowed by—and caught in the crossfire of—dueling views on spending and taxation. The averted “fiscal cliff” promises to yield more policy debate in 2013 and beyond. Climate change and renewables, called out in the inaugural address as priorities, are sure to spark debate. Nonetheless, energy and utility companies face infrastructure investment needs and impending deadlines for plant retirements and retrofits and must push forward in developing and executing strategies, some of which were deferred pending November’s electoral outcomes.

### Efficiency and Growth
- Energy efficiency continues to drive year-over-year growth in energy demand lower; utilities are seeking alternative recovery mechanisms in this slow demand growth environment—sometimes also entailing lower allowable ROEs.
- Some optimism remains that economic growth will pick up in 2013 and beyond, providing some tailwinds for energy companies, but more fiscal fireworks could cause a slowdown.

### Coal’s Slow Burn
- Anticipated coal-fired plant retirements continue to increase, spurred by EPA regulations and persistent low natural gas prices, while some owners will hold on (at least for a while) for various reasons: retrofit technology successes, performance of other plants, rate impacts, and reliability, and others are still deciding whether to retire or retrofit.
- For coal plant owners contemplating retrofits, the supply chain is increasingly cause for concern in regions such as the Midwest as EPA deadlines and large volumes of plants stress capability to complete refurbishment in a timely manner.

### Consequences of a Natural Gas-Based Energy Industry
- Shale gas continues to be the major story in the U.S. energy picture, but there are risks to low gas prices (significantly increased demand, greater and multiple levels of regulation, pricing uncertainty/miscalculations).
- As power generation becomes increasingly dependent upon natural gas as a baseload or swing fuel source, federal and reliability officials are turning their attention to infrastructure adequacy and coordination of the gas and electric industries, increasingly important issues.

### Policy Shift...or Not
- Changing personnel at the Department of Energy and the Environmental Protection Agency could alter policy; most, however, expect the trajectory and priorities of clean energy and increasing environmental regulation to remain substantially the same.
- Federal renewables incentives (e.g., production tax credit) received a temporary extension and the dividend tax exemption was extended permanently, but it remains unclear how a contentious federal budget process might affect those policies in the longer term.
- Meanwhile, FERC has offered clarification on criteria for granting transmission incentive rates. This provides some assurance for continued incentives in the near to medium term. Despite FERC’s clarification, questions about incentive criteria remain.
### Possible Impact of Selected Fiscal and Economic Factors on Energy Utilities

<table>
<thead>
<tr>
<th>Factor</th>
<th>Outcomes &amp; Uncertainties</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic Growth</strong></td>
<td>▪ Expected slow growth in early 2013</td>
<td>▪ Continued growth in energy demand, but at a relatively low rate</td>
</tr>
<tr>
<td></td>
<td>▪ Modest acceleration in late 2013 or 2014</td>
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<tr>
<td><strong>Dividend Taxation</strong></td>
<td>▪ Dividend tax exemption extended</td>
<td>▪ Potential for dividend and other investment tax incentives to get caught up in tax reform discussion</td>
</tr>
<tr>
<td></td>
<td>▪ Obama Administration contemplating further unknown tax increases</td>
<td></td>
</tr>
<tr>
<td><strong>Individual Income Taxes; Transfer Payments</strong></td>
<td>▪ Rates increasing; tax burdens certainly increasing, but ultimate allocation of burden unclear</td>
<td>▪ Household budget pressures on ratepayers</td>
</tr>
<tr>
<td></td>
<td>▪ Possibly reduced transfer payments (e.g., extended unemployment benefits)</td>
<td>▪ Increased demand for LIHEAP and other assistance programs</td>
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<td></td>
<td></td>
<td>▪ Commission, ratepayer resistance to rate increases</td>
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<tr>
<td></td>
<td></td>
<td>▪ More frequent rate filings, smaller increments</td>
</tr>
<tr>
<td><strong>Production Tax Credit</strong></td>
<td>▪ Extension for one year; elimination or possible phase-out beginning in 2014</td>
<td>▪ Final dash to renewables construction in 2013?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Potential grants of relief in some states to near-term RPS deadlines</td>
</tr>
<tr>
<td><strong>Carbon Tax</strong></td>
<td>▪ Recently discussed as possible proposal; unlikely to be implemented in current Congress</td>
<td>▪ Longer-term consideration</td>
</tr>
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<td></td>
<td></td>
<td>▪ Negatively affect coal-heavy utilities, but positive for renewables, nuclear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Ratepayer resistance to pass-through</td>
</tr>
<tr>
<td><strong>Capex Incentives</strong></td>
<td>▪ Accelerated depreciation extended</td>
<td>▪ Limited impact on utility investment, given maintenance, replacement, and upgrade needs</td>
</tr>
<tr>
<td></td>
<td>▪ Potential withdrawal of “stimulus”</td>
<td>▪ Demand a greater factor</td>
</tr>
<tr>
<td><strong>Monetary Policy</strong></td>
<td>▪ Continued low Treasury rates, but Fed exit strategy unclear</td>
<td>▪ Continued favorable financing costs, assuming spreads do not widen</td>
</tr>
</tbody>
</table>

While the immediate “fiscal cliff” talks yielded an interim deferral of some impending tax increases and spending reductions, key uncertainties remain as pending further rounds of contentious budget discussions play out in the next months and years.

Sources: Conference Board; Wells Fargo Economics; FitchRatings; OECD; EEI; industry reports; ScottMadden analysis
## The 2012 Election: How Might the Results Impact the Energy Industry?

<table>
<thead>
<tr>
<th>Area</th>
<th>Current Views</th>
</tr>
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</table>
| **Renewables & Clean Energy** | † Election outcome positive for renewable energy  
† President Obama may push for a clean energy standard, but it is unlikely to get enough House votes or a filibuster-proof majority in the Senate  
‡ Likely that push for wind PTC renewal will be part of budget negotiations – most expect one-year extension over next several months (a two-year extension currently proposed); further discussion in 2013  
† Solar investment credit not likely to be rescinded before sunset in 2016  
† Continuation of policy encouraging utility-scale solar development on large areas of federal land  
† Continued promotion of aggressive renewable and efficiency targets at Department of Defense installations  |
| **Shale Gas & Hydraulic Fracturing** | ‡ Outright ban unlikely, but continuation of EPA drinking water study and guidance on fracturing process and possible restrictions on activities on federal lands could increase production costs  
‡ Near term, likely to remain primarily a state issue, but some risk of federal rules and/or exceptions including EPA’s “green completion” regulation (expected in 2015) and the Interior Department’s proposed chemical-disclosure policy on federal lands  |
| **Climate Change & Carbon Regulation** | ‡ Split Congress likely limits comprehensive GHG legislation  
‡ Obama and Reid comments on new focus on climate creates some possibility of a carbon tax in any budget “grand bargain” – a “sleeper” issue  
† New source GHG regulations for fossil-fired power plants and refineries will be released, but may be constrained (slightly) by Congressional oversight  
‡ Possible expansion of GHG controls via regulation of existing facilities |

### The 2012 Election (Cont’d): How Might the Results Impact the Energy Industry?

#### Area | Current Views
--- | ---
**Nuclear Power** | - Proposed Clean Energy Standard, possible carbon fee/tax could buoy nuclear, but lack of permanent waste repository, low natural gas prices continue to dampen nuclear’s fortunes and significant federal support of new build is unlikely
- Four of five NRC commissioners’ terms expire in 2013–2016

**Power Plant Emissions Regulation** | - For CSAPR, MATS, and other rules, cycle of new proposed and final rules under statutory deadlines forced by “citizens suits” plus cycle of revisions driven by court challenges; pundits split on whether rule making will be more or less aggressive
- Emissions markets likely “dead” for a while with legal wrangling over regulations

**Transmission, Distribution & Smart Grid** | - No Congressional action on transmission policy, e.g., siting; FERC will continue to implement Order 1000
- Continued Obama Administration support of transmission; continuation of Administration’s Interagency Rapid Response Team

**Distributed Resources** | - Continued promotion of combined heat and power pursuant to executive order issued in August

**Energy Technologies** | - Limited likelihood of electric vehicle funding in wake of the “Solyndra effect”
- In light of Secretary Chu’s possible departure as head of DOE, some say DOE "needs to transition from a focus on technological innovation...to a focus on commercialization and consensus-building"

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## Utility Investment Outlook: Analysts’ Views

### Views of Selected Utility Industry Subsectors by Various Investment Research Houses and Rating Agencies

<table>
<thead>
<tr>
<th>Sector &amp; Outlook</th>
<th>Headwinds</th>
<th>Tailwinds</th>
<th>Uncertainties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investor-Owned Electric Utilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Stable credit ratings</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Market perform</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Continued softness in earnings</td>
<td>- Investor appetite for stable, high dividend yields and conservative equity option</td>
<td>- Higher interest rates may make yields less attractive, but “that doesn’t appear to be in the cards”</td>
</tr>
<tr>
<td></td>
<td>- No “game-changing catalyst on the horizon”</td>
<td>- Extension of dividend tax rates</td>
<td>- Long lead-time projects, regulatory delays in rate recovery, and pressures on allowable ROEs</td>
</tr>
<tr>
<td></td>
<td>- Valuations expensive on absolute basis and relative to broader market</td>
<td>- Unexpectedly hot summer in some U.S. regions boosted demand</td>
<td></td>
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<tr>
<td></td>
<td>- Cyclical and structural slowing of energy sales growth</td>
<td>- Solid liquidity—strong capital market access and low rates</td>
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<td></td>
<td>- Pension issues with changes in actuarial assumptions and low investment returns</td>
<td>- Low wholesale power prices</td>
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<tr>
<td></td>
<td></td>
<td>- Stable regulation (but downward trend in ROEs)</td>
<td></td>
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<tr>
<td><strong>Public Power, Municipals, and Cooperatives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Stable credit ratings</td>
<td>-</td>
<td>- Rate-setting authority</td>
<td>- Willingness to raise rates to support increased costs, given continued economic weakness, political risk of doing so</td>
</tr>
<tr>
<td>▪ Market perform</td>
<td>-</td>
<td>- Reliable cash flow</td>
<td></td>
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<tr>
<td></td>
<td>- Depressed wholesale prices (for publics/coops that augment revenues with market sales)</td>
<td>- Low natural gas (fuel) costs</td>
<td></td>
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<td></td>
<td>- Continued fiscal stress for municipalities; risk of need for higher financial support from munis to local governments</td>
<td>- Continued relative capital cost advantage</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Conservative business model</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Proactive increases in rates to meet increased costs</td>
<td></td>
</tr>
<tr>
<td><strong>Natural Gas Distributors</strong></td>
<td>- Increased focus, cost of pipeline, and system safety</td>
<td>- Stable, high dividend yields</td>
<td>- Weather variability</td>
</tr>
<tr>
<td>▪ Stable credit ratings</td>
<td>-</td>
<td>- Extension of dividend tax rates</td>
<td></td>
</tr>
<tr>
<td>▪ Market perform to outperform</td>
<td>-</td>
<td>- Low natural gas prices (minimize customer conservation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Expanded focus, cost of pipeline, and system safety</td>
<td>- Reduced liquidity needs: lower cost of gas in storage, customer receivables</td>
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<tr>
<td></td>
<td></td>
<td>- Customer growth from housing builds, conversions</td>
<td></td>
</tr>
<tr>
<td><strong>Competitive (Merchant) Generators</strong></td>
<td>- Extended trough for wholesale power prices (but some analysts say gas-dependent merchants well positioned for near to medium term)</td>
<td>- Vertical integration into retail provides some counter-cyclicality</td>
<td>- Potential natural gas price rebound</td>
</tr>
<tr>
<td>▪ Negative ratings outlook</td>
<td>-</td>
<td>- Extension of dividend tax rates</td>
<td></td>
</tr>
<tr>
<td>▪ Market perform</td>
<td>-</td>
<td>- Low natural gas prices (minimize customer conservation)</td>
<td>- Potential consolidation among gencos</td>
</tr>
<tr>
<td></td>
<td>- Expiration of above-market legacy hedges</td>
<td>- Reduced liquidity needs: lower cost of gas in storage, customer receivables</td>
<td>- Fuel type and diversity, regional differences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Capital markets for high-yield issuers volatile; capital market access issues</td>
<td></td>
</tr>
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</table>

Sources: Fitch Ratings; Zacks; Fidelity Investments; Charles Schwab; KeyBanc Capital Markets; Morgan Stanley
Energy and Utility Company Stock Prices: Some Buoyancy Despite “Cliff-Diving”

Over Five-Year Horizon, Electrics and Merchants Trail the Dow, But Small Diversifieds Still Outperforming


- DJ Industrial Avg.
- SNL Energy Large Diversified
- SNL Energy Small Diversified
- S&P Gas Utilities
- S&P Electric Utilities
- SNL Merchant Generator
- Citigroup MLP
- DJ Utility Index

The fiscal cliff did not yield a huge sell-off in utility stocks, and utilities remain a key—but not the only—option for investors seeking income, thus preserving its investment attractiveness.

However, one investment bank believes 2013 will see “continued poor stock performance for many diversified utilities, driven by credit concerns, retail margin weakness, and regulatory issues”*

More Recently, Gas Sector Is Coming “Back to Earth”

Selected Stock Index Values (July 2011–Dec. 2012) (Index: July 1, 2011 = 100%)

Sources: SNL Financial; *Morgan Stanley; ScottMadden analysis
Reduced Energy Demand: Cyclical or Secular?

Growth in Retail Sales Appears to Be Flattening


<table>
<thead>
<tr>
<th>Year</th>
<th>Residential</th>
<th>Commercial</th>
<th>Industrial</th>
<th>Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>1,000,000</td>
<td>2,000,000</td>
<td>3,000,000</td>
<td>4,000,000</td>
</tr>
<tr>
<td>1974</td>
<td>1,200,000</td>
<td>2,400,000</td>
<td>3,600,000</td>
<td>4,800,000</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2011</td>
<td>4,000,000</td>
<td>8,000,000</td>
<td>12,000,000</td>
<td>16,000,000</td>
</tr>
</tbody>
</table>

*trailing twelve months

Millions of KWh

Manufacturing Energy Use Has Declined, But Mix of Causes?

Energy Consumption vs. Selected Measures of Manufacturing Output (Index 1991 = 1)

- Despite increasingly larger residences, energy consumption per square foot has been declining
  - Key factors include building codes, improved technology, and efficiency programs
  - Conservation behavior, due to slow economic growth and high unemployment, may also be playing a part
  - While electricity consumption as a proportion of energy type has increased (air conditioning, electronic devices, etc.), power consumption per household has increased by 22% since the 1970s while average home square footage has increased 46%

- Electricity sales growth remains stuck at sub-1% levels with risk of declines if price/rate levels or volatility increase
- Manufacturing energy trending similarly due to technology improvements, although it is unclear what the impact of cheap natural gas will be on levels of consumption
- Aging and replacement of housing stock and equipment will continue to drive much of this trend

Sources: EIA, 2009 Residential Energy Consumption Survey, 2010 Early Release Estimates, Manufacturing Energy Consumption Survey, and Annual Energy Outlook; ScottMadden analysis
Energy efficiency resource standards (EERS) and goals are moving forward in many states, although new EERS are not pending.

Even without direct mandates like EERS, indirect effects from federal efficiency mandates such as lighting efficiency and Energy STAR, building codes, and improved materials and technologies (e.g., LEDs), continue to reduce energy intensity.

Fitch considers energy efficiency “a significant threat to the credit profile of the electric utility sector and the first major challenge to the otherwise monopolistic utility franchise”.

Increasingly, utilities will have to develop business and regulatory models that provide a return on investment in demand-side energy infrastructure.

### Timing of Selected DOE Appliance Efficiency Standards

<table>
<thead>
<tr>
<th>Appliance/Equipment</th>
<th>Issued</th>
<th>Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers</td>
<td>2007</td>
<td>2012</td>
</tr>
<tr>
<td>Central Air Conditioners</td>
<td>2011</td>
<td>2015</td>
</tr>
<tr>
<td>Ranges and Ovens</td>
<td>2009</td>
<td>2012</td>
</tr>
<tr>
<td>Refrigerators</td>
<td>2011</td>
<td>2014</td>
</tr>
<tr>
<td>Water Heaters</td>
<td>2010</td>
<td>2015</td>
</tr>
<tr>
<td>Commercial Boilers</td>
<td>2009</td>
<td>2012</td>
</tr>
<tr>
<td>Commercial Air Conditioners, Heat Pumps</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Commercial Refrigeration Equipment</td>
<td>2009</td>
<td>2012</td>
</tr>
<tr>
<td>General Service Lamps</td>
<td>2007,</td>
<td>2012</td>
</tr>
<tr>
<td>(incl. Fluorescent, Incandescent, and CFLs)</td>
<td>2009</td>
<td></td>
</tr>
</tbody>
</table>

Note: *Water- and evaporatively-cooled

Sources: DSIREUSA; Institute for Electric Efficiency; DOE Appliance Standards Awareness Project; FitchRatings
NERC’s Latest Long-Term Reliability Assessment: Some Good News and Some Cautionary Notes

About 44 GWs of Planned Fossil Retirements with 26 GWs More Projected by NERC by 2022

Planned Transmission Additions Over Next Five Years Far Exceed Any Prior Five Years’ Miles of Additions

Historical Actual Miles Added for Rolling Five-Year Periods and Projected Five-Year Plans (200 kV and Above)

2012 Key Reliability Findings

<table>
<thead>
<tr>
<th>Finding and Impact</th>
<th>Commentary and Considerations</th>
</tr>
</thead>
</table>
| ➤ Transmission growth to accommodate new and distant resources | ❑ 18,700 miles (>200 kV) are planned over the next five years—triple the circuit miles constructed during any five-year period  
❑ Delays could impede plans; reassessment of load growth accounts for more than 40% of delays/defers |
| ➤ Renewable resources additions introduce new planning and operational challenges | ❑ Integration issues plus concern about peak availability, with 20 GWs of on-peak planned renewable capacity, 21.5 GWs of on-peak “conceptual” capacity |
| ➤ Significant fossil-fired generator retirements over the next five years | ❑ NERC estimates nearly 71 GWs of retirements by 2022, with 90% of that retiring by 2017  
❑ Estimates are highly uncertain, as generation owners are still evaluating options and many have not announced retirement decisions. Per NERC, about 44 GWs of retirements are confirmed based upon announcements and resource plans  
❑ Next three or four years may see system stability issues in some areas, need transmission enhancements |

Source: NERC, 2012 Long-Term Reliability Assessment (Nov. 2012)
NERC’s Latest Long-Term Reliability Assessment: Some Good News and Some Cautionary Notes (Cont’d)

### 2012 Key Reliability Findings

<table>
<thead>
<tr>
<th>Finding and Impact</th>
<th>Commentary and Considerations</th>
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</thead>
</table>
| Long-term generator maintenance outages for environmental retrofits | - Most controls are required by 2016 (MATS compliance), and NERC estimates that about 339 unit-level retrofits covering 160 GWs will be required  
- NERC’s “unconfirmed” maintenance outages schedules still unknown, leaving less than 50 GWs (or the 160 GWs) confirmed, may result in generation capacity not being available during shoulder months and off-peak times during the operating day in the near term (2013–2016) |
| Resources sufficient to meet reliability targets in most areas | - Generally, long-term outlook for reserve margins, and thus reliability, looks good  
- The outlook varies, however, by region: Near term, ERCOT reserve margins are expected to decline significantly over the next 10 years |
| Increases in demand-side management help to offset future resource needs | - Demand-side management is projected to total 80 GWs by 2022, offsetting about six years of peak demand growth and equivalent to 7% of total on-peak generation 2022 capacity  
- Observers are monitoring frequency of economic demand response and response fatigue |

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Regional Variation in NERC’s Outlook—Trouble in Texas

- ERCOT’s Anticipated Reserve Margin below NERC Reference Margin Level in every year and is zero by 2020 unless more capacity is added
- NERC fears that capacity deficiencies could trigger emergency operating procedures that may include the shedding of firm load
- While acknowledging some progress, NERC “strongly recommends” the Texas PUC and ERCOT develop policies that bring capacity online in near and long term
### 2012 Key Reliability Findings

<table>
<thead>
<tr>
<th>Finding and Impact</th>
<th>Commentary and Considerations</th>
</tr>
</thead>
</table>
| Increased dependence on natural gas for electricity generation                    | - NERC estimates almost 100 GWs of planned and “conceptual” new capacity over the next 10 years will be gas fired  
- NERC continues to study impacts on operations and planning of this interdependence between gas and power generation, especially:  
  - Availability of gas-fired generation with neither firm transportation nor dual-fuel capabilities, especially during extreme cold weather  
  - Impact of significant gas supply or pipeline disruption |
| Increased risk of capacity deficiencies in ERCOT as planning reserve margins projected to fall below targets | - ERCOT reserve margins projected at 13.4% as early as next year; below its 13.75% target |

### Regional Variation in NERC’s Outlook—Expanding Concerns But Less Urgent

- Longer term, reserve margins begin to fall below reference levels in some other regions
- These regions (except ERCOT) have at least five years to enhance capacity
- “Conceptual resources”—generation in early stages of assessment—not considered for the reserve margin forecast, could be sufficient to aid regions including WECC, PJM, and Ontario, but their eventual construction is uncertain

Source: NERC, 2012 Long-Term Reliability Assessment (Nov. 2012)
### Potential Coal Plant Retirements: The Latest Tally

#### Selected U.S. Coal Plant Retirement Forecasts:
30 GWs to 100 GWs between 2015 and 2020

<table>
<thead>
<tr>
<th>Analyst</th>
<th>Projected Retirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Union of Concerned Scientists</td>
<td>59 GWs “ripe for retirement” in add’n to est’d.</td>
</tr>
<tr>
<td></td>
<td>41 GWs announced (100 GWs total)</td>
</tr>
<tr>
<td>Brattle</td>
<td>59–77 GWs</td>
</tr>
<tr>
<td>Sanford Bernstein</td>
<td>58 GWs by 2015</td>
</tr>
<tr>
<td>Bipartisan Policy Center</td>
<td>56 GWs by 2016</td>
</tr>
<tr>
<td>Friedman Billings Ramsay</td>
<td>50–55 GWs by 2018</td>
</tr>
<tr>
<td>Guggenheim Partners</td>
<td>50 GWs by 2015</td>
</tr>
<tr>
<td>ICF</td>
<td>50 GWs by 2015</td>
</tr>
<tr>
<td>EIA</td>
<td>49 GWs by 2020</td>
</tr>
<tr>
<td>Reuters/Factbox</td>
<td>35 GWs by 2015</td>
</tr>
<tr>
<td>Wood Mackenzie</td>
<td>30 GWs by 2015, add’l 45 GWs by 2025</td>
</tr>
</tbody>
</table>

- **Regulatory “tsunami”:** With re-election of President Obama, the “tsunami” (no longer “train wreck”) of EPA regulations affecting power generation is now expected to be promulgated and implemented.
- **Gas vs. coal:** The story remains centered on the natural gas vs. coal price differential, as natural gas prices continue to remain low by historical standards. Meanwhile, coal mines have ramped back production in response to lower demand, and production costs are rising in response to increased mining regulation.
- **Regional impacts:** EIA projects that most retirements will be older, inefficient units concentrated in the Mid-Atlantic, Ohio River Valley, and Southeast, which have excess capacity. The Midwest ISO could be particularly affected by a large number of unit retirements.
- **East vs. West:** Generation using lower sulfur Powder River Basin (PRB) and Illinois coal is expected to fare better than Appalachian coal-fired plants. Coal producer Peabody Energy estimates that PRB is competitive with $2.50 to $2.75/MMBTU natural gas, while for Illinois it is $3.25 to $3.50 and $4.50 for Appalachian coal.
- **“Unretirements” and temporary deferrals:** Some utilities may reconsider retirement of selected coal plants for varied reasons:
  - Detroit Edison, e.g., told regulators that it planned to keep some (albeit large) units open that it had originally slated for closure as new controls technology works better than projected.
  - Otter Tail Power is delaying retirement of its Hoot Lake plant from 2015 to 2020 to reduce ratepayer impacts.
  - TVA has had to delay idling of five coal units because of unanticipated operating challenges at a large pumped storage plant.
  - At PJM’s request, First Energy delayed some unit retirements to 2015, pending upgrades, in order to provide voltage support.

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**Announced Coal-Fired Plant Retirements as of Aug. 2012 (30 GWs through 2021)**

- **Sources:** Industry news; SNL Financial; ScottMadden analysis
Yucca flux: Used fuel strategies remain in limbo with the cessation of work on Yucca Mountain
- An appeals court decision caused NRC to suspend, at least for a while, new reactor license decisions, pending resolution of waste issues
- As a result, NRC has initiated a two-year “waste confidence” environmental impact assessment of used fuel storage at shutdown sites
- In January 2012, a Blue Ribbon Commission made recommendations for future waste disposal siting; congressional follow-up is still pending

Small modular reactor (SMR) interest: DOE has indicated interest in SMRs with a modest but meaningful grant of $67 million for SMR R&D and TVA has partnered with DOE to assist with SMR technology development

Decommissioning funding: NRC issued new guidelines for decommissioning—specifically regarding low-level waste—which the industry believes will increase those costs by $120 million per reactor

Post-Fukushima regulatory framework: NRC is considering a more integrated regulatory framework (decision in 2013), including:
- Role of voluntary industry initiatives
- Decision process for determining appropriate safety margins
- Addressing beyond-design-basis matters

FLEX: Some plants are participating in an NEI FLEX program in which each facility receives additional back-up generators and emergency batteries averaging $1 million per plant

Noteworthy Developments for Selected New and Existing Nuclear Plants

Kewaunee to be retired:
- Dominion to retire single-unit Kewaunee
- Cites economics, particularly low power prices
- Harbinger for other single-unit stations?

OPPD hires Exelon to provide day-to-day operations management of Ft. Calhoun station, citing Exelon’s “Management Model and proven best practices”

SONGS reliability questions remain:
- 2,254 MWs of capacity remains offline due to unexpected steam generator tubal wear

Exelon withdraws Victoria application, citing low natural gas prices and unfavorable economic and market conditions

Vogtle costs increase but...:
- Vogtle 3-4 are still expected online in 2016–17
- Total costs is now projected at $6.2 billion, still below the nearly $6.45 billion initial estimate
- Southern is now engaged in formal dispute with contractor over additional cost, schedule
- Additionally, a pending DOE loan guarantee agreement continues to be unresolved

Summer costs increase slightly:
- Summer is expected online in 2017–18
- SCANA has identified $283 million increase due to transaction costs, staffing, and EPC contract changes
- SCANA granted return on CWIP

Vogtle costs increase but...:
- Vogtle 3-4 are still expected online in 2016–17
- Total costs is now projected at $6.2 billion, still below the nearly $6.45 billion initial estimate
- Southern is now engaged in formal dispute with contractor over additional cost, schedule
- Additionally, a pending DOE loan guarantee agreement continues to be unresolved

Levy County going forward:
- Duke voiced to Florida’s PSC a continued commitment to new Levy County nuclear plant
- Expects to be online by 2024

Indian Point relicensing debate under way:
- 2,000-MW Indian Point up for relicensing with one reactor license expiring in 2013, another in 2015
- Competing estimates of rate impacts with closure:
  - NRDC/Riverkeeper: $1/month
  - Manhattan Institute: $100/year

Crystal River cost evaluation:
- Progress has received $40 million in uprates and requested an additional $9 million
- Florida’s PUC deferred decision to 2013 citing ongoing difficulties and uncertainty of current repairs

Sources: Nuclear Energy Institute; SNL Financial; industry news; company regulatory filings
Production curves (output yield from fields and wells) vary within and across various shale plays:
- Some skeptics point to rapid decline rates
- No “one-size-fits-all” assessment of shale play productivity; assessments still evolving

Reserves and ultimate supply are smaller than technically recoverable resources—a key question is how much at what price

Externalities—and responses thereto—could play a role in slowing development:
- Stringent EPA regulation or local opposition, such as New York’s ban on fracking, could make availability of the shale resource moot

Economics are brutal in the current environment:
- Series of write-downs on North American shale stakes by BHP Billiton ($2.84B), BP ($2.1B), BG ($1.3B), and others as “land rush” meets $3 natural gas prices
- While current gas prices offer breakeven for some wet plays, most dry gas is not in the money at $3

Water consumption remains a concern in some areas:
- Water usage rates in recently drought-prone areas like Texas are emerging as a point of concern
- Industry proponents, however, point to the large percentage of water consumed by municipalities and irrigation

### Average Freshwater Use per Shale Well (000s of Gallons)

<table>
<thead>
<tr>
<th>Shale Play</th>
<th>Drilling</th>
<th>Hydraulic Fracturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnett</td>
<td>250</td>
<td>4,600</td>
</tr>
<tr>
<td>Eagle Ford</td>
<td>125</td>
<td>5,000</td>
</tr>
<tr>
<td>Haynesville</td>
<td>600</td>
<td>5,000</td>
</tr>
<tr>
<td>Marcellus</td>
<td>85</td>
<td>5,600</td>
</tr>
<tr>
<td>Niobrara</td>
<td>300</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Source: GAO

### Selected Estimates of Breakeven by Shale Play ($/MMBTU)

<table>
<thead>
<tr>
<th>Shale Play</th>
<th>UBS (June 2011)</th>
<th>Baihly, et. al. (May 2011)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcellus/Fayetteville</td>
<td>$4.00</td>
<td>$4.00</td>
</tr>
<tr>
<td>Other</td>
<td>$6.00</td>
<td>$6.10</td>
</tr>
<tr>
<td>Fayetteville</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barnett</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haynesville</td>
<td>$3.20</td>
<td>$3.74</td>
</tr>
<tr>
<td>Eagle Ford</td>
<td>$6.24</td>
<td></td>
</tr>
</tbody>
</table>

Source: GAO

Notes:
*Based upon paper for Society of Petroleum Engineers and assuming EURs as of 2009
**Monthly futures prices as of Oct. 23, 2012
Sources: The American Oil & Gas Reporter (May 2011); World Oil (July 2012); UBS Investment Research, “NYT Shale Gas Allegations Seem Exaggerated” (June 27, 2011); industry publications
Power Plant Replacement and Retrofit Supply Chain: Timing Is Everything

If Retrofit Decision on Coal Unit Has Not Been Made, Technology Options May Be Limited Given Compliance Timeframes

With EPA compliance deadlines (esp. MATS*) approaching, the power plant construction and maintenance supply chain will be stretched

- Both significant new construction (replacement of retiring units) and retrofits will be occurring contemporaneously
- Retrofit windows will be limited—shoulder months and perhaps some winter outages
- Compliance is required by Q1 2015, with possible extensions into early 2016, leaving only about 24 to 36 months to complete
- Per a MISO-commissioned study, the most single-year retrofits and new build of 89 GWs**, which it deems a "soft cap"

Available skilled labor supply may be stretched thin

- A shortage of skilled labor persists, despite relatively high construction unemployment (11+% as of 3Q 2012)
- This is manifesting itself in increased cost: craft labor is seeing a gradual, nationwide increase in wages and fringe benefits
- Boilermakers in particular could be in short supply: MISO found that 10% of boilermakers are in utility construction, while retrofit/build workload will require about 30% of all boilermakers over the next several years

Contractor performance and liquidity should be monitored

- Increased competition and aggressive bidding on projects has increased risk of liquidity and performance issues with general and sub-contractors
- Rising materials costs exacerbate this risk

Notes:
*Mercury and Air Toxics Standard; **normalized as wet FGD-equivalent MWs

Sources:
Midwest ISO-The Brattle Group, "Supply Chain and Outage Analysis of MISO Coal Retrofits for MATS" (May 2012); Power Advocate, Cost Intelligence Report for the Energy Industry (Nov. 2012); EEI; EPA; Engineering News-Record; ScottMadden analysis
Rate Case and Regulatory Activity: Grid Costs and Reliability in Focus

Infrastructure Investment Continues
- Investor-owned electric utilities continue to invest in transmission and distribution (T&D) systems, for upgrades, reliability, and new build—at least 22 electric rate cases pending as of mid-December identified T&D system enhancements as a driver

Grid Resiliency in the Spotlight, But at What Cost
- Meanwhile, a spate of major weather events in 2011 and 2012—most recently Hurricane Sandy—has renewed calls to harden T&D system infrastructure
- Recovery of storm restoration costs has become contentious, as perceived slow response to extraordinary events causes some commissions to resist recovery requests and sparks debate over privatizing the Long Island Power Authority
- Discussion of undergrounding of lines has re-emerged (last “wave” of discussion was in the mid-2000s after major hurricanes)
  - Sandy’s impacts on the ConEd system demonstrated that undergrounding is not a panacea
  - Maryland and D.C. have each commissioned studies of undergrounding
  - However, at 5 to 10 times more costly per mile vs. overhead lines, undergrounding may be prohibitive and consumers may be unwilling to accept increased rates, especially as load growth continues to be flat
Amid the ongoing low interest rate environment, allowed returns on equity (ROE) continue to fall. In an effort to rein in rate awards, some commissions are requiring more frequent rate cases, while utilities continue to seek automatic adjustment mechanisms to combat regulatory lag. There is continuing divergence of transmission and other utility businesses with regard to regulatory construct and returns. Transmission ROEs remain above 12% in many regions, formula rates remain commonplace, and FERC recently reaffirmed its transmission incentive ROE policy. With slow or declining load growth, some utilities contemplate partial decoupling mechanisms or similar strategies; many jurisdictions have these in place. However, these alternative rate structures can impact allowed ROEs because of the perceived reduced revenue risk for the utility. Peer comparisons for making those “adjustments” are becoming more complicated as peers may also have decoupling or similar mechanisms. On the horizon, further activity to recover increasing costs of system hardening, infrastructure upgrades, and pension and benefits.

Sources: SNL Financial/Regulatory Research Associates; Edison Foundation/Institute for Energy Efficiency; ScottMadden analysis
Electric Transmission: Some Driving and Restraining Forces

**Driving Forces**
- FERC recently reaffirmed and clarified its incentive rate policy
- Continues to provide solid returns (>12% ROE) when compared to distribution (~10%)
- Aging infrastructure presents ongoing opportunities
- Coal retirements are driving the need for new projects
- Renewables driven both by economics (read production tax credit) and renewable portfolio standards will require interconnection

**Restraining Forces**
- Load growth has slowed due to the recession and weak recovery
- Energy efficiency and demand response continue to impact load growth and peak loads
- Energy intensity is increasing
- Distributed energy resources are proliferating in certain regions
- Siting and lack of federal backstop authority slow development
- Retail rate pressure continues, exacerbated by the weak economy

**Complicating Factors**
- Compliance filings suggest that elimination of the right of first refusal will require significantly more work; no clear path to new development by non-incumbents in many regions
- Timing of implementation of EPA standards limiting coal will challenge transmission development; lack of clarity has cascading effects
- Electric and gas convergence presents new contingencies in the planning process and reliability concerns in certain regions
- Timelines for deployment of supply side alternatives are significantly shorter than for transmission (distributed energy resources, demand response, energy efficiency, gas-fired generation), further complicating planning

Sources: ScottMadden analysis
# Elements of Electric Transmission Rates and FERC’s New Incentive Rate Policy

## Elements of Incentive Rates and Some Recent Developments

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base ROE</strong></td>
<td>- Was challenged in New England; FERC staff recommended reduction from 11.14% to 9.66% in a “new normal” economy; Commission decision pending</td>
</tr>
<tr>
<td><strong>Incentive ROE</strong></td>
<td>- Have been granted sparingly though some projects have received them for joining an RTO, project specific risk, independence</td>
</tr>
<tr>
<td></td>
<td>- Base ROEs plus incentive adders have generally been in the 11% to 12% range (for projects)</td>
</tr>
<tr>
<td><strong>Recovery of Abandoned Investment</strong></td>
<td>- PATH example: Opponents have already begun challenging what if any portion of the $225 million in development costs come from ratepayers; some have sought disallowances of some expenditures as “imprudent”</td>
</tr>
<tr>
<td></td>
<td>- Other cases may be on the horizon</td>
</tr>
<tr>
<td><strong>CWIP in Rate Base</strong></td>
<td>- Consistently granted</td>
</tr>
<tr>
<td></td>
<td>- Removal or limitation of CWIP in rate base could stress profitability and liquidity of developers of major, long lead time projects</td>
</tr>
<tr>
<td><strong>Formula Rates</strong></td>
<td>- These have grown commonplace and as a result are changing the way even integrated utilities manage O&amp;M and capital expenditure</td>
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<td></td>
<td>- Many states have retail riders</td>
</tr>
</tbody>
</table>

## FERC Policy Statement on Transmission Incentives

- On November 15, 2012, FERC issued a policy statement for transmission incentive rates which:
  - Is no longer limited to “routine/non-routine” analysis
  - Applies an enhanced “nexus” test
  - Encourages joint ownership

The policy now requires four showings:

- The proposed project faces risks and challenges that are not either already accounted for in the applicant’s base ROE or through risk-reducing incentives
- Applicant is taking appropriate steps to minimize its risks during project development
- Alternatives to the project have been, or will be, considered in a transmission planning process or other appropriate forum
- An applicant commits to cost containment by limiting the application of the incentive rate of return to a cost estimate (with a provision for revisiting estimates to address cost increases that are outside the control of the applicant)

**Formula transmission rates with transmission incentives (including adders for RTO participation) have generally reflected returns on equity from the mid-10% to upper-13% range**

**Sources:** Industry news; ScottMadden analysis
Gas-Power Interdependence: Implications of the “Dash to Gas”

Divergence of Fates of Coal- and Gas-Fired Generation


For Power, Natural Gas Is Increasingly in Demand


Historic “Longitudinal” Flow Pattern Shifting to Today’s Developing “Grid” Flow Patterns

Gas-Power Interdependence: Regional Differences Mean Different Concerns

depending upon variables such as existing and anticipated gas resources and infrastructure, volume and timing of coal-fired power plant retirements and retrofits, market structure, and a history of collaboration among regional players, solutions to gas-power interdependence complexities can be facilitated or hampered.
Gas-Power Interdependence: Regional Differences Mean Different Concerns (Cont’d)

Northwest/Mountain West
- Large intermittent resource build-out
- Significant hydro resources, but need to distinguish capacity and energy needs
- Significant coal-fired capacity; massive retirements not expected immediately
- Available Rockies, Canadian supply
- Largely traditional (non-bid-based) market
- Recent pipeline expansions
- Working group established for Northwest

California
- Large intermittent resource build-out, aggressive targets
- Heavy reliance upon gas-fired generation
- “Peaky,” low cap-factor gas needs for renewable capacity backstop
- Available gas supply in West
- Generally more temperate
- Large gas demand centers (SF, LA)
- Bid-based market
- Generator, gas transmission communication taking place

Desert Southwest
- Heavy reliance upon gas-fired generation, with more on horizon

Source: ScottMadden white paper, “Gas-Power Interdependence” (Jan. 2013)
As the clock ran out on 2012, “fiscal cliff” negotiations yielded an extension of the 2.2¢/kWh renewable energy production tax credit (PTC), among other subsidies*

- Projects “under construction”—a term subject to some interpretation—in 2013 can qualify for the PTC
- Effectively extends the credit for more than one year with the “commenced construction” deadline rather than a “placed in service” deadline

Industry observers are not sure how many 2012 projects will be “construction-ready” by 2013, given continued economic uncertainty, good reserves in many areas, flat power demand, and low wholesale electric prices.

One analyst projects 1.2 GW in new wind installations for 2013 versus a record 12 GWs to 13 GWs in 2012, as developers moved to complete projects given uncertainty about PTC renewal for 2013. Projects completed or “planned for completion” for 2012 went from about 5 GWs projected at the end of 2011 to more than 12 GWs estimated as of late November 2012.

The extension provides temporary clarity, but doesn’t solve fundamental long-term uncertainty for the industry, which has experienced start-stop subsidy support, leading to boom-bust construction cycles.

AWEA, the wind industry lobby, has indicated a willingness to phase out the PTC over several years (ending after 2018), perhaps in response to D.C. talk of fiscal austerity and technology advances and related cost improvements.

Looking to a possible future post-PTC era, one observer forecasts meaningful changes for the wind industry:
- **Financing structures**: Fewer debt/tax-focused schemes and more traditional project financing
- **Deeper pockets**: Developers will need to have larger balance sheets as activity slows
- **Customer-oriented models**: Less develop-and-flip activity, more tailored services such as resource shaping and firming

Note: The investment tax credit and bonus depreciation for renewables were extended as well.

Sources: REchargenews.com; Stoel Rives; Van Ness Feldman; American Wind Energy Association (AWEA); Dept. of Energy; Power magazine; Forbes; EIA; SNL Financial
Absent Delays, State Renewable Portfolio Standards Should Support Some Renewables Development

30 States Have Renewable Portfolio Standards or Goals

<table>
<thead>
<tr>
<th>Renewable or Clean Energy Targets or Goals (as of Oct. 2012)</th>
<th>Utility/IPP Non-Hydro Renewable Net Generation* as % of Total (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>Alaska</td>
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<tr>
<td>Arizona</td>
<td>Arkansas</td>
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<td>California</td>
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<td>Connecticut</td>
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<td>District of Columbia</td>
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<td>Oregon</td>
<td>Pennsylvania</td>
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<td>Rhode Island</td>
<td>South Carolina</td>
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<td>South Dakota</td>
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<td>Texas</td>
<td>Utah</td>
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<td>Vermont</td>
<td>Virginia</td>
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<td>Washington</td>
<td>West Virginia</td>
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<tr>
<td>Wisconsin</td>
<td>Wyoming</td>
</tr>
</tbody>
</table>

Notes:
*Includes utility/IPP combined heat & power, excludes industrial, commercial generation
Sources: Center for Climate and Energy Solutions; DSIREUSA.org; EIA

Compliance deadlines for renewable and alternative portfolio standards in some states are rapidly approaching, while only 164 TWh (~4%) of net generation in the United States in 2011 was from non-hydro renewable resources.

About half of RPS states have solar carve-outs, but in most cases those volumes are modest.

California, PJM, several Western states, and the Midwest have significant RPS compliance requirements beginning in 2020.

In addition to development, one key to compliance will be the availability of renewable energy certificates, with some utilities likely banking certificates to meet near-term needs.

However, 2013 development may be slower as uncertainty about production tax credit extension either froze or pulled development into 2012.
Wind O&M Costs: Increasing Focus But Costs Remain Low

- As the installed base of wind power grows and ages, the industry is increasingly focused on operations and maintenance (O&M) costs, especially as OEM warranties (typically last five or six years) begin to expire.
- One estimate put U.S. wind farm O&M at $2.7 billion in 2011, with the expectation that it will double by 2025.
- The worldwide wind fleet, however, is not homogeneous; it varies by ownership, technology, size, manufacturer, and geographic dispersion.
- Early U.S. installations using smaller, kW scale technologies are more likely to be candidates for repowering or retirement than for continued O&M.
- For newer turbines, technical advancements and better siting and management of farms has improved service performance.
- Some analysts see performance upgrades as an area for innovation and business growth.

Headwinds for New Wind Construction

- The wind construction market is expected to slow in 2013 given the stop-go production tax credit dynamic.
- Low natural gas prices have driven the spot electricity prices lower, which are compared to PPA prices for breakeven/cost-effectiveness of new build.
- The gap between state renewable portfolio standards and qualified generation capacity is narrowing in many states.
- Mostly limited progress on expediting new transmission build to “unlock” new wind generation from high-resource availability areas.

Wind Assets Aging by the Year

- U.S. Wind Cumulative Operating Capacity by Year Online (as of early Nov. 2012)
- More than 18 GWs of wind installed between 2005 and 2008 – rolling off warranty?
- About 6.800 GWs of wind installed between 1975 and 2004 – repair vs. repower?

Selected Utility Estimates of Wind O&M Costs

<table>
<thead>
<tr>
<th>Utility</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puget Sound Energy</td>
<td>$40,000 to $70,000/year for five-year-old, 1-MW turbine (about 1¢ to 1.5¢ per KWh)</td>
</tr>
<tr>
<td>Oklahoma Gas &amp; Electric</td>
<td>• 20% failure rate on major components requiring tower repair or crane</td>
</tr>
<tr>
<td></td>
<td>• Industry estimate: Failures in gearboxes, main bearings, and generators that involve a cost from $30,000/turbine (up tower repair) to $500,000/turbine (requiring a crane)</td>
</tr>
<tr>
<td>Basin Electric</td>
<td>$500,000/year budget for gearbox replacement</td>
</tr>
<tr>
<td>LADWP</td>
<td>$5 million budgeted per year for 90 wind turbine generators; now to be increased 20%</td>
</tr>
</tbody>
</table>

Notes: *Converted at $1.339/€1, the two-year trailing average exchange rate at Nov. 27, 2012
**Energy Practice**

The energy industry landscape is one of sharpening contrasts and accelerating change. The shelf life for conventional wisdom seems to grow shorter with each headline. Every day in this challenging and exciting environment, experienced ScottMadden consultants offer our clients deep energy knowledge and practical business acumen, collaborate with them, and help them succeed.

For 30 years, ScottMadden has been a leader in energy consulting, serving more than 200 energy organizations, including 20 of the top 20 energy utilities. ScottMadden has completed thousands of successful projects and provides practical expertise in nuclear, fossil, renewables, transmission, distribution, Smart Grid, gas, regulatory, and a host of other areas. ScottMadden: an exceptional consulting experience.

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We also provide customized, project-based research and analytical support on matters of interest to our clients.

For more information about our research capabilities or content, see the *Insight* section of our web site or contact:

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919.781.4191
| **Fossil Generation** | **Quick Fossil Benchmarking Analysis** by T. Williams, Dec. 2012  
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | **Constraints and Opportunities in Generation** by S. Pearman, Oct. 2012  

| **Public Power, Municipal, & Cooperative Utilities** | **Fostering Economic Development** by B. Kitchens and M. Miller, Jan. 2013  
[http://www.scottmadden.com/insight/600/Fostering-Economic-Development.html](http://www.scottmadden.com/insight/600/Fostering-Economic-Development.html) |
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|                                                   | **Gaining Access to Capital Markets, a G&T Cooperative Strategic Priority** by B. Kitchens and M. Miller, June 2012  

| **Natural Gas** | **Gas-Power Interdependence** by C. Lyons and G. Litra, Jan. 2013  
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|                 | **Natural Gas Vehicle (NGV) Overview—Trends and Implications** by E. Baker and J. Davis, July 2012  
|                 | **Infrastructure: Is it Sufficient for the Dash to Gas?** by J. Davis, June 2012  

| **Electric Transmission** | **ScottMadden Insight: Supply Trends—What Are the Impacts on Transmission?** by T. Williams, Oct. 2012  
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | **Transmission Control Centers—Critical Success Factors** by C. Lyons, July 2012  


| **Nuclear Power** | **Small and Single – It's a Tough World Out There** by G. Litra and C. Vlahoplus, Jan. 2013  