INVESTING IN NEW BASE LOAD GENERATING CAPACITY

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THE 25-YEAR VIEW

• Significant investment in base-load generating capacity is required over the next 25 years to balance supply and demand efficiently
  – ~ 200 to 250 Gw (Gross)
  – Depends on retirements of older steam and peaking units
  – Depends on demand growth
    • electricity prices
    • aggregate economic activity
    • energy efficiency policies and responses
  – Depends on future state and federal CO$_2$ policies
  – Depends on cost and availability of key technologies
THE 25-YEAR VIEW
without CO$_2$ emissions prices

• Absent significant carbon prices or other constraints to curb CO$_2$ emissions the lowest cost alternative is typically supercritical coal
  – Transportation bottlenecks and rising coal prices due to export demand could impact coal’s attractiveness in some areas
  – Significant reduction in gas price expectations could change the picture

• With existing government financial incentives and loan guarantees investment in new nuclear power plants is lower cost in some areas
  – Coal is likely to dominate significantly overall due to cost and other constraints on nuclear

• Gas combined-cycle will have a place primarily in areas where state and local policies make it impossible to build coal or nuclear plants (e.g. California and New England)

• This outcome is inconsistent with policies aimed at achieving significant (e.g. 60%) reductions in CO$_2$ emissions from 1990 levels by 2050
The least cost investment portfolio could change significantly if high (life-cycle) prices are placed on CO$_2$ emissions

- Supply-side effects
- Demand-side effects

Depends on

- Level of CO$_2$ prices
- How CO$_2$ prices are allowed to be reflected in retail electricity prices
- Cost and availability of large scale CCS technology
- Construction cost reductions for nuclear and renewables generation
- Future gas price trajectory

Achieving 60% reduction in CO$_2$ emissions by 2050 requires much higher CO$_2$ prices than the backstop price proposed in S. 1766 cap and trade program
Figure 1: Covered Greenhouse Gas Emissions Net of Offset Credits in the Reference and S. 1766 Core Cases (Bingaman-Specter)

(million metric tons CO₂ equivalent)


- 2030 CO₂ allowance price Capped at $25/ton CO₂
- Optimistic CCS assumptions

EIA 2008
287 bmt ~ Stabilize at current levels by 2050
203 bmt ~ 60% below 1990 levels by 2050
167 bmt ~ 80% below 1990 levels by 2050
Table 5. Relationship between ~$27 per ton CO$_2$-e price and recent average fuel prices.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Base Price Ave. 2002-2006 (2005$)</th>
<th>Added Cost ($)</th>
<th>Added Cost (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil ($/bbl)</td>
<td>$40.00</td>
<td>$12.20</td>
<td>30%</td>
</tr>
<tr>
<td>Regular Gasoline ($/gal)</td>
<td>$1.82</td>
<td>$0.26</td>
<td>14%</td>
</tr>
<tr>
<td>Heating Oil ($/gal)</td>
<td>$1.35</td>
<td>$0.29</td>
<td>21%</td>
</tr>
<tr>
<td>Wellhead Natural Gas ($/tcf)</td>
<td>$5.40</td>
<td>$1.49</td>
<td>28%</td>
</tr>
<tr>
<td>Residential Natural Gas ($/tcf)</td>
<td>$11.05</td>
<td>$1.50</td>
<td>14%</td>
</tr>
<tr>
<td>Utility Coal ($/short ton)</td>
<td>$26.70</td>
<td>$55.30</td>
<td>207%</td>
</tr>
</tbody>
</table>

Note: No adjustments for the effects of the policy on the producer price.
Source: U.S. average prices for 2002-2006 computed from DOE EIA price data. Base cost price is the 5-year average price, except coal (2001-2005). To the gasoline price we have added $0.42 to include the federal and an average of state gasoline excise taxes.
BARRIERS TO INVESTMENT

• Uncertainties about future U.S. CO$_2$ policies and associated CO$_2$ prices (including international linkages)
• Uncertainties about the cost and availability of CCS for existing and (primarily) new coal generating capacity
• Uncertainties about the application of financial incentives and load guarantee policies to new nuclear plants
• Uncertainties to state and local restriction of nuclear capacity
• Dramatic increases in construction costs for all technologies and uncertainties about whether this is a short-run “bubble” or long-run adjustment to large increase in demand for infrastructure investments
• Uncertainties about regulatory treatment of construction costs in “regulated” states
• Uncertainties about the future of competitive wholesale and retail markets in “competitive” states
  – Balance sheet capacity of many U.S. utilities and IPPs is limited absent regulatory recovery and/or loan guarantees
REducing Uncertainties

• Promptly adopt a credible, internally consistent and comprehensive GHG policy for the U.S. with international linkages
• Implement a demonstration program to “prove out” cost and availability facts for CCS (See MIT “Future of Coal” Study)
• Resolve uncertainties about availability of financial incentives and loan guarantees for new nuclear power plants and “demonstrate” NRC regulatory process
• Define regulatory rules of the game for investments in new regulated generating plants (e.g. as Florida is doing)
• Fish or cut bait on wholesale and retail competition
• Facilitate utility and IPP mergers that do not harm competition to strengthen balance sheet capacity and reduce effective cost of capital
• Many other uncertainties are not easily resolvable by policymakers but they are also not unusual business uncertainties