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# More Inconvenient Math

**Research Analysts**
**Dan Eggers, CFA**
713 890 1659
dan.eggers@credit-suisse.com
**Samantha Dennison**
713 890 1661
samantha.dennison@credit-suisse.com
**Kevin Cole, CFA**
713 890 1660
kevin.cole@credit-suisse.com

SECTOR REVIEW

## A Dive Into Changing Policy & Sensitivities

**We are updating our analysis of potential US carbon policy** to incorporate insightful feedback from our November 2007 report *The Inconvenient Math*, updated dispatch curves (*Adventures in Power Expectations*), and political developments around leading policies and presidential front-runners.

**Even with recent rhetoric in the wake of high fuel prices, we continue to believe that US carbon policy is a matter of when and not if**, although we now assume passage in 2010 (was '09/'10) and implementation in 2013 (was '12/'13). **We still look for a cap and trade program that includes free allocations to lessen the burden on consumers / exposed industries.**

**Our revised analysis provides a deeper analysis of the Lieberman-Warner and Bingaman-Specter bills, compares major differentiating points in the McCain and Obama plans, and considers the European experience.** We have also broadened the analysis to look at sensitivities around the major value drivers (beyond policy) including shifts in timing, sensitivity to gas prices and demand growth, as well as allocation policies. **Observations:**

- **Political consensus appears to have moved toward a higher starting carbon price / higher level of free allocations** from a low price / low allocation scenario to provide the stick to incent changes. **This shift benefits nuclear generation and is mostly a push for coal generators.**
- **The value impact of a two year delay in carbon policy implementation (2015 vs our 2013) reduces the carbon impact by about 17%** (total value impact ~3%); **delays to 2020 would reduce the carbon impact by half.**
- **Reaching proposed 60-80% $CO_2$ reduction targets is an ambitious goal in the power sector**, **requiring approximately 240 GW of coal plant retirements** replaced by either lower consumption (~1.4% decline annually for the next 40+ years) or 55 GW of wind, 96 GW of solar and 165 MW of new nuclear. **That's tough.**
- **The domestic economic cost is staggering at ~$7 trillion on a nominal basis.** We worry most about the economic ramifications slowing down the implementation process.
- **On current spot coal and natural gas prices, carbon would have to price above $80 / short ton to start to change the economic dispatch order (meaning less coal, more gas).**

**In conjunction with our updated outlook for carbon policy and value impact, we are updating our target prices for the Competitive Power stocks using a probability weighted assessment of potential carbon policy outcomes. Merchant nuclear generators are the biggest winners – most notably EXC, ETR, CEG, and PEG – while coal exposed generators are generally flat to modestly down from prior expectations (**Exhibit 3**).**

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# Tear Sheet – Print for Easy Reading

Given the quantity of data we discuss in this report, we use various short hand metrics in charts. We recommend printing out this one page tear sheet as a handy summary to help facilitate appreciation of data throughout the report.

**Exhibit 1: Credit Suisse Carbon Pricing Scenarios Analyzed**

| Scenarios | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S1** | **$20 Carbon Tax** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| % Allocations | 0% | 0% | 0% | 0% | 50% | 48% | 46% | 44% | 42% | 40% | 38% | 36% | 31% | 26% | 21% | 16% | 11% | 0% |
| Explanation: $20/ton tax on emissions. Used for illustrative purposes rather than a reflection of a possible policy outcome | | | | | | | | | | | | | | | | | | |
| **S2** | **Specter-Bingaman** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 10.89 | 11.65 | 12.47 | 13.34 | 14.27 | 15.27 | 16.34 | 17.49 | 24.52 | 34.40 | 48.24 | 67.66 | 94.90 | 133.11 |
| % Allocations | 0% | 0% | 0% | 0% | 71% | 70% | 69% | 69% | 65% | 62% | 59% | 56% | 41% | 24% | 13% | 4% | 0% | 0% |
| Explanation: Legislative proposal, most industry friendly. $12 / metric ton starting safety valve growing at 5% plus inflation (we assume 2%). Pricing assumed to remain at cap. Targets 60% below 2005 levels by 2050 | | | | | | | | | | | | | | | | | | |
| **S3** | **Obama Plan -- CS Assumption** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Explanation: CS assumptions around a potential Obama plan. No international offsets and no allocations. Targets 80% below 1990 levels by 2050 | | | | | | | | | | | | | | | | | | |
| **S4** | **Warner-Lieberman -- $ / ton from EPA economic analysis** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | 0% | 0% | 0% | 0% | 44% | 43% | 42% | 41% | 40% | 38% | 35% | 32% | 18% | 2% | 0% | 0% | 0% | 0% |
| Explanation: Legislative proposal using carbon pricing from the EPA's base case scenario analysis. Targets 70% below 2005 levels by 2050 | | | | | | | | | | | | | | | | | | |
| **S5** | **McCain Plan -- CS Assumption** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 16.36 | 16.72 | 19.52 | 23.06 | 27.15 | 23.33 | 23.67 | 24.78 | 34.15 | 50.06 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | 0% | 0% | 0% | 0% | 60% | 58% | 56% | 54% | 52% | 50% | 48% | 46% | 36% | 26% | 16% | 6% | 0% | 0% |
| Explanation: CS assumptions around a potential McCain plan. International offsets and free allocations permitted, but proportion declining over time. Targets 60% below 1990 levels by 2050 | | | | | | | | | | | | | | | | | | |
| **S6** | **European Pricing** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 21.73 | 20.71 | 23.22 | 29.88 | 35.84 | 34.85 | 34.51 | 34.51 | 38.86 | 48.29 | 59.91 | 75.15 | 94.75 | 119.44 |
| % Allocations | 0% | 0% | 0% | 0% | 92% | 92% | 92% | 65% | 65% | 65% | 65% | 65% | 0% | 0% | 0% | 0% | 0% | 0% |
| Explanation: Historical allocations and pricing for European trading scheme assuming 20% international offsets (CERs). Forwards used for 3 years, defaulting to L-W pricing in 2021 with 20% allocations at 2008 CER pricing | | | | | | | | | | | | | | | | | | |
| **S7** | **Warner-Lieberman High Technology Scenario-- $ / ton from EPA economic analysis** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 15.83 | 17.90 | 19.96 | 21.05 | 22.14 | 23.23 | 24.32 | 25.41 | 32.67 | 41.74 | 53.54 | 68.06 | 86.21 | 109.80 |
| % Allocations | 0% | 0% | 0% | 0% | 44% | 43% | 42% | 41% | 40% | 38% | 35% | 32% | 18% | 2% | 0% | 0% | 0% | 0% |
| Explanation: Legislative proposal using carbon pricing from the EPA's high technology scenario analysis. Targets 70% below 2005 levels by 2050 | | | | | | | | | | | | | | | | | | |

*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

**$ / ton:** Carbon pricing in *short tons*. Periodically we make reference to *metric tons* in the text, but all numbers are converted into short tons for our quantitative analysis.

**% Allocations:** Proportion of carbon credits allocated to merchant generators for free. We assume the remainder are auctioned.

**Cap and Trade:** Sets a limit on the amount of $CO_2$ that can be emitted. For every ton of $CO_2$ emitted, companies must hold a credit that represents the right to emit that ton. The total amount of credits in the system cannot exceed the cap, limiting emissions to that level. Companies that cannot economically reduce their emissions can buy credits in the auction or from those who pollute less and hold extra credits (the "trade" part).

**CS Prob. Weighted:** Our assumption calculated by probability weighting each scenario.

**Offset:** Financial instrument representing a reduction in $CO_2$ emissions. Under certain US legislation and in Europe, companies can purchase offsets to comply with caps on emission levels. The most common offset projects are renewable energy (wind, solar, biomass, hydro), energy efficiency, destruction of industrial pollutants, destruction of landfill methane, and forestry projects.

**CER:** Certified Emission Reductions – international offsets certified under the Kyoto Protocol that companies can trade in the marketplace. Historical pricing from Bloomberg.

**EUA:** European Union Allowances – tradable emission credits in the EU Emissions Trading Scheme. Historical and forward pricing from Bloomberg.

# Investment Summary

Following publication of our initial carbon policy analysis, *The Inconvenient Math*, (November 8th, 2007) we had the opportunity to discuss our conclusions with investors, companies, and industry participants across the country. Armed with insightful feedback, updated power curves (*Adventures in Power Expectations,* May 20th 2008), and federal level political movements, we wanted to provide an even deeper dive on the math including sensitivities around our core assumptions.

**What's New?**

In this report we delve into:

- Economics of Lieberman-Warner;
- Economics of Bingaman-Specter;
- Potential policy differences between John McCain and Barack Obama;
- Derivative implications of increasing gas prices and decreasing power demand; and
- Sensitivities around our major assumptions including policy implementation start date and level / timing of allocations.

If you like more numbers and fewer words, we have an excel appendix containing the data compendium – if you would like a copy please send a request to anyone on the team.

We should point out that we are not changing our methodology, but rather are providing an update to our original analysis with new political assumptions and more color on the math. We continue to believe back of the envelope calculations fail to capture true underlying economics because power market dynamics are non-linear. Instead, we apply carbon costs to our dispatch curves by region and analyze the revenue, cost, and dispatch implications by hour for all merchant power plants out to 2020 with extended looks to 2050 in five year blocks. For those who missed the original carbon report, please see Appendix A starting on page 36 for a detailed methodology and tutorial on how we approach carbon.

**Our Analysis**

We focus our data analysis on seven potential outcomes as detailed in Exhibit 2 both with and without the impact of carbon credit allocations. Five policies reflect different potential political outcomes and one represents the European path. We use the flat $20 / ton scenario more for illustrative purposes rather than a reflection of what could happen (we see great opposition to referring to carbon policy as a tax regardless of how the policy will actually behave).

**Exhibit 2: Political Scenarios Analyzed ($ / short ton)**

| Scenarios | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S1** | **$20 Carbon Tax** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| % Allocations | 0% | 0% | 0% | 0% | 50% | 48% | 46% | 44% | 42% | 40% | 38% | 36% | 31% | 26% | 21% | 16% | 11% | 0% |
| **S2** | **Specter-Bingaman** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 10.89 | 11.65 | 12.47 | 13.34 | 14.27 | 15.27 | 16.34 | 17.49 | 24.52 | 34.40 | 48.24 | 67.66 | 94.90 | 133.11 |
| % Allocations | 0% | 0% | 0% | 0% | 71% | 70% | 69% | 69% | 65% | 62% | 59% | 56% | 41% | 24% | 13% | 4% | 0% | 0% |
| **S3** | **Obama Plan -- CS Assumption** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| **S4** | **Warner-Lieberman -- $ / ton from EPA economic analysis** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | 0% | 0% | 0% | 0% | 44% | 43% | 42% | 41% | 40% | 38% | 35% | 32% | 18% | 2% | 0% | 0% | 0% | 0% |
| **S5** | **McCain Plan -- CS Assumption** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 16.36 | 16.72 | 19.52 | 23.06 | 27.15 | 23.33 | 23.67 | 24.78 | 34.15 | 50.06 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | 0% | 0% | 0% | 0% | 60% | 58% | 56% | 54% | 52% | 50% | 48% | 46% | 36% | 26% | 16% | 6% | 0% | 0% |
| **S6** | **European Pricing** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 21.73 | 20.71 | 23.22 | 29.88 | 35.84 | 34.85 | 34.51 | 34.51 | 38.86 | 48.29 | 59.91 | 75.15 | 94.75 | 119.44 |
| % Allocations | 0% | 0% | 0% | 0% | 92% | 92% | 92% | 65% | 65% | 65% | 65% | 65% | 0% | 0% | 0% | 0% | 0% | 0% |
| **S7** | **Warner-Lieberman High Technology Scenario-- $ / ton from EPA economic analysis** | | | | | | | | | | | | | | | | | |
| $ / ton | 0.00 | 0.00 | 0.00 | 0.00 | 15.83 | 17.90 | 19.96 | 21.05 | 22.14 | 23.23 | 24.32 | 25.41 | 32.67 | 41.74 | 53.54 | 68.06 | 86.21 | 109.80 |
| % Allocations | 0% | 0% | 0% | 0% | 44% | 43% | 42% | 41% | 40% | 38% | 35% | 32% | 18% | 2% | 0% | 0% | 0% | 0% |

*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

# Stock Implications

For those interested in the headline news from us today, we are changing our competitive generation target prices and ratings to incorporate our updated present value analysis of potential carbon policy (Exhibit 3).

**Exhibit 3: Updated Credit Suisse Price Targets and Ratings**

| | Rating | | New | | | Old | | | Change (New - Old) | | | 6/26 | Div | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | New | Old | TP | TP ex. CO2 | CO2 Value | TP | TP ex. CO2 | CO2 Value | % TP | CO2 Value | Rating | Close | Yield | Return |
| AYE | **O** | O | **63.00** | 65.50 | (2.50) | 65.00 | 65.50 | (0.50) | **-3.1%** | (2.00) | -- | 52.80 | 1.1% | **20.5%** |
| CEG | **O** | O | **113.00** | 99.00 | 14.00 | 106.00 | 99.00 | 7.00 | **6.6%** | 7.00 | -- | 83.48 | 2.3% | **37.6%** |
| D | **N** | N | **47.00** | 44.50 | 2.50 | 46.00 | 44.50 | 1.50 | **2.2%** | 1.00 | -- | 47.58 | 3.3% | **2.1%** |
| EIX | **N** | N | **52.50** | 54.00 | (1.50) | 54.50 | 54.00 | 0.50 | **-3.7%** | (2.00) | -- | 51.25 | 2.4% | **4.8%** |
| ETR | **N** | N | **132.00** | 114.50 | 17.50 | 124.00 | 114.50 | 9.50 | **6.5%** | 8.00 | -- | 121.65 | 2.5% | **11.0%** |
| EXC | **O** | O | **105.50** | 84.50 | 21.00 | 95.00 | 84.50 | 10.50 | **11.1%** | 10.50 | -- | 90.92 | 2.2% | **18.2%** |
| FE | **O** | O | **92.00** | 82.00 | 10.00 | 88.00 | 82.00 | 6.00 | **4.5%** | 4.00 | -- | 82.30 | 2.7% | **14.5%** |
| FPL | **O** | O | **79.00** | 67.50 | 11.50 | 76.00 | 67.50 | 8.50 | **3.9%** | 3.00 | -- | 66.05 | 2.7% | **22.3%** |
| PEG | **O** | O | **54.50** | 48.00 | 6.50 | 51.00 | 48.00 | 3.00 | **6.9%** | 3.50 | -- | 45.80 | 2.8% | **21.8%** |
| | | | | | | | | | | | | | | |
| DYN | **N** | N | **9.50** | 9.00 | 0.50 | 9.50 | 9.00 | 0.50 | **0.0%** | 0.00 | -- | 8.97 | 0.0% | **5.9%** |
| NRG | **R** | R | **R** | | (2.00) | R | | (5.00) | | 3.00 | | 42.98 | 0.0% | |
| RRI | **O** | O | **31.00** | 30.50 | 0.50 | 31.00 | 30.50 | 0.50 | **0.0%** | 0.00 | -- | 22.50 | 0.0% | **37.8%** |

*Source: Credit Suisse estimates*

We calculate the updated carbon impact by probability weighting the net present value of several potential scenarios as highlighted in Exhibit 4 (excluding the more illustrative 7th scenario of $20 / ton tax). Broadly speaking, the major difference relative to our prior analysis stems from using a higher starting carbon price which is largely offset by a higher level of allocations to lessen the economic burden for $CO_2$ intensive generators. We continue to include a "do nothing" scenario, giving nod to political concerns about the economic cost of implementing carbon legislation in a world of $4 gasoline, etc.

**Exhibit 4: Updated Probability Weighting Valuation Calculation**

| | Nothing Happens | S2 S-B | S3 Obama | S4 W-L | S5 McCain | S6 EU | S7 W-L HT | Weighting Nothing 10% | S2 15% | S3 10% | S4 20% | S5 10% | S6 15% | S7 20% | CS Prob. Weighted Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AYE | 0.00 | 0.06 | (10.16) | (3.83) | (0.12) | 0.69 | (3.43) | 0.00 | 0.01 | (1.02) | (0.77) | (0.01) | 0.10 | (0.69) | **(2.37)** |
| CEG | 0.00 | 12.36 | 14.78 | 18.25 | 17.34 | 19.20 | 13.12 | 0.00 | 1.85 | 1.48 | 3.65 | 1.73 | 2.88 | 2.62 | **14.22** |
| D | 0.00 | 2.57 | 2.25 | 3.48 | 3.57 | 4.01 | 2.43 | 0.00 | 0.39 | 0.23 | 0.70 | 0.36 | 0.60 | 0.49 | **2.75** |
| EIX | 0.00 | 0.34 | (7.21) | (2.28) | 0.34 | 1.25 | (2.16) | 0.00 | 0.05 | (0.72) | (0.46) | 0.03 | 0.19 | (0.43) | **(1.34)** |
| ETR | 0.00 | 13.87 | 22.94 | 22.94 | 19.66 | 21.22 | 17.00 | 0.00 | 2.08 | 2.29 | 4.59 | 1.97 | 3.18 | 3.40 | **17.51** |
| EXC | 0.00 | 16.79 | 26.96 | 27.36 | 23.78 | 25.38 | 20.14 | 0.00 | 2.52 | 2.70 | 5.47 | 2.38 | 3.81 | 4.03 | **20.90** |
| FE | 0.00 | 9.82 | 6.63 | 12.65 | 13.72 | 15.52 | 8.62 | 0.00 | 1.47 | 0.66 | 2.53 | 1.37 | 2.33 | 1.72 | **10.09** |
| FPL | 0.00 | 9.19 | 14.22 | 15.10 | 13.37 | 14.51 | 10.98 | 0.00 | 1.38 | 1.42 | 3.02 | 1.34 | 2.18 | 2.20 | **11.53** |
| PEG | 0.00 | 5.80 | 6.72 | 8.56 | 8.25 | 8.99 | 5.99 | 0.00 | 0.87 | 0.67 | 1.71 | 0.83 | 1.35 | 1.20 | **6.62** |
| | | | | | | | | | | | | | | | |
| DYN | 0.00 | 0.96 | (0.70) | 0.76 | 1.40 | 1.61 | 0.36 | 0.00 | 0.14 | (0.07) | 0.15 | 0.14 | 0.24 | 0.07 | **0.68** |
| NRG | 0.00 | 1.21 | (10.62) | (3.18) | 1.33 | 1.61 | (3.13) | 0.00 | 0.18 | (1.06) | (0.64) | 0.13 | 0.24 | (0.63) | **(1.77)** |
| RRI | 0.00 | 1.84 | (3.39) | 0.58 | 2.43 | 3.10 | (0.07) | 0.00 | 0.28 | (0.34) | 0.12 | 0.24 | 0.46 | (0.01) | **0.75** |

*Source: Credit Suisse estimates*

We describe in detail how we reach the net present value for each carbon policy in Appendix A. To summarize 10 pages of explanation, we calculate plant specific changes in gross margin with carbon by calculating the impact to revenues per MWh (function of market clearing power prices and any value from allocated credits), costs per MWh, and changes to asset utilization. We then discount the after tax margins using an assumed 50 year asset life (or life of asset for wind as implied in our earnings models – typically 30 years) at an 10.0% discount rate.

# Talking Politics

Carbon legislation could be a game changing event for the Utility sector; accordingly, all involved have been actively lobbying for the solution they deem independently most beneficial (or least detrimental). Despite experience in Europe and decisions by California and the Northeast on carbon legislation, we do not know what the US system will look like, which makes analyzing company specific impacts challenging at best.

Much debate remains on how to reduce US emissions with problematic issues including which industries to target in legislation, level of $CO_2$ emission reductions, cost implications (use of a safety valve on carbon prices if cost is too high for economy to bear?), method (effective tax vs. cap and trade), how to measure reductions (what's the starting point?), to name but a few.

## A Question of When, Not If

Despite all the complications involved with carbon policy, Congress has made a flurry of legislative proposals with the Lieberman-Warner bill probably garnering the most attention over the past several months. In addition, both presidential candidates support cap and trade, making legislation appear increasingly likely with only the actual content and timing under consideration (granted, a big only).

**Exhibit 5: Summary Chart of Legislation**

| Name | Bill # | # Co-Sponsors | Cap & trade? | 2050 target | Auction? | Free Allocations? | Offsets Allowed? | Safety Valve? |
|---|---|---|---|---|---|---|---|---|
| Lieberman-Warner Climate Security Act | S. 2191 | 11 | Industry-wide | 70% below '05 | 26.5% '12, 70% in '50 | Yes, specific # | Yes | Yes |
| Safe Climate Act of 2007 | HR. 1590 | 142 | Industry-wide | 80% below '90 | Yes, specifics by President & EPA | | Silent | Silent |
| Climate Stewardship & Innovation Act | S. 280 | 11 | Industry-wide | 67% below '04 | Yes, specifics by EPA | | Yes | No |
| Global Warming Pollution Reduction Act | S. 309 | 19 | Industry-wide | 80% below '90 | Yes, specifics by EPA | | Silent | Up to EPA, President |
| Electric Utility Cap & Trade Act | S. 317 | 2 | Utilities | 50% below '01 | 15% at start, 100% in '36 | Yes, specific # | Yes | More offsets |
| Low Carbon Economy Act (Specter-Bingaman) | S. 1766 | 7 | Utilities | 60% below '05 | 24% '12, 80% '50 | Yes, specific # | Yes | $12/mt in '12 +5% + inflation / yr |
| Climate Stewardship Act (house version L-W) | HR. 620 | 129 | Industry-wide | 70% below '90 | Yes, specifics by EPA | | Yes | No |
| Global Warming Reduction Act | S. 485 | 3 | Industry-wide | 95% below '90 | Yes, specifics by President | | Yes | No |
| Clean Air Planning Act | S. 1177 | 11 | Utilities | 25% below '90 | Yes | Yes, specific # | Yes | More offsets |
| Clean Air / Climate Change Act | S. 1168 | 2 | Utilities | 40% below '05 | Yes | Yes, specific # | Yes | No |
| Clean Power Act | S. 1201 | 4 | Utilities | 17% below '90 | 50% in ;20, 100% in '35 | Yes, specific # | Yes | No |
| Save our Climate Act | HR. 2069 | 2 | Tax on fuels | 80% below '90 | $10/mt (revenues to US treasury) | | No | No |
| Obama | | | Industry-wide | 80% below '90 | 100% auction | No | Silent | Silent |
| McCain | | | Industry-wide | 60% below '90 | Yes | Yes | Yes | Silent |

*Source: Credit Suisse estimates, Library of Congress*

# Credit Suisse's Assumptions / Analysis

Given the uncertainty around what policy will eventually look like, we have focused our analysis on legislation already introduced plus a look at Europe's experience. Of course, in a Presidential election year we couldn't miss the opportunity to run a McCain scenario and an Obama scenario, although neither candidate has set out a definitive, detailed plan (read: we made numerous assumptions around words spoken by both candidates).

In Exhibit 6 we highlight in more detail the seven scenarios analyzed in this report. Relative to our last analysis, the political solution appears to have moved closer to a high carbon price / high allocation from a low carbon price / low allocation model, with politicians attempting to provide the stick to incent companies to change behavior (or assets in the case of electricity). We assume policies are implemented beginning in 2013 to dovetail with the next round of Kyoto, but provide sensitivities in the report to changes from our assumed implementation date.

A few quick words on the chart labels contained in Exhibit 6:

- **$ / ton:** reflects carbon pricing in short tons. In the text of this note we periodically refer to metric ton pricing, but all numbers are converted into short tons for our data analysis and presentation.
- **% Allocations:** our assumption about the percentage of carbon credits allocated to merchant generators for free. We assume the remainder are either auctioned or purchased from other companies.

We should point out that carbon prices escalate materially in the out years, reaching almost $150 / short ton by 2050 under several scenarios. While these prices might seem steep, they are on a nominal basis ($150 / ton in 2050 equates to $65 / ton today assuming 2% inflation). In addition, prices will need to rise this high to achieve the targeted $CO_2$ emission reductions as laid out by politicians (it's always nice when implementation is well beyond one's likely tenure in public office).

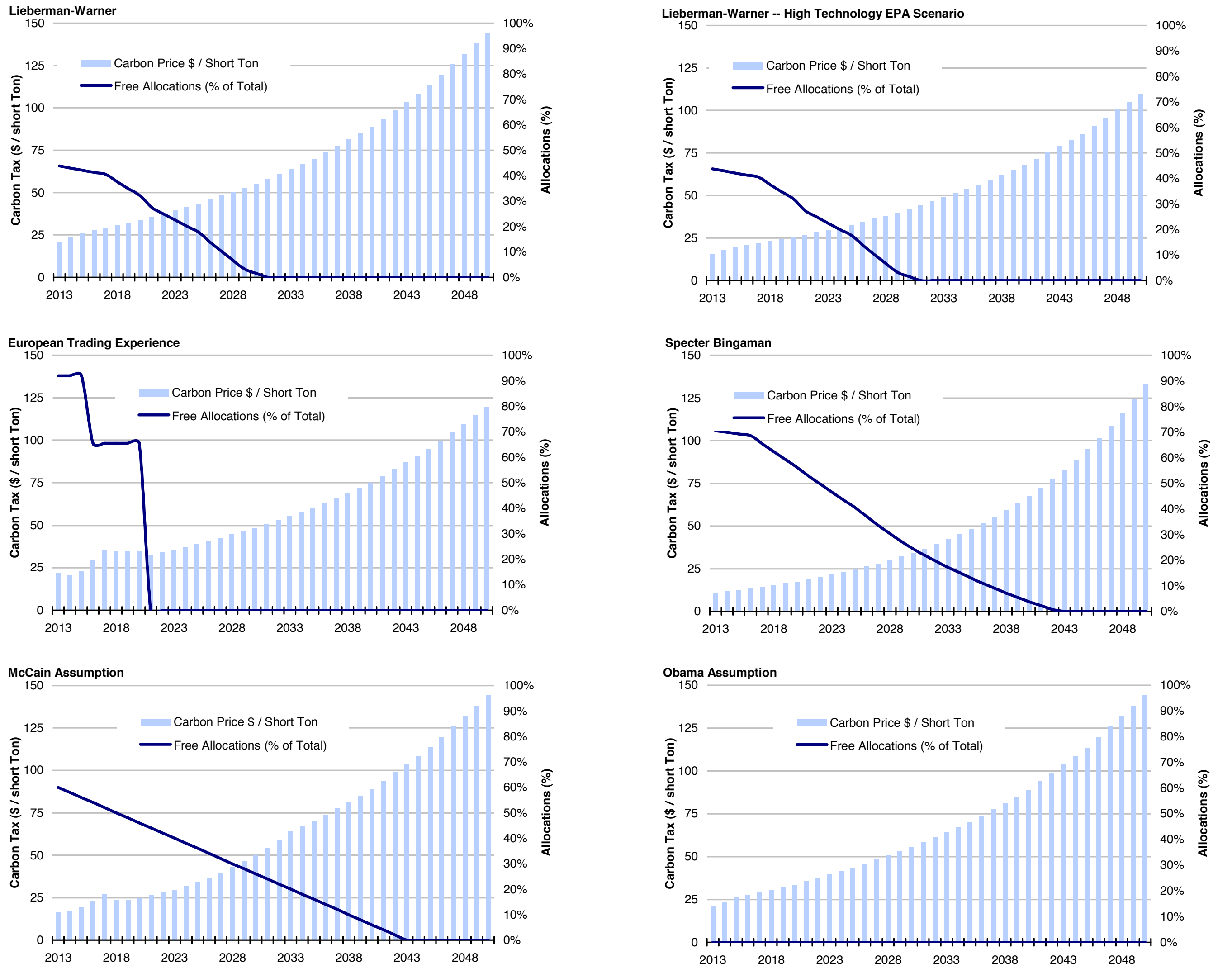
We should also note that the forward carbon prices in Lieberman-Warner and Bingaman-Specter are based on studies performed by government agencies.

**Exhibit 6: Summary of Credit Suisse Scenarios Analyzed ($ / short ton)**

| Scenarios | | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S1** | **$20 Carbon Tax** | | | | | | | | | | | | | | | | | | |
| $ / ton | | 0.00 | 0.00 | 0.00 | 0.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| % Allocations | | 0% | 0% | 0% | 0% | 50% | 48% | 46% | 44% | 42% | 40% | 38% | 36% | 31% | 26% | 21% | 16% | 11% | 0% |
| **S2** | **Specter-Bingaman** | | | | | | | | | | | | | | | | | | |
| $ / ton | | 0.00 | 0.00 | 0.00 | 0.00 | 10.89 | 11.65 | 12.47 | 13.34 | 14.27 | 15.27 | 16.34 | 17.49 | 24.52 | 34.40 | 48.24 | 67.66 | 94.90 | 133.11 |
| % Allocations | | 0% | 0% | 0% | 0% | 71% | 70% | 69% | 69% | 65% | 62% | 59% | 56% | 41% | 24% | 13% | 4% | 0% | 0% |
| **S3** | **Obama Plan -- CS Assumption** | | | | | | | | | | | | | | | | | | |
| $ / ton | | 0.00 | 0.00 | 0.00 | 0.00 | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| **S4** | **Warner-Lieberman -- $ / ton from EPA economic analysis** | | | | | | | | | | | | | | | | | | |
| $ / ton | | 0.00 | 0.00 | 0.00 | 0.00 | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | | 0% | 0% | 0% | 0% | 44% | 43% | 42% | 41% | 40% | 38% | 35% | 32% | 18% | 2% | 0% | 0% | 0% | 0% |
| **S5** | **McCain Plan -- CS Assumption** | | | | | | | | | | | | | | | | | | |
| $ / ton | | 0.00 | 0.00 | 0.00 | 0.00 | 16.36 | 16.72 | 19.52 | 23.06 | 27.15 | 23.33 | 23.67 | 24.78 | 34.15 | 50.06 | 69.87 | 88.93 | 113.43 | 144.28 |
| % Allocations | | 0% | 0% | 0% | 0% | 60% | 58% | 56% | 54% | 52% | 50% | 48% | 46% | 36% | 26% | 16% | 6% | 0% | 0% |
| **S6** | **European Pricing** | | | | | | | | | | | | | | | | | | |
| $ / ton | | 0.00 | 0.00 | 0.00 | 0.00 | 21.73 | 20.71 | 23.22 | 29.88 | 35.84 | 34.85 | 34.51 | 34.51 | 38.86 | 48.29 | 59.91 | 75.15 | 94.75 | 119.44 |
| % Allocations | | 0% | 0% | 0% | 0% | 92% | 92% | 92% | 65% | 65% | 65% | 65% | 65% | 0% | 0% | 0% | 0% | 0% | 0% |
| **S7** | **Warner-Lieberman High Technology Scenario-- $ / ton from EPA economic analysis** | | | | | | | | | | | | | | | | | | |
| $ / ton | | 0.00 | 0.00 | 0.00 | 0.00 | 15.83 | 17.90 | 19.96 | 21.05 | 22.14 | 23.23 | 24.32 | 25.41 | 32.67 | 41.74 | 53.54 | 68.06 | 86.21 | 109.80 |
| % Allocations | | 0% | 0% | 0% | 0% | 44% | 43% | 42% | 41% | 40% | 38% | 35% | 32% | 18% | 2% | 0% | 0% | 0% | 0% |

*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

**Exhibit 7: Graphical Summary of Credit Suisse Scenarios Analyzed ($ / short ton)**




*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

# Lieberman-Warner

From discussions we've had across the country, the Lieberman-Warner bill stands out as the best road map for potential US carbon policy (detailed bill with 450+ pages). In Exhibit 8 we illustrate some of the bill's takeaways for merchant power generators. Chart labels refer to:

- **Economy $CO_2$ emissions:** the US economy wide targeted $CO_2$ emissions by year (the 'cap' part of the cap and trade bill)
- **Economy Wide % Auction:** proportion of $CO_2$ credits provided via a government based auction
- **Power Sector Allocations / Total:** proportion of US economy wide emission allocations that are provided to the power sector for free
- **Power Sector Free Allocations (%):** allocations provided to the power sector for free as a percentage of total power sector emissions

We were hoping that the June Senate debate on Lieberman-Warner would have been fruitful in 'hardening' some of the key issues through a transparent and robust political review (it did not), but now believe incremental clarity is now a 2009 event.

**Exhibit 8: Lieberman-Warner Bill Highlights ($ / short ton)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lieberman-Warner** | | | | | | | | | | | | | | | |
| Economy CO2 emissions (Millions short tons) | 5,240 | 5,144 | 5,047 | 4,951 | 4,854 | 4,758 | 4,662 | 4,564 | 4,468 | 3,985 | 3,503 | 3,020 | 2,537 | 2,054 | 1,572 |
| Economy Wide % Auction | 25% | 28% | 30% | 31% | 32% | 34% | 35% | 37% | 40% | 52% | 70% | 70% | 70% | 70% | 70% |
| Power Sector Allocations / Total | 19% | 19% | 19% | 19% | 19% | 19% | 18% | 17% | 16% | 10% | 1% | 0% | 0% | 0% | 0% |
| Power Sector Free Allocations (%) | 45% | 44% | 43% | 42% | 41% | 40% | 38% | 35% | 32% | 18% | 2% | 0% | 0% | 0% | 0% |
| ADAGE CO2 prices ($ / short ton) | | | | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| IGEM CO2 prices ($ / short ton) | | | | 36.30 | 38.29 | 40.29 | 42.29 | 44.28 | 46.28 | 58.98 | 75.32 | 96.19 | 122.50 | 156.99 | 199.64 |

*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

### Assessing the Price of Carbon

Of course in a cap and trade system the market should decide the price of carbon based on the economic cost associated with reducing emissions to the targeted cap level. While we would love to have the time and leisure to build out an economic model to assess the price of carbon under Lieberman-Warner parameters, we decided to stick to what we're best at (insert your punch line here…) and leave the economists to the task. Accordingly, we have incorporated the EPA's carbon pricing output stemming from an economic analysis of Lieberman-Warner published in March 2008.

Given the complexity of economic and environmental interactions underlying the bill's analysis, even the EPA appreciates that no one model can address all the economic implications and accordingly uses an array of modeling tools. We incorporated the lowest cost model into our analysis (Applied Dynamic Analysis of the Global Economy, ADAGE) versus the higher cost version (Intertemporal General Equilibrium Model, IGEM). In addition we also used the EPA's high technology version, which includes lower carbon pricing based on better available technology in the future.

ADAGE is a dynamic computable general equilibrium (CGE) model capable of examining many types of economic, energy, environmental, climate change mitigation, and trade policies at the international, national, U.S. regional, and U.S. state levels. To investigate proposed policy effects, the CGE model combines a consistent theoretical structure with economic data covering all interactions among businesses and households.

By contrast, IGEM models the U.S. economy with an emphasis on energy and environmental aspects using a dynamic multi-sector model covering 35 industries. IGEM depicts growth of the economy due to capital accumulation, technical change and population change in addition to changes in consumption patterns due to demographic changes, price and income effects. The model simulates the effects of policy changes, external shocks and demographic changes on the prices, production and consumption of energy, and the emissions of pollutants.

For more detail on the EPA's models, please see:
http://www.epa.gov/climatechange/economics/modeling.html

# Bingaman-Specter

In our opinion Bingaman-Specter remains the friendliest piece of carbon legislation for $CO_2$ emitters with a relatively low safety valve compared to Lieberman-Warner plus a high level of free allocations. Bingaman-Specter places a safety valve on carbon at $12 / metric ton (which equals ~$10.90 / short ton, the more common US terminology) initially rising by 5% plus inflation per year (we assume 2%).

Since Bingaman-Specter's emission reduction goals look similar to Lieberman-Warner's (60% vs. 70% by 2050), we assume pricing would have to match the latter to achieve stated targets. However, pricing remains modestly below Lieberman-Warner's 2050 level if we grow the starting $12/ metric ton safety valve cap at 7% annually. Assuming the EPA's economic modeling is accurate, the Bingaman-Specter bill as written would not be able to achieve its emission reduction targets, effectively turning the legislation into a soft cap or carbon tax.

**Exhibit 9: Bingaman-Specter Bill Highlights ($ / short ton)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Specter-Bingaman** | | | | | | | | | | | | | | | |
| Economy CO2 emissions (Millions short tons) | 6,036 | 5,982 | 5,928 | 5,875 | 5,822 | 5,770 | 5,718 | 5,667 | 5,615 | 5,201 | 4,373 | 3,875 | 3,378 | 2,880 | 2,382 |
| Economy Wide % Auction | 24% | 24% | 24% | 24% | 24% | 26% | 28% | 30% | 32% | 43% | 53% | 63% | 73% | 80% | 80% |
| Power Sector Allocations / Total | 26% | 26% | 26% | 26% | 26% | 25% | 24% | 23% | 22% | 17% | 12% | 7% | 2% | 0% | 0% |
| Power Sector Free Allocations (%) | 71% | 71% | 70% | 69% | 69% | 65% | 62% | 59% | 56% | 41% | 24% | 13% | 4% | 0% | 0% |
| CO2 prices ($ / short ton) | 10.89 | 11.65 | 12.47 | 13.34 | 14.27 | 15.27 | 16.34 | 17.49 | 18.71 | 26.24 | 36.81 | 51.62 | 72.40 | 101.55 | 142.42 |

*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

# The European Experience

Currently Europe is the only region globally running an active carbon cap and trade program, which has functioned since 2005. While the US will probably learn from Europe's trials and tribulations, we ran a scenario incorporating actual historical pricing (called EUAs), allocations (we used the UK as a reference case – each country was allowed to set their own allocations), and an assumption on the level of international offsets allowed (called CERs – we assumed 20% of the total). For future pricing, we use forwards as quoted on Bloomberg, defaulting to Lieberman-Warner pricing in the out years for EUAs and leaving CERs flat at 2008 pricing levels (which arguably will trend higher as low hanging fruit is consumed).

**Exhibit 10: European Pricing ($ / short ton)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Europe Pricing** | | | | | | | | | | | | | | | |
| Offsets (CER int'l pricing) | 16.36 | 16.36 | 18.76 | 22.23 | 26.64 | 20.89 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 |
| % Int'l Offsets Allowed (CS estimate) | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| Carbon Pricing (EUA pricing) | 23.08 | 21.80 | 24.34 | 31.79 | 38.14 | 38.34 | 38.13 | 38.13 | 35.57 | 45.92 | 58.26 | 73.68 | 93.83 | 119.60 | 144.28 |
| Blended Pricing ($ / short ton) | 21.73 | 20.71 | 23.22 | 29.88 | 35.84 | 34.85 | 34.51 | 34.51 | 32.47 | 40.74 | 50.62 | 62.96 | 79.07 | 99.69 | 119.44 |
| Power Sector Free Allocations (%) | 92% | 92% | 92% | 65% | 65% | 65% | 65% | 65% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

# McCain vs. Obama

While both McCain and Obama support a cap and trade system, neither have fully flushed out their plans (although McCain has sponsored and written cap and trade legislation previously). Reading through policy statements, we can point to 2 clear differences between the candidates:

(1) **Use of international carbon offsets:** McCain specifically allows the use of offsets but at a declining level over time (offsets are financial instruments representing a reduction, avoidance, or sequestration of greenhouse gas emissions). Obama has not commented on the use of offsets. Currently CERs are trading at ~50% of the price of EUAs in Europe, so McCain's price tag for carbon should be less than Obama's.

(2) **Allowances:** McCain supports providing industry with allowances for free, transitioning over time to a full auctioned system; Obama plans to auction all credits from day 1 (i.e. no allocations, which is good for government fund raising and bad for carbon emitters).

In Exhibit 11 we highlight the assumptions we made on a potential Obama plan compared to a McCain plan incorporating the two key differences between the candidates. Obviously the magnitude of the difference could be larger or smaller, but we wanted to provide a sense of direction between the two candidates.

**Exhibit 11: Obama vs. McCain – Credit Suisse Assumptions**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Obama** | | | | | | | | | | | | | | | |
| Offsets (CER int'l pricing) | 16.36 | 16.36 | 18.76 | 22.23 | 26.64 | 20.89 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 |
| % Int'l Offsets Allowed (CS estimate) | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Carbon Pricing | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 35.57 | 45.92 | 58.26 | 73.68 | 93.83 | 119.60 | 144.28 |
| Blended Pricing ($ / short ton) | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 35.57 | 45.92 | 58.26 | 73.68 | 93.83 | 119.60 | 144.28 |
| Power Sector Free Allocations (%) | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| **McCain** | | | | | | | | | | | | | | | |
| Offsets (CER int'l pricing) | 16.36 | 16.36 | 18.76 | 22.23 | 26.64 | 20.89 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 | 20.05 |
| % Int'l Offsets Allowed (CS estimate) | 100% | 95% | 90% | 85% | 80% | 75% | 70% | 65% | 60% | 35% | 10% | 0% | 0% | 0% | 0% |
| Carbon Pricing | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 35.57 | 45.92 | 58.26 | 73.68 | 93.83 | 119.60 | 144.28 |
| Blended Pricing ($ / short ton) | 16.36 | 16.72 | 19.52 | 23.06 | 27.15 | 23.33 | 23.67 | 24.78 | 26.26 | 36.86 | 54.44 | 73.68 | 93.83 | 119.60 | 144.28 |
| Power Sector Free Allocations (%) | 60% | 58% | 56% | 54% | 52% | 50% | 48% | 46% | 44% | 34% | 24% | 14% | 4% | 0% | 0% |

*Source: Credit Suisse estimates, Library of Congress, Bloomberg, EPA*

# Economic Cost

Unfortunately reducing $CO_2$ emissions will not occur for free. Most simply in the future consumers will pay for the right to emit $CO_2$ whereas today there is no cost. For the power sector specifically, plants will have to emit less $CO_2$ which broadly means dirty plants run less, clean plants run more, and customers consume less. Hence the game changing aspect of the carbon equation…

### Cost to the Economy

To frame the magnitude of cost to the economy we highlight the potential tax revenues and total cost of the cap and trade systems as proposed by Bingaman-Specter and Lieberman-Warner in Exhibit 12 using assumptions highlighted in Exhibit 13. On an undiscounted basis Lieberman-Warner could generate $4.3 trillion in tax revenues (or $1.8 trillion using a 4% discount rate) whereas Bingaman-Specter could generate $4.2 trillion (or $1.5 trillion on a 4% rate). The total cost of $6.6–7.3 trillion on an undiscounted basis could be somewhat overstated assuming costing a previously free substance could create new industries and thus jobs (carbon sequestration, renewable energy, conservation, etc).

**Exhibit 12: Economic Cost**

| | | Tax Revenues | | Total Cost | |
|---|---|---|---|---|---|
| | | L-W | S-B | L-W | S-B |
| **Cost ($s in BB)** | | **4,332** | **4,188** | **7,280** | **6,622** |
| NPV Cost ($s in BB) 4% discount | 4% | 1,825 | 1,547 | 3,403 | 2,788 |
| NPV Cost ($s in BB) 5% discount | 5% | 1,512 | 1,240 | 2,902 | 2,318 |
| NPV Cost ($s in BB) 6% discount | 6% | 1,266 | 1,005 | 2,502 | 1,951 |
| NPV Cost ($s in BB) 7% discount | 7% | 1,071 | 823 | 2,180 | 1,662 |
| NPV Cost ($s in BB) 8% discount | 8% | 916 | 682 | 1,918 | 1,431 |
| NPV Cost ($s in BB) 9% discount | 9% | 790 | 572 | 1,703 | 1,246 |
| NPV Cost ($s in BB) 10% discount | 10% | 688 | 484 | 1,524 | 1,095 |

*Source: Credit Suisse estimates*

**Exhibit 13: Assumptions on Economic Cost**

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Warner-Lieberman** | | | | | | | | | | | | | | |
| Total Allowances (MM) | 5,144 | 5,047 | 4,951 | 4,854 | 4,758 | 4,662 | 4,564 | 4,468 | 3,985 | 3,503 | 3,020 | 2,537 | 2,054 | 1,572 |
| % Auction | 25% | 28% | 30% | 31% | 32% | 34% | 35% | 37% | 49% | 63% | 70% | 70% | 70% | 70% |
| $ / ton | 20.87 | 23.59 | 26.32 | 27.77 | 29.22 | 30.67 | 32.12 | 33.58 | 43.56 | 55.35 | 69.87 | 88.93 | 113.43 | 144.28 |
| Tax Revenues ($s in BB) | 26 | 33 | 38 | 41 | 44 | 48 | 51 | 55 | 84 | 122 | 147 | 157 | 162 | 158 |
| Total Cost | 107 | 119 | 130 | 135 | 139 | 143 | 147 | 150 | 174 | 194 | 211 | 226 | 233 | 227 |
| **Specter-Bingaman** | | | | | | | | | | | | | | |
| Total Allowances (MM) | 5,982 | 5,928 | 5,875 | 5,822 | 5,770 | 5,718 | 5,667 | 5,615 | 5,201 | 4,373 | 3,875 | 3,378 | 2,880 | 2,382 |
| % Auction | 24% | 24% | 24% | 24% | 26% | 28% | 30% | 32% | 43% | 53% | 63% | 73% | 80% | 80% |
| $ / ton | 10.89 | 11.65 | 12.47 | 13.34 | 14.27 | 15.27 | 16.34 | 17.49 | 24.52 | 34.40 | 48.24 | 67.66 | 94.90 | 133.11 |
| Tax Revenues ($s in BB) | 16 | 17 | 18 | 19 | 21 | 24 | 28 | 31 | 55 | 80 | 118 | 167 | 219 | 254 |
| Total Cost | 65 | 69 | 73 | 78 | 82 | 87 | 93 | 98 | 128 | 150 | 187 | 229 | 273 | 317 |

*Source: Company data, Credit Suisse estimates*

### Cost to the Power Sector

Looking specifically at the power sector, some companies will benefit and some will lose. We delve into the economics in the next section but highlight that in order to meet Lieberman-Warner's 2050 $CO_2$ profile, the power industry would have to:

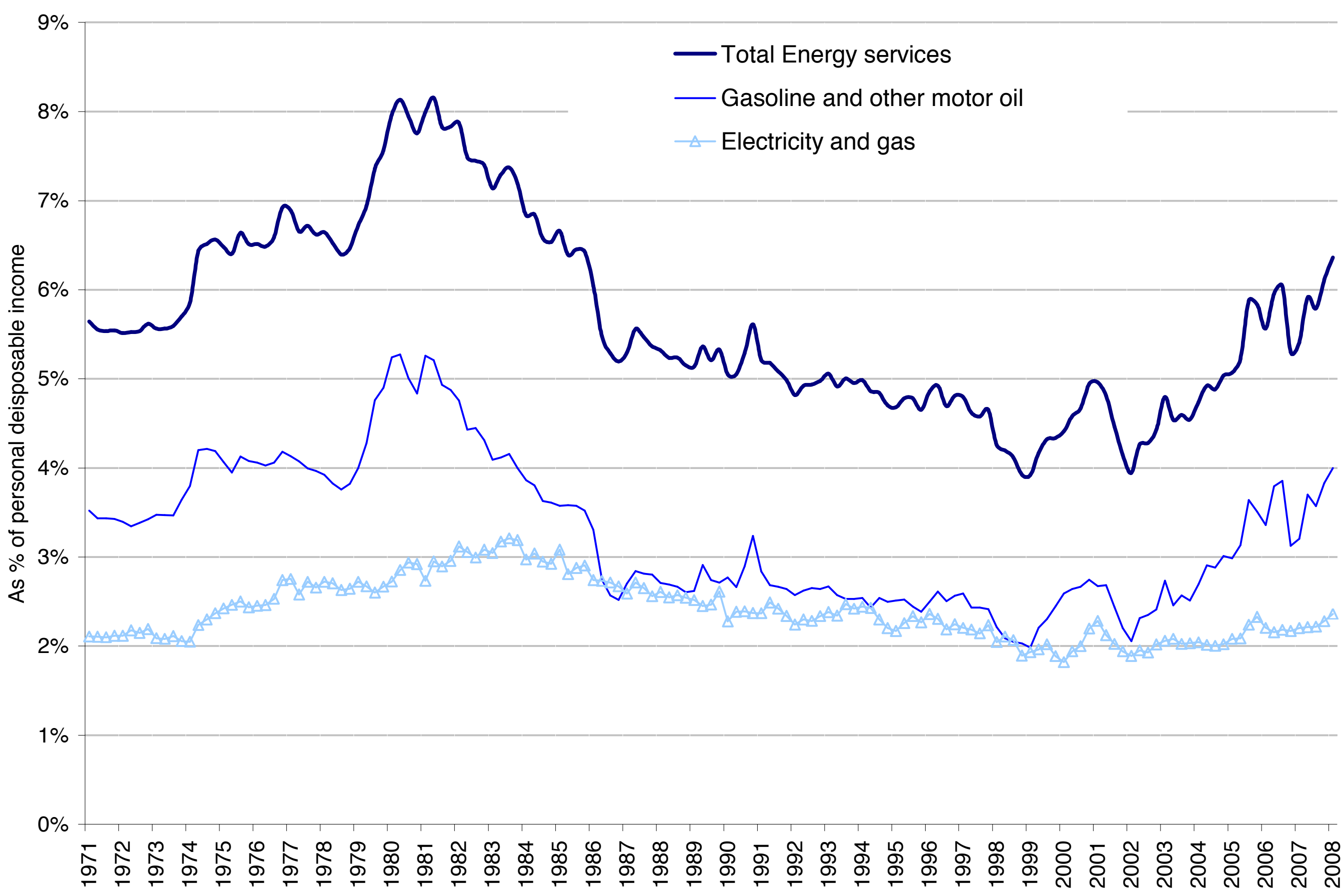
- Shut down 240 GW of coal fired power plants (~80% of total capacity), and
- Replace the coal fired generation with 55 GW of wind (assuming 35% asset utilization and 10% market penetration), 96 GW of solar (20% utilization and 10% penetration), and 165 MW of new nuclear, or
- Reduce power demand by 1,700 TWh (compound annual decline of 1.4%).

# Can Congress Pass Carbon?

Given the substantial economic cost to the consumer of implementing carbon legislation as highlighted on the prior page, we worry about the inevitable political and economic challenges of passing carbon policy in a recessionary and rising energy cost environment. Over the past year we have seen gasoline prices increase 85%, coal increase 190%, and natural gas increase 40% (Exhibit 15), which is starting to make a material dent on personal disposable income (Exhibit 14). Even without carbon legislation, consumers will still face substantially higher energy costs as higher commodity prices filter through the economy.

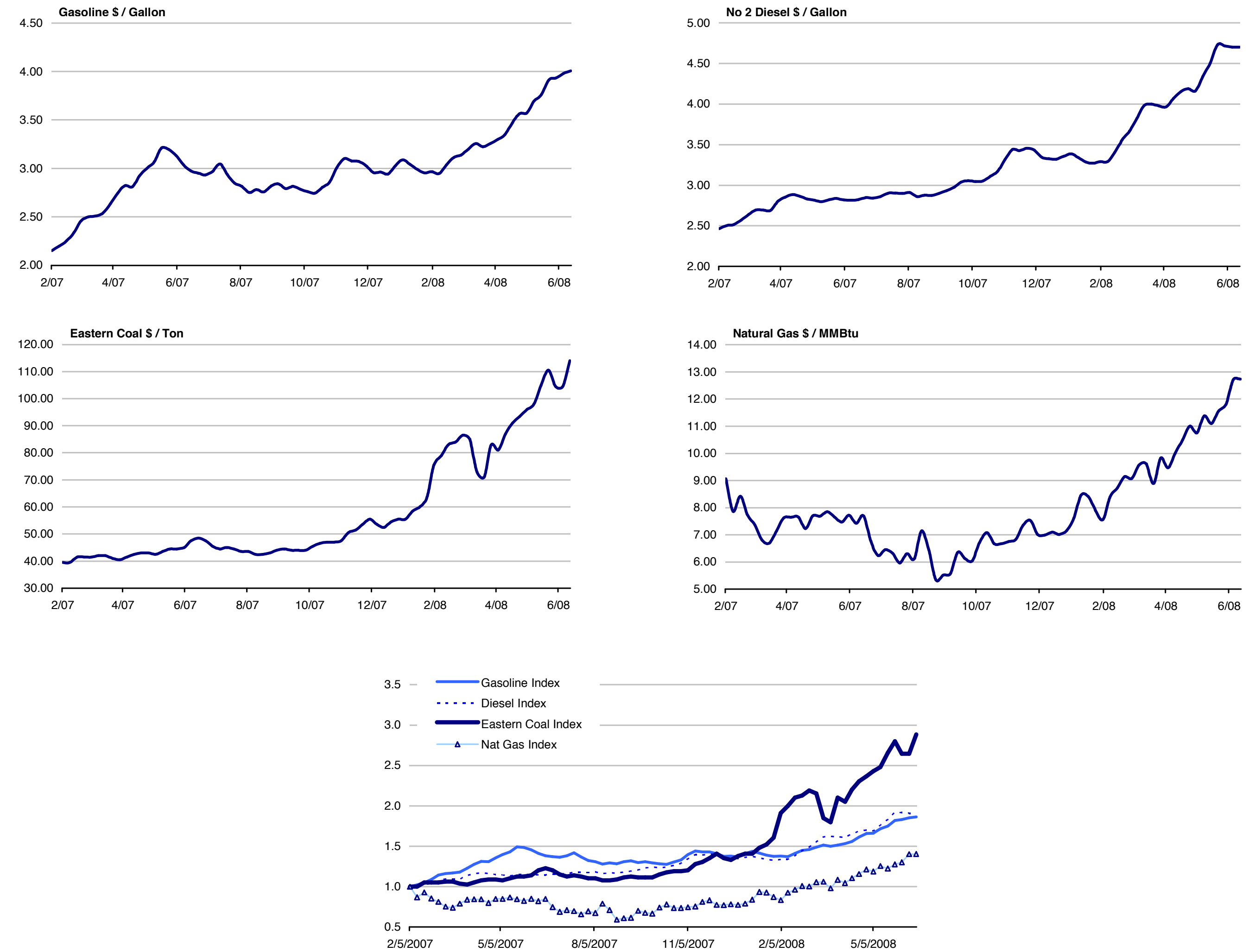
Further increases to the cost of energy could represent the biggest challenge to substantive progress on greenhouse gas legislation – Republicans used this basic argument to halt progress around debating Lieberman-Warner in 2008. We think successful advancement of global warming legislation will need help from a well designed / thought out economic argument – new jobs and industry, avoided costs of climatic change – and would also benefit from some commodity price moderation as well.

**Exhibit 14: Energy Costs to Personal Disposable Income**




*Source: Company data, Credit Suisse estimates, BEA*

## Exhibit 15: Rising Energy Costs



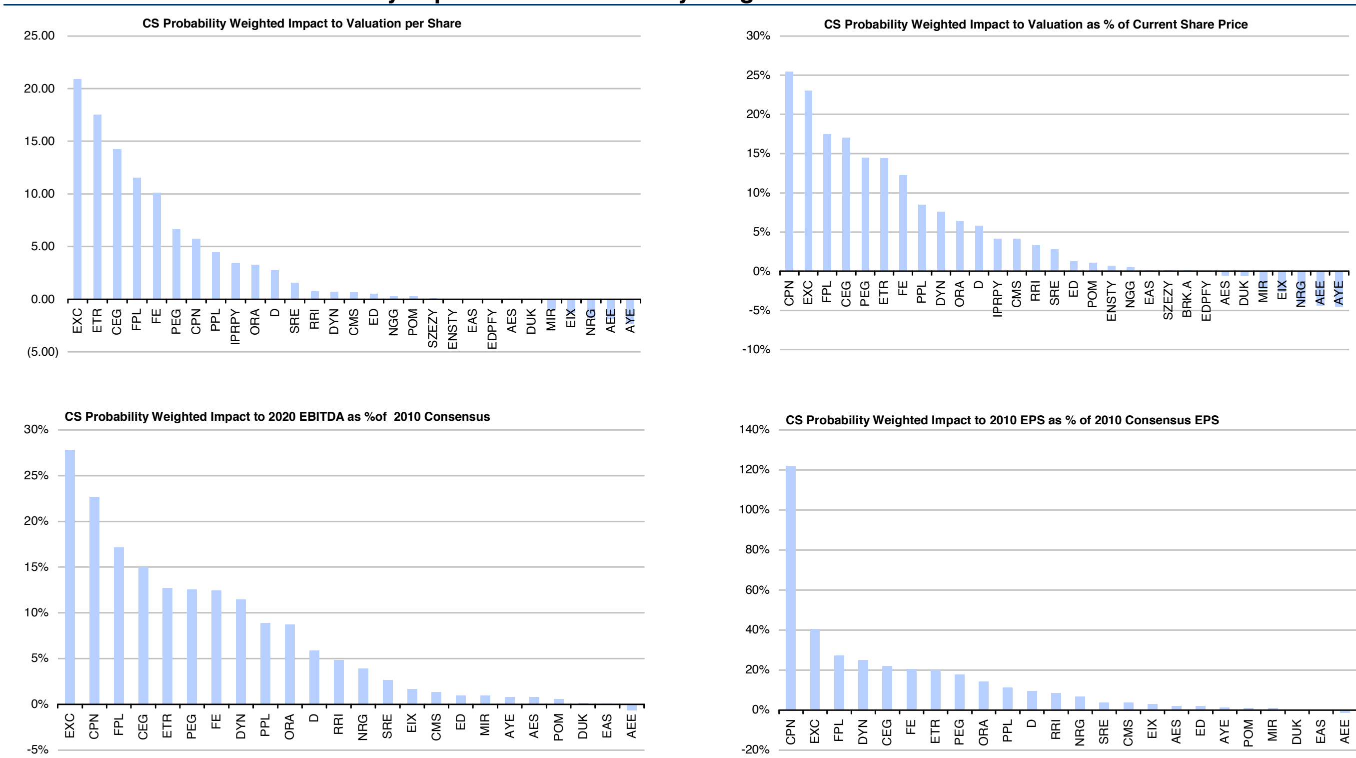

*Source: Company data, Credit Suisse estimates, Bloomberg*

# The Math – Winners & Losers

Using our probability weighted assumptions, CPN, EXC, and FPL fair most positively with upside relative to current valuation, while AYE, NRG, and EIX fair the worst offering downside to valuation. In Exhibit 17 we highlight the impact to valuation per share, in Exhibit 18 the impact as a percentage of equity valuations today, and in Exhibit 19–Exhibit 20 the impact to 2010 consensus EPS and EBITDA estimates. All the scenarios assume allocations as laid out in Exhibit 1.

In the following section we walk through in more detail the impact to different asset classes that are embedded within these consolidated tables.

**Exhibit 16: Consolidated Summary Impact on CS Probability Weighted Outcome**




*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Consolidated Impact to Valuation

## Exhibit 17: Consolidated NPV Impact per Share by Company

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXC | 12.05 | EXC | 16.79 | EXC | 26.96 | EXC | 27.36 | EXC | 23.78 | EXC | 25.38 | EXC | 20.14 | EXC | 20.90 |
| ETR | 10.08 | ETR | 13.87 | ETR | 22.94 | ETR | 22.94 | ETR | 19.66 | ETR | 21.22 | ETR | 17.00 | ETR | 17.51 |
| FPL | 6.56 | CEG | 12.36 | CEG | 14.78 | CEG | 18.25 | CEG | 17.34 | CEG | 19.20 | CEG | 13.12 | CEG | 14.22 |
| CEG | 5.65 | FE | 9.82 | FPL | 14.22 | FPL | 15.10 | FE | 13.72 | FE | 15.52 | FPL | 10.98 | FPL | 11.53 |
| PEG | 2.47 | FPL | 9.19 | PEG | 6.72 | FE | 12.65 | FPL | 13.37 | FPL | 14.51 | FE | 8.62 | FE | 10.09 |
| ORA | 1.93 | PEG | 5.80 | FE | 6.63 | PEG | 8.56 | PEG | 8.25 | PEG | 8.99 | PEG | 5.99 | PEG | 6.62 |
| FE | 1.69 | CPN | 5.39 | CPN | 5.19 | CPN | 7.43 | CPN | 7.91 | CPN | 7.83 | CPN | 4.87 | CPN | 5.76 |
| CPN | 1.49 | PPL | 4.36 | ORA | 4.32 | PPL | 5.54 | PPL | 6.11 | PPL | 6.85 | PPL | 3.78 | PPL | 4.44 |
| PPL | 0.85 | IPRPY | 3.64 | PPL | 2.84 | IPRPY | 4.36 | IPRPY | 5.56 | IPRPY | 5.20 | ORA | 3.18 | IPRPY | 3.39 |
| D | 0.80 | ORA | 2.60 | D | 2.25 | ORA | 4.32 | ORA | 3.71 | D | 4.01 | D | 2.43 | ORA | 3.29 |
| ED | 0.18 | D | 2.57 | IPRPY | 1.55 | D | 3.48 | D | 3.57 | ORA | 3.97 | IPRPY | 2.39 | D | 2.75 |
| SRE | 0.14 | RRI | 1.84 | SRE | 1.01 | SRE | 1.96 | RRI | 2.43 | RRI | 3.10 | SRE | 1.24 | SRE | 1.55 |
| CMS | 0.11 | SRE | 1.58 | CMS | 0.57 | CMS | 0.83 | SRE | 2.34 | SRE | 2.26 | CMS | 0.49 | RRI | 0.75 |
| ENSTY | 0.04 | NRG | 1.21 | ED | 0.43 | DYN | 0.76 | DYN | 1.40 | DYN | 1.61 | ED | 0.45 | DYN | 0.68 |
| EAS | 0.01 | DYN | 0.96 | ENSTY | 0.09 | ED | 0.64 | NRG | 1.33 | NRG | 1.61 | DYN | 0.36 | CMS | 0.62 |
| EDPFY | 0.00 | MIR | 0.62 | EAS | 0.03 | RRI | 0.58 | CMS | 0.86 | MIR | 1.43 | NGG | 0.22 | ED | 0.50 |
| NGG | (0.06) | CMS | 0.57 | EDPFY | 0.00 | POM | 0.35 | ED | 0.65 | EIX | 1.25 | POM | 0.19 | NGG | 0.31 |
| SZEZY | (0.11) | ED | 0.46 | POM | (0.02) | NGG | 0.33 | MIR | 0.50 | CMS | 0.85 | ENSTY | 0.06 | POM | 0.28 |
| POM | (0.13) | NGG | 0.46 | NGG | (0.08) | ENSTY | 0.09 | NGG | 0.46 | ED | 0.73 | EAS | 0.03 | SZEZY | 0.07 |
| DUK | (0.51) | EIX | 0.34 | SZEZY | (0.08) | SZEZY | 0.08 | POM | 0.46 | AYE | 0.69 | SZEZY | 0.03 | ENSTY | 0.07 |
| IPRPY | (0.62) | POM | 0.33 | DYN | (0.70) | EAS | 0.04 | EIX | 0.34 | NGG | 0.62 | EDPFY | 0.00 | EAS | 0.03 |
| DYN | (0.64) | AES | 0.14 | DUK | (0.74) | EDPFY | 0.00 | AES | 0.20 | POM | 0.56 | RRI | (0.07) | EDPFY | 0.00 |
| AES | (0.69) | SZEZY | 0.11 | AES | (1.03) | DUK | (0.19) | SZEZY | 0.15 | AES | 0.38 | DUK | (0.21) | AES | (0.10) |
| RRI | (2.26) | DUK | 0.09 | RRI | (3.39) | AES | (0.20) | DUK | 0.10 | DUK | 0.20 | AES | (0.27) | DUK | (0.10) |
| MIR | (3.47) | AYE | 0.06 | MIR | (5.92) | MIR | (1.69) | ENSTY | 0.08 | SZEZY | 0.16 | MIR | (1.59) | MIR | (0.89) |
| EIX | (3.69) | ENSTY | 0.05 | AEE | (7.03) | EIX | (2.28) | EAS | 0.04 | AEE | 0.11 | EIX | (2.16) | EIX | (1.34) |
| AEE | (4.14) | EAS | 0.03 | EIX | (7.21) | AEE | (2.85) | EDPFY | 0.00 | ENSTY | 0.08 | AEE | (2.63) | NRG | (1.77) |
| AYE | (5.39) | EDPFY | 0.00 | AYE | (10.16) | NRG | (3.18) | AYE | (0.12) | EAS | 0.05 | NRG | (3.13) | AEE | (1.87) |
| NRG | (6.43) | AEE | (0.27) | NRG | (10.62) | AYE | (3.83) | AEE | (0.50) | EDPFY | 0.00 | AYE | (3.43) | AYE | (2.37) |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

## Exhibit 18: Consolidated NPV Impact per Share to Current Share Prices by Company

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXC | 13% | CPN | 24% | EXC | 30% | CPN | 33% | CPN | 35% | CPN | 35% | EXC | 22% | CPN | 25% |
| FPL | 10% | EXC | 18% | CPN | 23% | EXC | 30% | EXC | 26% | EXC | 28% | CPN | 22% | EXC | 23% |
| ETR | 8% | CEG | 15% | FPL | 22% | FPL | 23% | CEG | 21% | CEG | 23% | FPL | 17% | FPL | 17% |
| CEG | 7% | FPL | 14% | ETR | 19% | CEG | 22% | FPL | 20% | FPL | 22% | CEG | 16% | CEG | 17% |
| CPN | 7% | PEG | 13% | CEG | 18% | ETR | 19% | PEG | 18% | PEG | 20% | ETR | 14% | PEG | 14% |
| PEG | 5% | FE | 12% | PEG | 15% | PEG | 19% | FE | 17% | FE | 19% | PEG | 13% | ETR | 14% |
| ORA | 4% | ETR | 11% | ORA | 8% | FE | 15% | ETR | 16% | DYN | 18% | FE | 10% | FE | 12% |
| FE | 2% | DYN | 11% | FE | 8% | PPL | 11% | DYN | 16% | ETR | 17% | PPL | 7% | PPL | 8% |
| D | 2% | PPL | 8% | PPL | 5% | DYN | 8% | PPL | 12% | RRI | 14% | ORA | 6% | DYN | 8% |
| PPL | 2% | RRI | 8% | D | 5% | ORA | 8% | RRI | 11% | PPL | 13% | D | 5% | ORA | 6% |
| CMS | 1% | D | 5% | CMS | 4% | D | 7% | D | 8% | D | 8% | DYN | 4% | D | 6% |
| ED | 0% | ORA | 5% | IPRPY | 2% | CMS | 5% | ORA | 7% | ORA | 8% | CMS | 3% | IPRPY | 4% |
| ENSTY | 0% | IPRPY | 4% | SRE | 2% | IPRPY | 5% | IPRPY | 7% | IPRPY | 6% | IPRPY | 3% | CMS | 4% |
| SRE | 0% | CMS | 4% | ED | 1% | SRE | 4% | CMS | 6% | CMS | 6% | SRE | 2% | RRI | 3% |
| EAS | 0% | SRE | 3% | ENSTY | 1% | RRI | 3% | SRE | 4% | SRE | 4% | ED | 1% | SRE | 3% |
| BRK.A | 0% | NRG | 3% | EAS | 0% | ED | 2% | NRG | 3% | NRG | 4% | POM | 1% | ED | 1% |
| EDPFY | 0% | MIR | 2% | BRK.A | 0% | POM | 1% | POM | 2% | MIR | 4% | ENSTY | 1% | POM | 1% |
| NGG | 0% | POM | 1% | EDPFY | 0% | ENSTY | 1% | ED | 2% | EIX | 2% | NGG | 0% | ENSTY | 1% |
| SZEZY | 0% | ED | 1% | POM | 0% | NGG | 0% | MIR | 1% | POM | 2% | EAS | 0% | NGG | 0% |
| POM | -1% | AES | 1% | NGG | 0% | EAS | 0% | AES | 1% | AES | 2% | BRK.A | 0% | EAS | 0% |
| IPRPY | -1% | NGG | 1% | SZEZY | 0% | SZEZY | 0% | ENSTY | 1% | ED | 2% | SZEZY | 0% | SZEZY | 0% |
| DUK | -3% | EIX | 1% | DUK | -4% | BRK.A | 0% | NGG | 1% | AYE | 1% | EDPFY | 0% | BRK.A | 0% |
| AES | -4% | ENSTY | 1% | AES | -5% | EDPFY | 0% | EIX | 1% | DUK | 1% | RRI | 0% | EDPFY | 0% |
| DYN | -7% | DUK | 0% | DYN | -8% | AES | -1% | DUK | 1% | NGG | 1% | DUK | -1% | AES | -1% |
| EIX | -7% | SZEZY | 0% | EIX | -14% | DUK | -1% | SZEZY | 0% | ENSTY | 1% | AES | -1% | DUK | -1% |
| MIR | -9% | EAS | 0% | MIR | -15% | MIR | -4% | EAS | 0% | AEE | 0% | MIR | -4% | MIR | -2% |
| AEE | -10% | AYE | 0% | RRI | -15% | EIX | -4% | BRK.A | 0% | SZEZY | 0% | EIX | -4% | EIX | -3% |
| RRI | -10% | BRK.A | 0% | AEE | -16% | AEE | -7% | EDPFY | 0% | EAS | 0% | AEE | -6% | NRG | -4% |
| AYE | -10% | EDPFY | 0% | AYE | -19% | AYE | -7% | AYE | 0% | BRK.A | 0% | AYE | -6% | AEE | -4% |
| NRG | -15% | AEE | -1% | NRG | -25% | NRG | -7% | AEE | -1% | EDPFY | 0% | NRG | -7% | AYE | -4% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Consolidated Impact to Estimates

**Exhibit 19: 2020 EPS to 2010 Consensus EPS Estimates**

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPN | 91% | CPN | 106% | CPN | 62% | CPN | 146% | CPN | 131% | CPN | 240% | CPN | 107% | CPN | 122% |
| EXC | 32% | DYN | 30% | EXC | 52% | EXC | 53% | EXC | 40% | DYN | 83% | EXC | 40% | EXC | 40% |
| FPL | 21% | EXC | 28% | FPL | 32% | FPL | 36% | DYN | 34% | EXC | 56% | FPL | 26% | FPL | 27% |
| CEG | 16% | FPL | 19% | ETR | 27% | CEG | 27% | FPL | 27% | NRG | 46% | CEG | 20% | DYN | 25% |
| ETR | 15% | FE | 19% | ORA | 19% | ETR | 27% | FE | 23% | FE | 44% | ETR | 20% | CEG | 22% |
| DYN | 15% | NRG | 18% | CEG | 18% | DYN | 24% | CEG | 23% | RRI | 44% | FE | 17% | FE | 20% |
| FE | 15% | RRI | 18% | PEG | 14% | FE | 24% | ETR | 19% | FPL | 40% | PEG | 16% | ETR | 20% |
| PEG | 13% | CEG | 17% | D | 5% | PEG | 22% | PEG | 19% | CEG | 38% | DYN | 16% | PEG | 18% |
| ORA | 11% | PEG | 14% | FE | 5% | ORA | 19% | RRI | 17% | PEG | 31% | ORA | 14% | ORA | 14% |
| PPL | 8% | ETR | 13% | PPL | 3% | PPL | 13% | NRG | 14% | ETR | 28% | PPL | 9% | PPL | 11% |
| D | 7% | PPL | 11% | CMS | 2% | D | 12% | ORA | 14% | AYE | 26% | D | 8% | D | 10% |
| RRI | 6% | ORA | 10% | ED | 1% | CMS | 4% | PPL | 13% | MIR | 25% | SRE | 3% | RRI | 9% |
| NRG | 4% | MIR | 9% | SRE | 0% | SRE | 4% | D | 10% | PPL | 25% | CMS | 3% | NRG | 7% |
| SRE | 3% | AYE | 9% | EAS | 0% | RRI | 3% | MIR | 6% | ORA | 20% | RRI | 3% | SRE | 4% |
| CMS | 2% | D | 8% | POM | -1% | ED | 2% | EIX | 6% | EIX | 20% | ED | 2% | CMS | 4% |
| EIX | 2% | EIX | 7% | DUK | -8% | POM | 1% | AYE | 6% | D | 18% | POM | 1% | EIX | 3% |
| ED | 1% | AEE | 4% | AES | -8% | AES | 1% | SRE | 4% | AEE | 16% | AES | 0% | AES | 2% |
| POM | 1% | AES | 4% | EIX | -17% | EIX | 0% | CMS | 4% | AES | 11% | EIX | 0% | ED | 2% |
| AES | 1% | SRE | 4% | AEE | -25% | EAS | 0% | AES | 3% | SRE | 8% | EAS | 0% | AYE | 1% |
| EAS | 0% | CMS | 3% | AYE | -31% | NRG | 0% | ED | 2% | CMS | 7% | NRG | 0% | POM | 1% |
| DUK | 0% | DUK | 2% | DYN | -32% | DUK | -1% | AEE | 2% | DUK | 6% | DUK | -1% | MIR | 1% |
| MIR | 0% | ED | 1% | MIR | -32% | AYE | -4% | DUK | 1% | ED | 3% | MIR | -3% | DUK | 0% |
| AYE | 0% | POM | 1% | RRI | -36% | MIR | -5% | POM | 1% | POM | 3% | AYE | -3% | EAS | 0% |
| AEE | -3% | EAS | 0% | NRG | -43% | AEE | -5% | EAS | 0% | EAS | 0% | AEE | -5% | AEE | -1% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

**Exhibit 20: 2020 EBITDA to 2010 Consensus EBITDA Estimates**

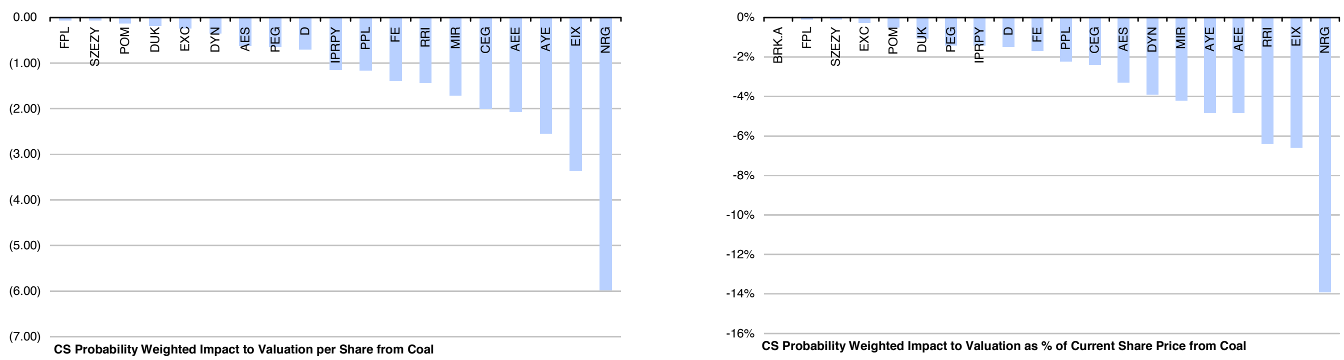
| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXC | 22% | CPN | 20% | EXC | 36% | EXC | 37% | EXC | 27% | CPN | 45% | EXC | 27% | EXC | 28% |
| CPN | 17% | EXC | 19% | FPL | 20% | CPN | 27% | CPN | 24% | EXC | 39% | CPN | 20% | CPN | 23% |
| FPL | 13% | DYN | 14% | ETR | 17% | FPL | 22% | FPL | 17% | DYN | 38% | FPL | 17% | FPL | 17% |
| CEG | 11% | FPL | 12% | CEG | 13% | CEG | 19% | CEG | 16% | FE | 27% | CEG | 14% | CEG | 15% |
| ETR | 10% | CEG | 12% | ORA | 12% | ETR | 17% | DYN | 15% | NRG | 27% | ETR | 13% | ETR | 13% |
| PEG | 9% | FE | 11% | CPN | 11% | PEG | 16% | FE | 14% | CEG | 26% | PEG | 11% | PEG | 13% |
| FE | 9% | NRG | 11% | PEG | 10% | FE | 14% | PEG | 13% | FPL | 25% | FE | 10% | FE | 12% |
| DYN | 7% | RRI | 10% | D | 3% | ORA | 12% | ETR | 12% | RRI | 25% | ORA | 9% | DYN | 11% |
| ORA | 7% | PEG | 10% | FE | 3% | DYN | 11% | PPL | 10% | MIR | 23% | PPL | 7% | PPL | 9% |
| PPL | 7% | MIR | 9% | PPL | 2% | PPL | 10% | RRI | 10% | PEG | 22% | DYN | 7% | ORA | 9% |
| D | 4% | PPL | 8% | ED | 1% | D | 7% | ORA | 8% | PPL | 19% | D | 5% | D | 6% |
| RRI | 3% | ETR | 8% | CMS | 1% | SRE | 3% | NRG | 8% | ETR | 18% | SRE | 2% | RRI | 5% |
| NRG | 2% | ORA | 6% | SRE | 0% | CMS | 2% | D | 6% | AYE | 17% | RRI | 2% | NRG | 4% |
| SRE | 2% | AYE | 5% | EAS | 0% | RRI | 1% | MIR | 6% | ORA | 12% | CMS | 1% | SRE | 3% |
| CMS | 1% | D | 5% | POM | -1% | ED | 1% | AYE | 4% | D | 11% | ED | 1% | EIX | 2% |
| EIX | 1% | EIX | 4% | AES | -3% | POM | 1% | EIX | 3% | EIX | 11% | POM | 0% | CMS | 1% |
| ED | 1% | SRE | 3% | DUK | -4% | AES | 0% | SRE | 3% | AEE | 8% | EIX | 0% | ED | 1% |
| POM | 0% | AEE | 2% | EIX | -9% | EIX | 0% | CMS | 1% | SRE | 6% | AES | 0% | MIR | 1% |
| AES | 0% | AES | 1% | AEE | -12% | EAS | 0% | AES | 1% | AES | 4% | EAS | 0% | AYE | 1% |
| EAS | 0% | DUK | 1% | DYN | -14% | NRG | 0% | ED | 1% | DUK | 4% | NRG | 0% | AES | 1% |
| DUK | 0% | CMS | 1% | AYE | -20% | DUK | -1% | AEE | 1% | CMS | 3% | DUK | -1% | POM | 1% |
| MIR | 0% | ED | 1% | RRI | -20% | AYE | -2% | DUK | 1% | ED | 2% | AYE | -2% | DUK | 0% |
| AYE | 0% | POM | 1% | NRG | -25% | AEE | -2% | POM | 1% | POM | 2% | AEE | -2% | EAS | 0% |
| AEE | -1% | EAS | 0% | MIR | -30% | MIR | -4% | EAS | 0% | EAS | 0% | MIR | -3% | AEE | -1% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

## Value of Coal Assets

In this updated carbon analysis we have broken out the constituent asset classes to better understand the major driving forces behind the consolidated impact. In Exhibit 21 we highlight the consolidated impact to coal assets assuming our probability weighted outcome with numerical detail per scenario in Exhibit 22–Exhibit 23. Even with allocations as assumed in these numbers, coal assets still experience a negative impact with the magnitude dependent not only on MWh produced but also on market conditions. Exhibit 24 highlights the differences on a per MWh basis that are created by specific market conditions.

**Exhibit 21: Consolidated Impact to Coal Assets by Company on CS Probability Weighted Outcome**




*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

## Coal Asset Numerical Detail

### Exhibit 22: NPV Impact per Share of Carbon on Coal Assets by Company

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FE | 0.52 | FE | 0.70 | CPN | 0.00 | CPN | 0.00 | FE | 0.73 | FE | 1.70 | CPN | 0.00 | SRE | 0.00 |
| AYE | 0.21 | DYN | 0.04 | CMS | 0.00 | CMS | 0.00 | DYN | 0.02 | AYE | 0.44 | CMS | 0.00 | ORA | 0.00 |
| DYN | 0.02 | DUK | 0.00 | ED | 0.00 | ED | 0.00 | SRE | 0.00 | DYN | 0.16 | ED | 0.00 | NGG | 0.00 |
| SRE | 0.00 | ORA | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | ORA | 0.00 | DUK | 0.07 | ENSTY | 0.00 | ETR | 0.00 |
| ORA | 0.00 | SRE | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | CPN | 0.00 | PPL | 0.05 | EDPFY | 0.00 | ENSTY | 0.00 |
| NGG | 0.00 | CPN | 0.00 | EAS | 0.00 | EAS | 0.00 | CMS | 0.00 | ETR | 0.00 | EAS | 0.00 | EDPFY | 0.00 |
| ETR | 0.00 | ED | 0.00 | ETR | 0.00 | ETR | 0.00 | ED | 0.00 | NGG | 0.00 | ETR | 0.00 | ED | 0.00 |
| ENSTY | 0.00 | ENSTY | 0.00 | NGG | 0.00 | NGG | 0.00 | ENSTY | 0.00 | EAS | 0.00 | NGG | 0.00 | EAS | 0.00 |
| EDPFY | 0.00 | EAS | 0.00 | ORA | 0.00 | ORA | 0.00 | EDPFY | 0.00 | CPN | 0.00 | ORA | 0.00 | CPN | 0.00 |
| ED | 0.00 | EDPFY | 0.00 | SRE | 0.00 | SRE | 0.00 | EAS | 0.00 | CMS | 0.00 | SRE | 0.00 | CMS | 0.00 |
| EAS | 0.00 | CMS | 0.00 | SZEZY | (0.12) | FPL | (0.09) | ETR | 0.00 | ED | 0.00 | FPL | (0.07) | FPL | (0.06) |
| CMS | 0.00 | ETR | 0.00 | FPL | (0.13) | SZEZY | (0.09) | NGG | 0.00 | ENSTY | 0.00 | SZEZY | (0.08) | SZEZY | (0.07) |
| CPN | 0.00 | NGG | 0.00 | POM | (0.37) | POM | (0.19) | DUK | (0.02) | EDPFY | 0.00 | POM | (0.16) | POM | (0.13) |
| DUK | (0.03) | FPL | (0.04) | EXC | (0.76) | DUK | (0.30) | FPL | (0.05) | ORA | 0.00 | DUK | (0.28) | DUK | (0.19) |
| PPL | (0.03) | POM | (0.04) | DUK | (0.80) | EXC | (0.37) | SZEZY | (0.06) | SRE | 0.00 | EXC | (0.31) | EXC | (0.24) |
| FPL | (0.03) | SZEZY | (0.04) | AES | (1.49) | DYN | (0.57) | POM | (0.09) | FPL | (0.05) | DYN | (0.54) | DYN | (0.35) |
| SZEZY | (0.05) | EXC | (0.06) | DYN | (1.62) | AES | (0.88) | EXC | (0.12) | POM | (0.05) | AES | (0.74) | AES | (0.63) |
| POM | (0.06) | AYE | (0.10) | PEG | (1.82) | PEG | (0.93) | PPL | (0.25) | SZEZY | (0.07) | PEG | (0.80) | PEG | (0.65) |
| EXC | (0.07) | PPL | (0.12) | D | (2.11) | D | (1.03) | AYE | (0.34) | EXC | (0.07) | D | (0.88) | D | (0.70) |
| D | (0.15) | D | (0.22) | IPRPY | (2.82) | IPRPY | (1.62) | D | (0.38) | AEE | (0.17) | IPRPY | (1.37) | IPRPY | (1.15) |
| RRI | (0.20) | PEG | (0.24) | PPL | (4.43) | PPL | (1.81) | PEG | (0.39) | D | (0.25) | PPL | (1.62) | PPL | (1.16) |
| PEG | (0.24) | RRI | (0.28) | RRI | (4.83) | RRI | (2.19) | AES | (0.47) | PEG | (0.28) | RRI | (1.88) | FE | (1.39) |
| AES | (0.31) | AES | (0.31) | MIR | (5.46) | FE | (2.43) | RRI | (0.55) | RRI | (0.29) | MIR | (2.19) | RRI | (1.44) |
| MIR | (0.33) | MIR | (0.43) | CEG | (6.40) | MIR | (2.58) | AEE | (0.74) | AES | (0.42) | FE | (2.46) | MIR | (1.71) |
| AEE | (0.44) | AEE | (0.44) | AEE | (7.21) | CEG | (3.02) | IPRPY | (0.77) | CEG | (0.44) | CEG | (2.59) | CEG | (2.01) |
| CEG | (0.46) | IPRPY | (0.53) | FE | (8.43) | AEE | (3.10) | MIR | (0.78) | MIR | (0.45) | AEE | (2.80) | AEE | (2.07) |
| IPRPY | (0.49) | CEG | (0.54) | EIX | (9.58) | AYE | (4.07) | CEG | (0.97) | IPRPY | (0.77) | AYE | (3.59) | AYE | (2.55) |
| EIX | (0.82) | EIX | (1.23) | AYE | (10.34) | EIX | (4.92) | EIX | (1.94) | EIX | (1.49) | EIX | (4.14) | EIX | (3.37) |
| NRG | (2.45) | NRG | (2.84) | NRG | (14.34) | NRG | (8.44) | NRG | (4.22) | NRG | (4.11) | NRG | (6.95) | NRG | (5.97) |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

### Exhibit 23: NPV Impact of Carbon on Coal Assets by Company as Percentage of Current Share Price

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FE | 1% | FE | 1% | CPN | 0% | CPN | 0% | FE | 1% | FE | 2% | CPN | 0% | SRE | 0% |
| AYE | 0% | DYN | 0% | CMS | 0% | CMS | 0% | DYN | 0% | DYN | 2% | CMS | 0% | ORA | 0% |
| DYN | 0% | DUK | 0% | ED | 0% | ED | 0% | SRE | 0% | AYE | 1% | ED | 0% | NGG | 0% |
| SRE | 0% | ORA | 0% | ENSTY | 0% | ENSTY | 0% | ORA | 0% | DUK | 0% | ENSTY | 0% | ETR | 0% |
| ORA | 0% | SRE | 0% | EDPFY | 0% | EDPFY | 0% | CPN | 0% | PPL | 0% | EDPFY | 0% | ENSTY | 0% |
| NGG | 0% | CPN | 0% | EAS | 0% | EAS | 0% | CMS | 0% | ETR | 0% | EAS | 0% | EDPFY | 0% |
| ETR | 0% | ENSTY | 0% | ETR | 0% | ETR | 0% | ED | 0% | NGG | 0% | ETR | 0% | ED | 0% |
| ENSTY | 0% | ED | 0% | NGG | 0% | NGG | 0% | ENSTY | 0% | EAS | 0% | NGG | 0% | EAS | 0% |
| EDPFY | 0% | CMS | 0% | ORA | 0% | ORA | 0% | EDPFY | 0% | CPN | 0% | ORA | 0% | CPN | 0% |
| ED | 0% | EDPFY | 0% | SRE | 0% | SRE | 0% | EAS | 0% | CMS | 0% | SRE | 0% | CMS | 0% |
| CPN | 0% | EAS | 0% | BRK.A | 0% | BRK.A | 0% | ETR | 0% | ED | 0% | BRK.A | 0% | BRK.A | 0% |
| EAS | 0% | NGG | 0% | SZEZY | 0% | FPL | 0% | NGG | 0% | ENSTY | 0% | FPL | 0% | FPL | 0% |
| CMS | 0% | ETR | 0% | FPL | 0% | SZEZY | 0% | BRK.A | 0% | EDPFY | 0% | SZEZY | 0% | SZEZY | 0% |
| BRK.A | 0% | BRK.A | 0% | EXC | -1% | EXC | 0% | FPL | 0% | SRE | 0% | EXC | 0% | EXC | 0% |
| FPL | 0% | FPL | 0% | POM | -1% | POM | -1% | SZEZY | 0% | ORA | 0% | POM | -1% | POM | 0% |
| PPL | 0% | SZEZY | 0% | IPRPY | -3% | DUK | -2% | DUK | 0% | BRK.A | 0% | DUK | -2% | DUK | -1% |
| SZEZY | 0% | EXC | 0% | PEG | -4% | IPRPY | -2% | EXC | 0% | FPL | 0% | IPRPY | -2% | PEG | -1% |
| EXC | 0% | POM | 0% | D | -4% | PEG | -2% | POM | 0% | EXC | 0% | PEG | -2% | IPRPY | -1% |
| DUK | 0% | AYE | 0% | DUK | -5% | D | -2% | PPL | 0% | SZEZY | 0% | D | -2% | D | -1% |
| POM | 0% | PPL | 0% | CEG | -8% | FE | -3% | AYE | -1% | POM | 0% | FE | -3% | FE | -2% |
| D | 0% | D | 0% | AES | -8% | PPL | -3% | D | -1% | AEE | 0% | PPL | -3% | PPL | -2% |
| PEG | -1% | PEG | -1% | PPL | -8% | CEG | -4% | PEG | -1% | D | -1% | CEG | -3% | CEG | -2% |
| CEG | -1% | IPRPY | -1% | FE | -10% | AES | -5% | IPRPY | -1% | CEG | -1% | AES | -4% | AES | -3% |
| IPRPY | -1% | CEG | -1% | MIR | -13% | DYN | -6% | CEG | -1% | PEG | -1% | MIR | -5% | DYN | -4% |
| MIR | -1% | AEE | -1% | AEE | -17% | MIR | -6% | AEE | -2% | IPRPY | -1% | DYN | -6% | MIR | -4% |
| RRI | -1% | MIR | -1% | DYN | -18% | AEE | -7% | MIR | -2% | MIR | -1% | AEE | -7% | AYE | -5% |
| AEE | -1% | RRI | -1% | EIX | -19% | AYE | -8% | RRI | -2% | RRI | -1% | AYE | -7% | AEE | -5% |
| EIX | -2% | AES | -2% | AYE | -20% | EIX | -10% | AES | -2% | AES | -2% | EIX | -8% | RRI | -6% |
| AES | -2% | EIX | -2% | RRI | -21% | RRI | -10% | EIX | -4% | EIX | -3% | RRI | -8% | EIX | -7% |
| NRG | -6% | NRG | -7% | NRG | -33% | NRG | -20% | NRG | -10% | NRG | -10% | NRG | -16% | NRG | -14% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

## Market Conditions Matter – Tough for Coal Plants in Gas Markets

In Exhibit 24 we show the valuation impact per TWh. The material spread across companies highlights that the regional asset differences in dispatch curves meaningfully impacts the overall economics of coal plants in a costed carbon world.

Companies with coal assets located in markets where gas assets mostly set the marginal cost of power are hurt the most (e.g. Texas). Since gas assets emit about half as much $CO_2$ per MWh of electricity produced, coal margins will be squeezed when gas assets set the marginal price of electricity. As a general rule of thumb, for every $1 / ton of $CO_2$ cost, coal plant operating costs rise by $1 / MWh whereas gas plant operating costs rise by $0.50 / MWh, so coal margins are squeezed 50% when gas assets set the marginal price of power.

To further highlight market differences, Exhibit 25 shows the percentage of time coal sets the power price by region as estimated from our dispatch curves.

**Exhibit 24: NPV Impact of Carbon $s in MM per TWh**

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| USPG | 0.00 | SRE | 0.00 | ED | 0.00 | ED | 0.00 | CPN | 0.00 | AYE | 2.34 | ENSTY | 0.00 |
| Tenaska | 0.00 | CPN | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | CMS | 0.00 | PPL | 0.28 | EDPFY | 0.00 |
| SRE | 0.00 | CMS | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | ED | 0.00 | CPN | 0.00 | EAS | 0.00 |
| ORA | 0.00 | ED | 0.00 | EAS | 0.00 | EAS | 0.00 | ENSTY | 0.00 | CMS | 0.00 | ETR | 0.00 |
| NGG | 0.00 | ENSTY | 0.00 | ETR | 0.00 | ETR | 0.00 | EDPFY | 0.00 | ED | 0.00 | NGG | 0.00 |
| ETR | 0.00 | EDPFY | 0.00 | NGG | 0.00 | NGG | 0.00 | EAS | 0.00 | ENSTY | 0.00 | ORA | 0.00 |
| ENSTY | 0.00 | EAS | 0.00 | ORA | 0.00 | ORA | 0.00 | ETR | 0.00 | EDPFY | 0.00 | SRE | 0.00 |
| EDPFY | 0.00 | ETR | 0.00 | SRE | 0.00 | SRE | 0.00 | NGG | 0.00 | EAS | 0.00 | Tenaska | 0.00 |
| ED | 0.00 | NGG | 0.00 | Tenaska | 0.00 | Tenaska | 0.00 | ORA | 0.00 | ETR | 0.00 | USPG | 0.00 |
| EAS | 0.00 | ORA | 0.00 | FPL | (1.02) | FPL | (0.68) | SRE | 0.00 | NGG | 0.00 | FPL | (0.55) |
| FPL | (0.23) | Tenaska | 0.00 | EXC | (2.87) | EXC | (1.40) | USPG | 0.00 | Tenaska | 0.00 | EXC | (1.17) |
| CPN | 0.00 | USPG | 0.00 | BRK.A | (8.49) | PEG | (5.04) | FPL | (0.42) | USPG | 0.00 | PEG | (4.33) |
| POM | (2.23) | EXC | (0.21) | PEG | (9.86) | BRK.A | (5.34) | EXC | (0.45) | ORA | 0.00 | BRK.A | (4.52) |
| PPL | (0.15) | FPL | (0.28) | SZEZY | (10.50) | FE | (6.63) | DUK | (0.70) | SRE | 0.00 | POM | (6.02) |
| CMS | 0.00 | AYE | (0.50) | POM | (14.07) | POM | (7.14) | PPL | (1.40) | EXC | (0.28) | SZEZY | (6.57) |
| EXC | (0.26) | PPL | (0.66) | CEG | (19.03) | SZEZY | (7.91) | AYE | (1.76) | FPL | (0.39) | FE | (6.70) |
| BRK.A | (1.92) | PEG | (1.30) | IPRPY | (21.84) | DYN | (8.65) | PEG | (2.08) | AEE | (1.24) | CEG | (7.70) |
| AEE | (3.12) | POM | (1.56) | FE | (22.97) | CEG | (8.99) | CEG | (2.87) | CEG | (1.32) | DYN | (8.18) |
| AES | (8.31) | CEG | (1.62) | PPL | (24.34) | PPL | (9.92) | RRI | (3.23) | PEG | (1.51) | PPL | (8.88) |
| MIR | (1.62) | RRI | (1.64) | DYN | (24.64) | DUK | (10.81) | BRK.A | (3.29) | RRI | (1.69) | DUK | (10.29) |
| IPRPY | (3.81) | MIR | (2.09) | D | (25.22) | D | (12.30) | POM | (3.30) | POM | (1.96) | D | (10.50) |
| RRI | (1.20) | BRK.A | (2.13) | MIR | (26.79) | IPRPY | (12.53) | MIR | (3.82) | MIR | (2.23) | IPRPY | (10.64) |
| CEG | (1.37) | D | (2.59) | RRI | (28.32) | MIR | (12.67) | D | (4.56) | BRK.A | (3.02) | MIR | (10.75) |
| SZEZY | (3.95) | AEE | (3.13) | DUK | (29.16) | RRI | (12.85) | AEE | (5.27) | D | (3.03) | RRI | (11.03) |
| NRG | (6.92) | SZEZY | (3.62) | AES | (40.42) | AYE | (21.39) | SZEZY | (5.58) | SZEZY | (5.89) | AYE | (18.87) |
| DUK | (1.03) | IPRPY | (4.08) | NRG | (40.53) | AEE | (22.02) | IPRPY | (5.97) | IPRPY | (5.95) | NRG | (19.66) |
| PEG | (1.28) | EIX | (7.08) | AEE | (51.16) | AES | (23.84) | EIX | (11.11) | EIX | (8.51) | AEE | (19.89) |
| EIX | (4.68) | NRG | (8.02) | AYE | (54.44) | NRG | (23.85) | NRG | (11.92) | AES | (11.25) | AES | (19.98) |
| D | (1.85) | AES | (8.26) | EIX | (54.92) | EIX | (28.17) | AES | (12.72) | NRG | (11.62) | EIX | (23.74) |
| TXU | (16.17) | TXU | (17.58) | TXU | (71.24) | TXU | (44.71) | TXU | (27.45) | TXU | (25.30) | TXU | (37.58) |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

**Exhibit 25: Percentage of Time Coal Sets the Marginal Price of Electricity**

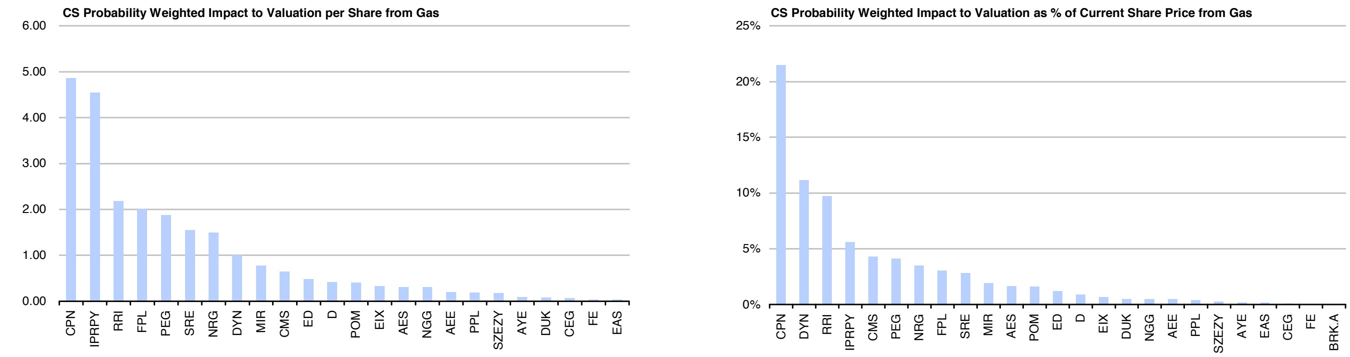
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|
| **ATC % of Time Coal on the Margin** | | | | | | | | |
| ERCOT | 5% | 5% | 5% | 4% | 4% | 4% | 1% | 0% |
| MISO | 47% | 46% | 47% | 41% | 35% | 32% | 30% | 29% |
| NYISO | 3% | 3% | 4% | 4% | 2% | 2% | 2% | 0% |
| NEPOOL | 18% | 18% | 20% | 20% | 16% | 17% | 14% | 17% |
| PJM | 31% | 30% | 27% | 24% | 23% | 19% | 15% | 16% |
| WECC | 11% | 9% | 8% | 7% | 6% | 4% | 0% | 0% |
| CAISO | 10% | 7% | 7% | 8% | 6% | 7% | 0% | 0% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Value of Gas Assets

Before taking into consideration allocations, gas assets should benefit under costed carbon if the asset efficiency (aka heat rate) is better (lower) than the efficiency of the marginal plant. In Exhibit 26 we highlight the consolidated impact to gas assets assuming our probability weighted outcome with numerical detail per scenario in Exhibit 27–Exhibit 28.

**Exhibit 26: Consolidated Impact to Gas Assets by Company on CS Probability Weighted Outcome**




*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

## Gas Asset Numerical Detail

### Exhibit 27: NPV Impact per Share of Carbon on Gas Assets by Company

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPN | 2.93 | CPN | 4.68 | IPRPY | 4.38 | CPN | 6.27 | CPN | 6.92 | CPN | 6.76 | CPN | 4.00 | CPN | 4.87 |
| IPRPY | 2.30 | IPRPY | 4.17 | CPN | 4.03 | IPRPY | 5.98 | IPRPY | 6.33 | IPRPY | 5.97 | IPRPY | 3.77 | IPRPY | 4.54 |
| RRI | 1.68 | RRI | 2.12 | FPL | 1.81 | RRI | 2.77 | RRI | 2.98 | RRI | 3.39 | RRI | 1.81 | RRI | 2.19 |
| NRG | 1.52 | NRG | 1.87 | PEG | 1.53 | FPL | 2.63 | FPL | 2.81 | FPL | 2.75 | FPL | 1.67 | FPL | 2.01 |
| PEG | 1.20 | FPL | 1.85 | RRI | 1.44 | PEG | 2.42 | PEG | 2.53 | PEG | 2.75 | PEG | 1.58 | PEG | 1.88 |
| FPL | 1.08 | PEG | 1.72 | SRE | 1.01 | SRE | 1.96 | NRG | 2.45 | NRG | 2.49 | SRE | 1.24 | SRE | 1.55 |
| SRE | 0.97 | SRE | 1.58 | DYN | 0.87 | NRG | 1.68 | SRE | 2.34 | SRE | 2.26 | NRG | 1.23 | NRG | 1.50 |
| MIR | 0.88 | MIR | 1.01 | CMS | 0.63 | DYN | 1.29 | DYN | 1.34 | MIR | 1.84 | DYN | 0.87 | DYN | 1.00 |
| DYN | 0.63 | DYN | 0.90 | ED | 0.41 | CMS | 0.86 | MIR | 1.24 | DYN | 1.41 | MIR | 0.57 | MIR | 0.78 |
| NGG | 0.36 | CMS | 0.59 | D | 0.39 | MIR | 0.84 | CMS | 0.89 | CMS | 0.87 | CMS | 0.52 | CMS | 0.65 |
| CMS | 0.35 | NGG | 0.46 | POM | 0.34 | ED | 0.61 | ED | 0.63 | ED | 0.70 | ED | 0.43 | ED | 0.49 |
| ED | 0.35 | ED | 0.45 | AES | 0.26 | D | 0.54 | POM | 0.55 | NGG | 0.62 | D | 0.37 | D | 0.42 |
| EIX | 0.31 | POM | 0.37 | AEE | 0.18 | POM | 0.53 | D | 0.54 | POM | 0.61 | POM | 0.34 | POM | 0.41 |
| POM | 0.28 | D | 0.37 | PPL | 0.17 | AES | 0.40 | EIX | 0.47 | D | 0.59 | EIX | 0.29 | EIX | 0.34 |
| D | 0.27 | EIX | 0.35 | EIX | 0.14 | EIX | 0.40 | NGG | 0.46 | EIX | 0.56 | AES | 0.27 | AES | 0.31 |
| AES | 0.19 | AES | 0.27 | NRG | 0.14 | NGG | 0.33 | AES | 0.41 | AES | 0.46 | NGG | 0.22 | NGG | 0.31 |
| AEE | 0.14 | SZEZY | 0.17 | SZEZY | 0.14 | AEE | 0.26 | PPL | 0.25 | AEE | 0.29 | AEE | 0.18 | AEE | 0.20 |
| PPL | 0.11 | PPL | 0.17 | AYE | 0.07 | PPL | 0.25 | SZEZY | 0.25 | PPL | 0.28 | PPL | 0.16 | PPL | 0.19 |
| SZEZY | 0.11 | AEE | 0.17 | CEG | 0.06 | SZEZY | 0.23 | AEE | 0.24 | SZEZY | 0.26 | SZEZY | 0.15 | SZEZY | 0.18 |
| DUK | 0.06 | DUK | 0.08 | DUK | 0.05 | AYE | 0.11 | DUK | 0.12 | AYE | 0.13 | DUK | 0.07 | AYE | 0.09 |
| AYE | 0.06 | AYE | 0.08 | EAS | 0.03 | DUK | 0.11 | AYE | 0.12 | DUK | 0.13 | AYE | 0.07 | DUK | 0.08 |
| CEG | 0.05 | CEG | 0.06 | FE | 0.02 | CEG | 0.09 | CEG | 0.09 | CEG | 0.10 | CEG | 0.06 | CEG | 0.07 |
| FE | 0.03 | FE | 0.03 | ENSTY | 0.00 | EAS | 0.04 | FE | 0.04 | FE | 0.05 | FE | 0.03 | FE | 0.03 |
| EAS | 0.02 | EAS | 0.03 | EXC | 0.00 | FE | 0.04 | EAS | 0.04 | EAS | 0.05 | EAS | 0.03 | EAS | 0.03 |
| EXC | 0.00 | EXC | 0.00 | EDPFY | 0.00 | EXC | 0.00 | EXC | 0.00 | EXC | 0.00 | EXC | 0.00 | ORA | 0.00 |
| ENSTY | 0.00 | ENSTY | 0.00 | ETR | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | ETR | 0.00 |
| EDPFY | 0.00 | EDPFY | 0.00 | ORA | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | ENSTY | 0.00 |
| ETR | 0.00 | ETR | 0.00 | NGG | (0.08) | ETR | 0.00 | ETR | 0.00 | ETR | 0.00 | ETR | 0.00 | EDPFY | 0.00 |
| ORA | 0.00 | ORA | 0.00 | MIR | (0.51) | ORA | 0.00 | ORA | 0.00 | ORA | 0.00 | ORA | 0.00 | EXC | 0.00 |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

### Exhibit 28: NPV Impact of Carbon on Gas Assets by Company as Percentage of Current Share Price

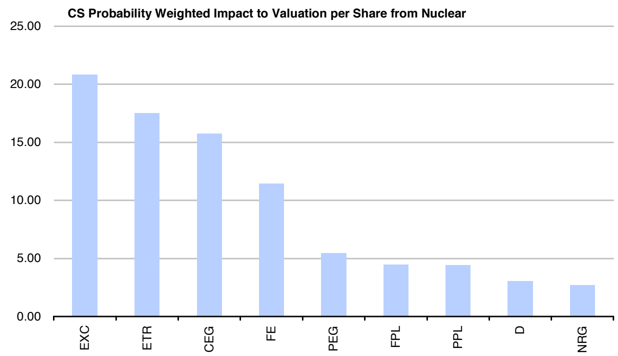
| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPN | 13% | CPN | 21% | CPN | 18% | CPN | 28% | CPN | 31% | CPN | 30% | CPN | 18% | CPN | 21% |
| RRI | 7% | DYN | 10% | DYN | 10% | DYN | 14% | DYN | 15% | DYN | 16% | DYN | 10% | DYN | 11% |
| DYN | 7% | RRI | 9% | RRI | 6% | RRI | 12% | RRI | 13% | RRI | 15% | RRI | 8% | RRI | 10% |
| NRG | 4% | IPRPY | 5% | IPRPY | 5% | IPRPY | 7% | IPRPY | 8% | IPRPY | 7% | IPRPY | 5% | IPRPY | 6% |
| IPRPY | 3% | NRG | 4% | CMS | 4% | CMS | 6% | CMS | 6% | PEG | 6% | CMS | 3% | CMS | 4% |
| PEG | 3% | CMS | 4% | PEG | 3% | PEG | 5% | NRG | 6% | NRG | 6% | PEG | 3% | PEG | 4% |
| CMS | 2% | PEG | 4% | FPL | 3% | FPL | 4% | PEG | 6% | CMS | 6% | NRG | 3% | NRG | 3% |
| MIR | 2% | SRE | 3% | SRE | 2% | NRG | 4% | FPL | 4% | MIR | 5% | FPL | 3% | FPL | 3% |
| SRE | 2% | FPL | 3% | AES | 1% | SRE | 4% | SRE | 4% | FPL | 4% | SRE | 2% | SRE | 3% |
| FPL | 2% | MIR | 2% | POM | 1% | AES | 2% | MIR | 3% | SRE | 4% | AES | 1% | MIR | 2% |
| POM | 1% | POM | 1% | ED | 1% | POM | 2% | AES | 2% | AES | 2% | MIR | 1% | AES | 2% |
| AES | 1% | AES | 1% | D | 1% | MIR | 2% | POM | 2% | POM | 2% | POM | 1% | POM | 2% |
| ED | 1% | ED | 1% | AEE | 0% | ED | 2% | ED | 2% | ED | 2% | ED | 1% | ED | 1% |
| EIX | 1% | D | 1% | PPL | 0% | D | 1% | D | 1% | D | 1% | D | 1% | D | 1% |
| D | 1% | NGG | 1% | NRG | 0% | EIX | 1% | EIX | 1% | EIX | 1% | EIX | 1% | EIX | 1% |
| NGG | 1% | EIX | 1% | DUK | 0% | DUK | 1% | NGG | 1% | NGG | 1% | AEE | 0% | DUK | 0% |
| DUK | 0% | DUK | 0% | EIX | 0% | AEE | 1% | DUK | 1% | DUK | 1% | DUK | 0% | NGG | 0% |
| AEE | 0% | AEE | 0% | SZEZY | 0% | NGG | 0% | AEE | 1% | AEE | 1% | NGG | 0% | AEE | 0% |
| PPL | 0% | PPL | 0% | AYE | 0% | PPL | 0% | PPL | 0% | PPL | 1% | PPL | 0% | PPL | 0% |
| SZEZY | 0% | SZEZY | 0% | EAS | 0% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% |
| AYE | 0% | AYE | 0% | CEG | 0% | AYE | 0% | AYE | 0% | AYE | 0% | AYE | 0% | AYE | 0% |
| EAS | 0% | EAS | 0% | BRK.A | 0% | EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% |
| CEG | 0% | CEG | 0% | FE | 0% | CEG | 0% | CEG | 0% | CEG | 0% | CEG | 0% | CEG | 0% |
| FE | 0% | FE | 0% | ENSTY | 0% | FE | 0% | FE | 0% | FE | 0% | FE | 0% | FE | 0% |
| BRK.A | 0% | BRK.A | 0% | EXC | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% |
| EXC | 0% | EXC | 0% | EDPFY | 0% | EXC | 0% | EXC | 0% | EXC | 0% | EXC | 0% | ORA | 0% |
| ENSTY | 0% | ENSTY | 0% | ETR | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | ETR | 0% |
| EDPFY | 0% | EDPFY | 0% | ORA | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | ENSTY | 0% |
| ETR | 0% | ETR | 0% | NGG | 0% | ETR | 0% | ETR | 0% | ETR | 0% | ETR | 0% | EDPFY | 0% |
| ORA | 0% | ORA | 0% | MIR | -1% | ORA | 0% | ORA | 0% | ORA | 0% | ORA | 0% | EXC | 0% |

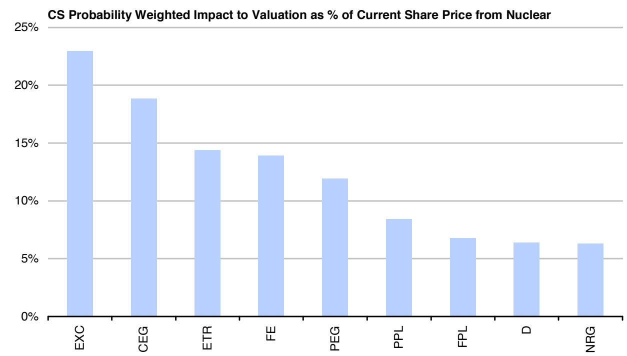
*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Value of Nuclear Assets

Since nuclear assets emit no carbon we would expect nuclear assets to fair the best under various carbon scenarios, benefiting from an increase in market clearing power prices with no associated impact to marginal operating costs. The logic indeed holds true as we show in Exhibit 29. We highlight the numerical detail per scenario in Exhibit 30–Exhibit 31.

**Exhibit 29: Consolidated Impact to Nuclear Assets by Company on CS Probability Weighted Outcome**




*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

### Nuclear Asset Numerical Detail

**Exhibit 30: NPV Impact per Share of Carbon on Nuclear Assets by Company**

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXC | 12.34 | EXC | 16.60 | EXC | 27.34 | EXC | 27.34 | EXC | 23.56 | EXC | 25.09 | EXC | 20.17 | EXC | 20.84 |
| ETR | 10.08 | ETR | 13.87 | ETR | 22.94 | ETR | 22.94 | ETR | 19.66 | ETR | 21.22 | ETR | 17.00 | ETR | 17.51 |
| CEG | 9.15 | CEG | 12.48 | CEG | 20.62 | CEG | 20.62 | CEG | 17.71 | CEG | 19.00 | CEG | 15.25 | CEG | 15.73 |
| FE | 6.67 | FE | 9.09 | FE | 15.04 | FE | 15.04 | FE | 12.94 | FE | 13.77 | FE | 11.05 | FE | 11.45 |
| PEG | 3.23 | PEG | 4.35 | PEG | 7.15 | PEG | 7.15 | PEG | 6.16 | PEG | 6.57 | PEG | 5.28 | PEG | 5.45 |
| FPL | 2.67 | FPL | 3.56 | FPL | 5.84 | FPL | 5.84 | FPL | 5.03 | FPL | 5.40 | FPL | 4.32 | FPL | 4.46 |
| PPL | 2.62 | PPL | 3.52 | PPL | 5.79 | PPL | 5.79 | PPL | 4.99 | PPL | 5.32 | PPL | 4.27 | PPL | 4.42 |
| D | 1.81 | D | 2.42 | D | 3.97 | D | 3.97 | D | 3.42 | D | 3.67 | D | 2.93 | D | 3.03 |
| NRG | 1.49 | NRG | 2.17 | NRG | 3.57 | NRG | 3.57 | NRG | 3.10 | NRG | 3.23 | NRG | 2.60 | NRG | 2.71 |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

**Exhibit 31: NPV Impact of Carbon on Nuclear Assets by Company as Percentage of Current Share Price**

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXC | 14% | EXC | 18% | EXC | 30% | EXC | 30% | EXC | 26% | EXC | 28% | EXC | 22% | EXC | 23% |
| CEG | 11% | CEG | 15% | CEG | 25% | CEG | 25% | CEG | 21% | CEG | 23% | CEG | 18% | CEG | 19% |
| ETR | 8% | ETR | 11% | ETR | 19% | ETR | 19% | ETR | 16% | ETR | 17% | ETR | 14% | ETR | 14% |
| FE | 8% | FE | 11% | FE | 18% | FE | 18% | FE | 16% | FE | 17% | FE | 13% | FE | 14% |
| PEG | 7% | PEG | 9% | PEG | 16% | PEG | 16% | PEG | 13% | PEG | 14% | PEG | 12% | PEG | 12% |
| PPL | 5% | PPL | 7% | PPL | 11% | PPL | 11% | PPL | 9% | PPL | 10% | PPL | 8% | PPL | 8% |
| FPL | 4% | FPL | 5% | FPL | 9% | FPL | 9% | FPL | 8% | FPL | 8% | FPL | 7% | FPL | 7% |
| D | 4% | D | 5% | D | 8% | D | 8% | NRG | 7% | D | 8% | D | 6% | D | 6% |
| NRG | 3% | NRG | 5% | NRG | 8% | NRG | 8% | D | 7% | NRG | 8% | NRG | 6% | NRG | 6% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Value of Wind Assets

To attempt to assess the value of wind without creating another 100 MB model we used some simplifying assumptions. We did not run the wind assets through our dispatch model because a large proportion of wind assets are under contract in various parts of the country (virtually impossible to get the appropriate disclosures required to quantitatively analyze the impact). Instead, we assumed on average gas sets the price of power 50% of the time and used a 35% utilization rate. We include MW additions through 2012 for EIX and FPL and do not assume any benefit for MWs in service before 2008.

### Wind Asset Numerical Detail

**Exhibit 32: NPV Impact per Share of Carbon on Wind Assets by Company**

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FPL | 3.35 | FPL | 3.46 | FPL | 6.15 | FPL | 6.15 | FPL | 5.11 | FPL | 5.88 | FPL | 4.66 | FPL | 4.69 |
| EIX | 1.31 | EIX | 1.23 | EIX | 2.26 | EIX | 2.26 | EIX | 1.83 | EIX | 2.19 | EIX | 1.71 | EIX | 1.72 |
| AES | 0.26 | AES | 0.25 | AES | 0.45 | AES | 0.45 | AES | 0.36 | AES | 0.44 | AES | 0.34 | AES | 0.34 |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

**Exhibit 33: NPV Impact of Carbon on Wind Assets by Company as Percentage of Current Share Price**

| | S1 $20 tax | | S2 S-B | | S3 Obama | | S4 W-L | | S5 McCain | | S6 EU | | S7 W-L HT | | CS Prob. Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FPL | 5% | FPL | 5% | FPL | 9% | FPL | 9% | FPL | 8% | FPL | 9% | FPL | 7% | FPL | 7% |
| EIX | 3% | EIX | 2% | EIX | 4% | EIX | 4% | EIX | 4% | EIX | 4% | EIX | 3% | EIX | 3% |
| AES | 1% | AES | 1% | AES | 2% | AES | 2% | AES | 2% | AES | 2% | AES | 2% | AES | 2% |

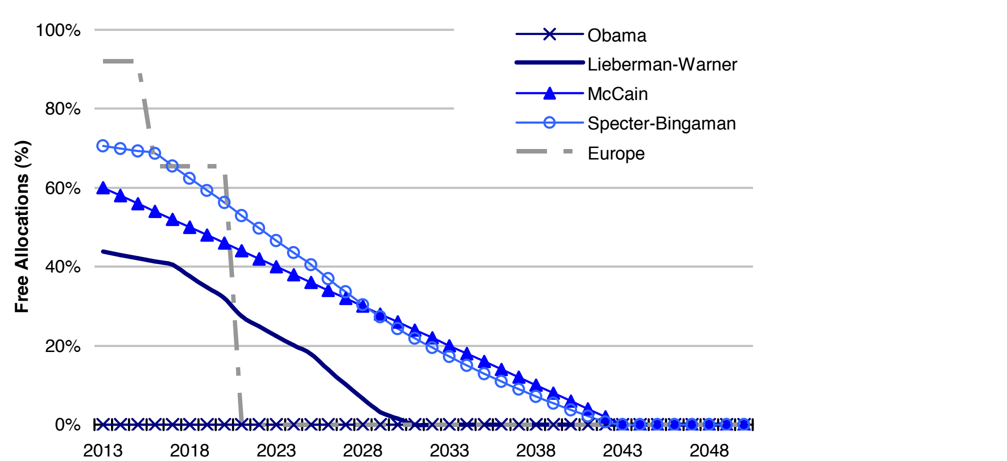
*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Value of Allocations

In all the data previously provided we have assumed a declining level of allocations to phase in the economic burden to dirtier companies as they work to 'clean up their ways' (Exhibit 34 shows the allocations by year). As our math shows, most of the dirtier fleets actually benefit under a costed carbon policy scenario depending on the level of allocations, which is a little strange since the goal of carbon policy should be to provide an economic incentive to reduce $CO_2$ (broadly taken by economists to mean dirty assets pay, clean assets benefit). The valuation swings serve to highlight challenges with implementing any kind of system – there are ways to best play the game given the cards you are dealt.

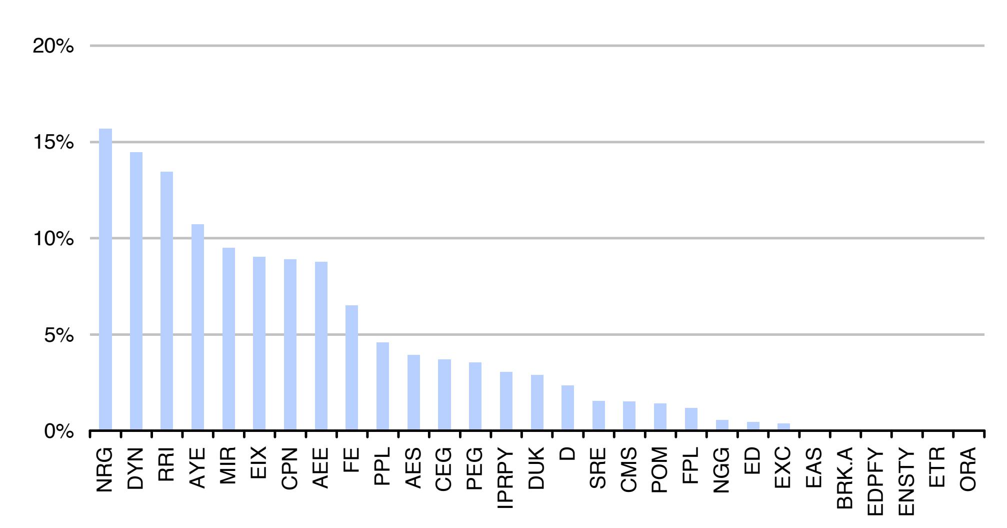
To further highlight the valuation impact from allocations we show the consolidated NPV difference in our seven scenarios between our assumed allocations and no allocations in Exhibit 36 and Exhibit 37.

**Exhibit 34: Assumed Allocations by Year**




*Source: Company data, Credit Suisse estimates*

**Exhibit 35: Positive Impact of Allocations Under $20 / ton Scenario (Impact vs. no Allocations to Current Share Price on CS Probability Weighted Assumptions)**




*Source: Company data, Credit Suisse estimates*

## Exhibit 36: Allocation Value Per Share (Impact with Allocations Less Impact Without Allocations)

| | S1 | | S2 | | S3 | | S4 | | S5 | | S6 | | S7 | | CS Prob. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $20/ton | | S-B | | Obama | W-L | W-L | | McCain | | EU | | W-L HT | | Weighted |
| BRK.A | 0.00 | BRK.A | 34.05 | AEE | 0.00 | BRK.A | 33.30 | BRK.A | 44.54 | BRK.A | 56.53 | BRK.A | 25.19 | BRK.A | 29.74 |
| NRG | 0.00 | NRG | 8.10 | AES | 0.00 | NRG | 7.44 | NRG | 10.42 | NRG | 12.29 | NRG | 5.78 | NRG | 6.75 |
| AYE | 0.00 | AYE | 6.61 | AYE | 0.00 | AYE | 6.33 | AYE | 8.64 | AYE | 10.58 | AYE | 4.79 | AYE | 5.67 |
| FE | 0.00 | FE | 6.33 | BRK.A | 0.00 | FE | 6.02 | FE | 8.08 | FE | 10.11 | FE | 4.61 | FE | 5.40 |
| EIX | 0.00 | EIX | 5.17 | CEG | 0.00 | EIX | 4.93 | EIX | 6.66 | EIX | 8.27 | EIX | 3.75 | EIX | 4.42 |
| MIR | 0.00 | MIR | 4.56 | CMS | 0.00 | MIR | 4.22 | MIR | 5.68 | MIR | 7.28 | MIR | 3.35 | MIR | 3.86 |
| AEE | 0.00 | AEE | 4.41 | CPN | 0.00 | AEE | 4.18 | AEE | 5.63 | AEE | 7.04 | AEE | 3.20 | AEE | 3.76 |
| RRI | 0.00 | RRI | 4.25 | D | 0.00 | RRI | 3.97 | RRI | 5.41 | RRI | 6.73 | RRI | 3.09 | RRI | 3.60 |
| CEG | 0.00 | CEG | 3.79 | DUK | 0.00 | CEG | 3.46 | CEG | 4.70 | CEG | 5.99 | CEG | 2.77 | CEG | 3.18 |
| PPL | 0.00 | IPRPY | 2.89 | DYN | 0.00 | IPRPY | 2.80 | IPRPY | 4.03 | IPRPY | 4.59 | IPRPY | 2.05 | IPRPY | 2.49 |
| IPRPY | 0.00 | PPL | 2.82 | EAS | 0.00 | PPL | 2.70 | PPL | 3.66 | PPL | 4.53 | PPL | 2.05 | PPL | 2.42 |
| CPN | 0.00 | CPN | 2.34 | ED | 0.00 | CPN | 2.24 | CPN | 3.29 | CPN | 3.70 | CPN | 1.68 | CPN | 2.02 |
| PEG | 0.00 | PEG | 1.91 | EDPFY | 0.00 | PEG | 1.84 | PEG | 2.47 | PEG | 3.12 | PEG | 1.41 | PEG | 1.65 |
| DYN | 0.00 | DYN | 1.51 | EIX | 0.00 | DYN | 1.47 | DYN | 2.01 | DYN | 2.44 | DYN | 1.10 | DYN | 1.31 |
| D | 0.00 | D | 1.28 | ENSTY | 0.00 | D | 1.23 | D | 1.63 | D | 2.05 | D | 0.94 | D | 1.10 |
| SRE | 0.00 | SRE | 1.02 | ETR | 0.00 | SRE | 0.95 | SRE | 1.42 | SRE | 1.54 | SRE | 0.71 | SRE | 0.86 |
| AES | 0.00 | AES | 0.90 | EXC | 0.00 | FPL | 0.88 | FPL | 1.26 | FPL | 1.43 | AES | 0.65 | FPL | 0.78 |
| FPL | 0.00 | FPL | 0.89 | FE | 0.00 | AES | 0.84 | AES | 1.13 | AES | 1.42 | FPL | 0.64 | AES | 0.76 |
| DUK | 0.00 | DUK | 0.61 | FPL | 0.00 | DUK | 0.55 | DUK | 0.76 | DUK | 0.95 | DUK | 0.44 | DUK | 0.51 |
| NGG | 0.00 | NGG | 0.49 | IPRPY | 0.00 | NGG | 0.40 | EXC | 0.55 | NGG | 0.69 | EXC | 0.32 | NGG | 0.37 |
| EXC | 0.00 | EXC | 0.45 | MIR | 0.00 | EXC | 0.40 | NGG | 0.53 | EXC | 0.68 | NGG | 0.31 | EXC | 0.37 |
| POM | 0.00 | POM | 0.38 | NGG | 0.00 | POM | 0.37 | POM | 0.48 | POM | 0.65 | POM | 0.29 | POM | 0.33 |
| CMS | 0.00 | CMS | 0.25 | NRG | 0.00 | CMS | 0.25 | CMS | 0.35 | CMS | 0.43 | CMS | 0.19 | CMS | 0.22 |
| ED | 0.00 | ED | 0.21 | ORA | 0.00 | ED | 0.20 | ED | 0.27 | ED | 0.34 | ED | 0.15 | ED | 0.18 |
| SZEZY | 0.00 | SZEZY | 0.18 | PEG | 0.00 | SZEZY | 0.16 | SZEZY | 0.22 | SZEZY | 0.27 | SZEZY | 0.13 | SZEZY | 0.15 |
| EAS | 0.00 | EAS | 0.01 | POM | 0.00 | EAS | 0.01 | EAS | 0.02 | EAS | 0.02 | EAS | 0.01 | EAS | 0.01 |
| EDPFY | 0.00 | EDPFY | 0.00 | PPL | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 |
| ENSTY | 0.00 | ENSTY | 0.00 | RRI | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 | ENSTY | 0.00 |
| ETR | 0.00 | ETR | 0.00 | SRE | 0.00 | ETR | 0.00 | ETR | 0.00 | ETR | 0.00 | ETR | 0.00 | ETR | 0.00 |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

## Exhibit 37: Allocation Value (Impact with Allocations Less Impact Without Allocations) as % of Current Stock Price

| | S1 | | S2 | | S3 | | S4 | | S5 | | S6 | | S7 | | CS Prob. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $20/ton | | S-B | | Obama | W-L | W-L | | McCain | | EU | | W-L HT | | Weighted |
| RRI | 0% | RRI | 19% | AEE | 0% | RRI | 18% | NRG | 24% | RRI | 30% | RRI | 14% | RRI | 16% |
| NRG | 0% | NRG | 19% | AES | 0% | NRG | 17% | RRI | 24% | NRG | 29% | NRG | 13% | NRG | 16% |
| DYN | 0% | DYN | 17% | AYE | 0% | DYN | 16% | DYN | 22% | DYN | 27% | DYN | 12% | DYN | 15% |
| AYE | 0% | AYE | 13% | BRK.A | 0% | AYE | 12% | AYE | 16% | AYE | 20% | AYE | 9% | AYE | 11% |
| MIR | 0% | MIR | 11% | CEG | 0% | MIR | 10% | CPN | 15% | MIR | 18% | MIR | 8% | MIR | 9% |
| AEE | 0% | CPN | 10% | CMS | 0% | CPN | 10% | MIR | 14% | AEE | 16% | AEE | 7% | CPN | 9% |
| CPN | 0% | AEE | 10% | CPN | 0% | AEE | 10% | AEE | 13% | CPN | 16% | CPN | 7% | AEE | 9% |
| EIX | 0% | EIX | 10% | D | 0% | EIX | 10% | EIX | 13% | EIX | 16% | EIX | 7% | EIX | 9% |
| FE | 0% | FE | 8% | DUK | 0% | FE | 7% | FE | 10% | FE | 12% | FE | 6% | FE | 7% |
| PPL | 0% | PPL | 5% | DYN | 0% | PPL | 5% | PPL | 7% | PPL | 9% | PPL | 4% | PPL | 5% |
| AES | 0% | AES | 5% | EAS | 0% | AES | 4% | AES | 6% | AES | 7% | AES | 3% | AES | 4% |
| CEG | 0% | CEG | 5% | ED | 0% | CEG | 4% | CEG | 6% | CEG | 7% | CEG | 3% | CEG | 4% |
| PEG | 0% | PEG | 4% | EDPFY | 0% | PEG | 4% | PEG | 5% | PEG | 7% | PEG | 3% | PEG | 4% |
| DUK | 0% | IPRPY | 4% | EIX | 0% | IPRPY | 3% | IPRPY | 5% | IPRPY | 6% | DUK | 3% | IPRPY | 3% |
| IPRPY | 0% | DUK | 3% | ENSTY | 0% | DUK | 3% | DUK | 4% | DUK | 5% | IPRPY | 3% | DUK | 3% |
| D | 0% | D | 3% | ETR | 0% | D | 3% | D | 3% | D | 4% | D | 2% | D | 2% |
| SRE | 0% | SRE | 2% | EXC | 0% | SRE | 2% | SRE | 3% | CMS | 3% | SRE | 1% | SRE | 2% |
| CMS | 0% | CMS | 2% | FE | 0% | CMS | 2% | CMS | 2% | SRE | 3% | CMS | 1% | CMS | 1% |
| POM | 0% | POM | 1% | FPL | 0% | POM | 1% | FPL | 2% | POM | 2% | POM | 1% | POM | 1% |
| FPL | 0% | FPL | 1% | IPRPY | 0% | FPL | 1% | POM | 2% | FPL | 2% | FPL | 1% | FPL | 1% |
| NGG | 0% | NGG | 1% | MIR | 0% | NGG | 1% | NGG | 1% | NGG | 1% | NGG | 0% | NGG | 1% |
| ED | 0% | ED | 1% | NGG | 0% | ED | 1% | ED | 1% | ED | 1% | ED | 0% | ED | 0% |
| EXC | 0% | EXC | 0% | NRG | 0% | EXC | 0% | EXC | 1% | EXC | 1% | EXC | 0% | EXC | 0% |
| EAS | 0% | EAS | 0% | ORA | 0% | EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% |
| BRK.A | 0% | BRK.A | 0% | PEG | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% |
| EDPFY | 0% | EDPFY | 0% | POM | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% |
| ENSTY | 0% | ENSTY | 0% | PPL | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% |
| ETR | 0% | ETR | 0% | RRI | 0% | ETR | 0% | ETR | 0% | ETR | 0% | ETR | 0% | ETR | 0% |
| ORA | 0% | ORA | 0% | SRE | 0% | ORA | 0% | ORA | 0% | ORA | 0% | ORA | 0% | ORA | 0% |
| **Avg** | **0%** | | **5%** | | **0%** | | **5%** | | **7%** | | **8%** | | **4%** | | **4%** |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Sensitivity Analysis

While we provide various scenarios to better understand the potential implications of proposed carbon policies, we appreciate the point estimate nature of a scenario itself. Carbon policy is a massive political process that is chock full of uncertainties so we think it useful to look at sensitivities around policy including the implementation start date and level of allocations and potential derivative implications (what happens to gas prices? what about electricity demand?).

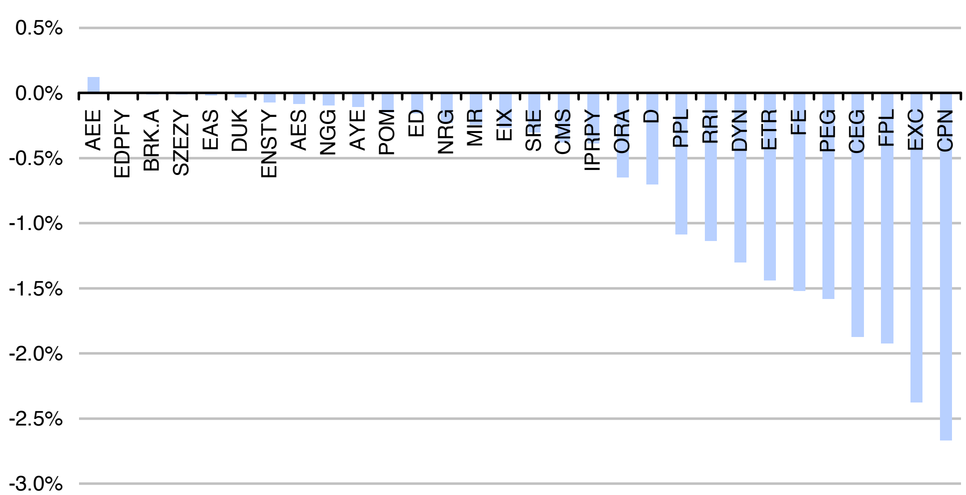
In our sensitivity analyses we use the illustrative $20 / short ton scenario as our starting point.

## Sensitivity to Policy Changes – Start Date

Our current analysis assumes carbon policy is implemented in 2013 to dovetail with whatever plan replaces the Kyoto Treaty. A recent concern we have heard from investors is that the combination of a slow start on Lieberman-Warner, the weak economy, and high energy prices will lead to a delayed implementation of carbon policy. We agree in the sense that we edged out our analysis to start in 2013 from 2012 previously but also appreciate the need to understand the valuation impact of timing changes.

Pushing the start date out by two years decreases the valuation impact by 17% on average, while waiting until 2020 effectively halves the valuation impact. In Exhibit 39 and Exhibit 40 we look at the valuation impacts of delaying legislation annually through 2020 assuming a 10.0% discount rate.

**Exhibit 38: % Impact to Current Share Price On $20 / ton Scenario Shifting from 2013 Start Date to 2015 Start Date**




*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

**Exhibit 39: Sensitivity to Start Date – Change from 2013 Assumptions NPV per Share ($20 / ton scenario)**

| S1 | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | | 2019 | | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEE | 0.03 | AEE | 0.05 | AEE | 0.07 | AEE | 0.09 | AEE | 0.11 | AEE | 0.13 | AEE | 0.14 |
| EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 |
| EAS | (0.00) | EAS | (0.00) | EAS | (0.01) | EAS | (0.01) | EAS | (0.01) | EAS | (0.01) | EAS | (0.01) |
| DUK | (0.00) | DUK | (0.01) | DUK | (0.01) | DUK | (0.01) | DUK | (0.01) | DUK | (0.01) | DUK | (0.02) |
| ENSTY | (0.00) | ENSTY | (0.01) | ENSTY | (0.01) | ENSTY | (0.01) | ENSTY | (0.01) | ENSTY | (0.02) | ENSTY | (0.02) |
| SZEZY | (0.00) | SZEZY | (0.01) | SZEZY | (0.01) | SZEZY | (0.01) | SZEZY | (0.02) | SZEZY | (0.02) | SZEZY | (0.02) |
| AES | (0.01) | AES | (0.02) | AES | (0.02) | AES | (0.03) | AES | (0.03) | AES | (0.04) | AES | (0.04) |
| POM | (0.02) | POM | (0.04) | POM | (0.05) | POM | (0.07) | POM | (0.08) | POM | (0.10) | POM | (0.11) |
| AYE | (0.03) | AYE | (0.06) | AYE | (0.08) | AYE | (0.10) | AYE | (0.12) | AYE | (0.14) | AYE | (0.15) |
| CMS | (0.03) | CMS | (0.06) | CMS | (0.08) | CMS | (0.10) | CMS | (0.13) | CMS | (0.14) | CMS | (0.16) |
| ED | (0.03) | ED | (0.06) | ED | (0.09) | ED | (0.11) | ED | (0.13) | ED | (0.15) | ED | (0.17) |
| NGG | (0.03) | NGG | (0.06) | NGG | (0.09) | NGG | (0.12) | NGG | (0.14) | NGG | (0.16) | NGG | (0.18) |
| NRG | (0.05) | NRG | (0.10) | NRG | (0.14) | NRG | (0.18) | NRG | (0.22) | NRG | (0.25) | NRG | (0.28) |
| MIR | (0.05) | MIR | (0.10) | MIR | (0.14) | MIR | (0.18) | MIR | (0.22) | MIR | (0.25) | MIR | (0.28) |
| DYN | (0.06) | DYN | (0.12) | DYN | (0.17) | DYN | (0.21) | DYN | (0.25) | DYN | (0.29) | DYN | (0.33) |
| EIX | (0.07) | EIX | (0.14) | EIX | (0.20) | EIX | (0.25) | EIX | (0.30) | EIX | (0.34) | EIX | (0.38) |
| SRE | (0.09) | SRE | (0.17) | SRE | (0.24) | SRE | (0.31) | SRE | (0.37) | SRE | (0.42) | SRE | (0.47) |
| RRI | (0.13) | RRI | (0.26) | RRI | (0.37) | RRI | (0.47) | RRI | (0.56) | RRI | (0.64) | RRI | (0.72) |
| IPRPY | (0.16) | IPRPY | (0.31) | IPRPY | (0.45) | IPRPY | (0.57) | IPRPY | (0.68) | IPRPY | (0.79) | IPRPY | (0.88) |
| D | (0.17) | D | (0.33) | D | (0.48) | D | (0.61) | D | (0.73) | D | (0.84) | D | (0.94) |
| ORA | (0.18) | ORA | (0.33) | ORA | (0.48) | ORA | (0.61) | ORA | (0.73) | ORA | (0.84) | ORA | (0.94) |
| PPL | (0.30) | PPL | (0.57) | PPL | (0.82) | PPL | (1.04) | PPL | (1.25) | PPL | (1.43) | PPL | (1.60) |
| CPN | (0.32) | CPN | (0.60) | CPN | (0.87) | CPN | (1.10) | CPN | (1.32) | CPN | (1.52) | CPN | (1.70) |
| PEG | (0.38) | PEG | (0.72) | PEG | (1.04) | PEG | (1.32) | PEG | (1.58) | PEG | (1.82) | PEG | (2.03) |
| FE | (0.66) | FE | (1.25) | FE | (1.79) | FE | (2.29) | FE | (2.73) | FE | (3.14) | FE | (3.51) |
| FPL | (0.67) | FPL | (1.27) | FPL | (1.82) | FPL | (2.32) | FPL | (2.77) | FPL | (3.19) | FPL | (3.56) |
| CEG | (0.82) | CEG | (1.56) | CEG | (2.24) | CEG | (2.85) | CEG | (3.41) | CEG | (3.92) | CEG | (4.38) |
| ETR | (0.92) | ETR | (1.75) | ETR | (2.51) | ETR | (3.20) | ETR | (3.82) | ETR | (4.39) | ETR | (4.91) |
| EXC | (1.13) | EXC | (2.16) | EXC | (3.09) | EXC | (3.94) | EXC | (4.72) | EXC | (5.42) | EXC | (6.06) |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

**Exhibit 40: Sensitivity to Start Date – Change from 2012 Assumptions as % of Current Share Price ($20 / ton scenario)**

| S1 | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | | 2019 | | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEE | 0% | AEE | 0% | AEE | 0% | AEE | 0% | AEE | 0% | AEE | 0% | AEE | 0% |
| EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% |
| BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | EAS | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% |
| SZEZY | 0% | SZEZY | 0% | SZEZY | 0% | DUK | 0% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% |
| EAS | 0% | EAS | 0% | EAS | 0% | ENSTY | 0% | EAS | 0% | EAS | 0% | EAS | 0% |
| DUK | 0% | DUK | 0% | DUK | 0% | SZEZY | 0% | DUK | 0% | DUK | 0% | DUK | 0% |
| ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | AES | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% |
| AES | 0% | AES | 0% | AES | 0% | POM | 0% | AES | 0% | AES | 0% | AES | 0% |
| NGG | 0% | NGG | 0% | NGG | 0% | AYE | 0% | NGG | 0% | NGG | 0% | NGG | 0% |
| AYE | 0% | AYE | 0% | AYE | 0% | CMS | 0% | AYE | 0% | AYE | 0% | AYE | 0% |
| POM | 0% | POM | 0% | POM | 0% | ED | 0% | POM | 0% | POM | 0% | POM | 0% |
| ED | 0% | ED | 0% | ED | 0% | NGG | 0% | ED | 0% | ED | 0% | ED | 0% |
| NRG | 0% | NRG | 0% | NRG | 0% | NRG | 0% | NRG | -1% | NRG | -1% | NRG | -1% |
| MIR | 0% | MIR | 0% | MIR | 0% | MIR | 0% | MIR | -1% | MIR | -1% | MIR | -1% |
| EIX | 0% | EIX | 0% | EIX | 0% | DYN | 0% | EIX | -1% | EIX | -1% | EIX | -1% |
| SRE | 0% | SRE | 0% | SRE | 0% | EIX | -1% | SRE | -1% | SRE | -1% | SRE | -1% |
| CMS | 0% | CMS | 0% | CMS | -1% | SRE | -1% | CMS | -1% | CMS | -1% | CMS | -1% |
| IPRPY | 0% | IPRPY | 0% | IPRPY | -1% | RRI | -1% | IPRPY | -1% | IPRPY | -1% | IPRPY | -1% |
| ORA | 0% | ORA | -1% | ORA | -1% | IPRPY | -1% | ORA | -1% | ORA | -2% | ORA | -2% |
| D | 0% | D | -1% | D | -1% | D | -1% | D | -2% | D | -2% | D | -2% |
| PPL | -1% | PPL | -1% | PPL | -2% | ORA | -2% | PPL | -2% | PPL | -3% | PPL | -3% |
| RRI | -1% | RRI | -1% | RRI | -2% | PPL | -2% | RRI | -2% | RRI | -3% | RRI | -3% |
| DYN | -1% | DYN | -1% | DYN | -2% | CPN | -2% | DYN | -3% | DYN | -3% | DYN | -4% |
| ETR | -1% | ETR | -1% | ETR | -2% | PEG | -3% | ETR | -3% | ETR | -4% | ETR | -4% |
| FE | -1% | FE | -2% | FE | -2% | FE | -3% | FE | -3% | FE | -4% | FE | -4% |
| PEG | -1% | PEG | -2% | PEG | -2% | FPL | -3% | PEG | -3% | PEG | -4% | PEG | -4% |
| CEG | -1% | CEG | -2% | CEG | -3% | CEG | -3% | CEG | -4% | CEG | -5% | CEG | -5% |
| FPL | -1% | FPL | -2% | FPL | -3% | ETR | -4% | FPL | -4% | FPL | -5% | FPL | -5% |
| EXC | -1% | EXC | -2% | EXC | -3% | EXC | -4% | EXC | -5% | EXC | -6% | EXC | -7% |
| CPN | -1% | CPN | -3% | CPN | -4% | BRK.A | -5% | CPN | -6% | CPN | -7% | CPN | -7% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Sensitivity to Policy Changes – Level of Allocations

In Exhibit 41 we highlight the valuation benefit gained from allocations in perpetuity relative to no allocations using our hypothetical $20 / short ton carbon pricing scenario. We are not advocating for any particular level of allocations, but more wanted to highlight the magnitude of valuation swings created by relatively small changes to allocations. On average increasing allocations by 20% has the effect of increasing valuations by 3% on average (Exhibit 42) with coal generators serving as the big winners.

We should note that these changes are from the baseline assumptions of no allocations whereas our targets assume allocation as prescribed by different policies – i.e. don't add these numbers to our targets up front if you assume different allocation outcomes.

**Exhibit 41: Total NPV Impact from Allocations Relative to No Allocations (Using $20/ short ton Price)**

| Allocations--> | 100% | 90% | 80% | 70% | 60% | 50% | 40% | 30% | 20% | 10% |
|---|---|---|---|---|---|---|---|---|---|---|
| AES | 2.17 | 1.96 | 1.74 | 1.52 | 1.30 | 1.09 | 0.87 | 0.65 | 0.43 | 0.22 |
| AYE | 16.02 | 14.42 | 12.82 | 11.21 | 9.61 | 8.01 | 6.41 | 4.81 | 3.20 | 1.60 |
| AEE | 10.72 | 9.65 | 8.57 | 7.50 | 6.43 | 5.36 | 4.29 | 3.22 | 2.14 | 1.07 |
| CPN | 5.64 | 5.08 | 4.51 | 3.95 | 3.39 | 2.82 | 2.26 | 1.69 | 1.13 | 0.56 |
| CMS | 0.58 | 0.52 | 0.47 | 0.41 | 0.35 | 0.29 | 0.23 | 0.17 | 0.12 | 0.06 |
| ED | 0.50 | 0.45 | 0.40 | 0.35 | 0.30 | 0.25 | 0.20 | 0.15 | 0.10 | 0.05 |
| CEG | 9.37 | 8.43 | 7.50 | 6.56 | 5.62 | 4.69 | 3.75 | 2.81 | 1.87 | 0.94 |
| D | 3.13 | 2.82 | 2.51 | 2.19 | 1.88 | 1.57 | 1.25 | 0.94 | 0.63 | 0.31 |
| DUK | 1.52 | 1.37 | 1.22 | 1.06 | 0.91 | 0.76 | 0.61 | 0.46 | 0.30 | 0.15 |
| DYN | 3.67 | 3.31 | 2.94 | 2.57 | 2.20 | 1.84 | 1.47 | 1.10 | 0.73 | 0.37 |
| EIX | 12.56 | 11.31 | 10.05 | 8.80 | 7.54 | 6.28 | 5.03 | 3.77 | 2.51 | 1.26 |
| ENSTY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EDPFY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EAS | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 |
| TXU | | | | | | | | | | |
| ETR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EXC | 1.09 | 0.98 | 0.87 | 0.76 | 0.65 | 0.54 | 0.43 | 0.33 | 0.22 | 0.11 |
| FE | 15.47 | 13.92 | 12.38 | 10.83 | 9.28 | 7.74 | 6.19 | 4.64 | 3.09 | 1.55 |
| FPL | 2.12 | 1.91 | 1.69 | 1.48 | 1.27 | 1.06 | 0.85 | 0.64 | 0.42 | 0.21 |
| IPRPY | 6.86 | 6.18 | 5.49 | 4.80 | 4.12 | 3.43 | 2.74 | 2.06 | 1.37 | 0.69 |
| BRK.A | 84.47 | 76.03 | 67.58 | 59.13 | 50.68 | 42.24 | 33.79 | 25.34 | 16.89 | 8.45 |
| MIR | 11.05 | 9.94 | 8.84 | 7.73 | 6.63 | 5.52 | 4.42 | 3.31 | 2.21 | 1.10 |
| NGG | 1.14 | 1.02 | 0.91 | 0.80 | 0.68 | 0.57 | 0.46 | 0.34 | 0.23 | 0.11 |
| NRG | 20.07 | 18.06 | 16.05 | 14.05 | 12.04 | 10.03 | 8.03 | 6.02 | 4.01 | 2.01 |
| ORA | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| POM | 0.93 | 0.84 | 0.74 | 0.65 | 0.56 | 0.46 | 0.37 | 0.28 | 0.19 | 0.09 |
| PPL | 6.84 | 6.15 | 5.47 | 4.79 | 4.10 | 3.42 | 2.73 | 2.05 | 1.37 | 0.68 |
| PEG | 4.66 | 4.19 | 3.72 | 3.26 | 2.79 | 2.33 | 1.86 | 1.40 | 0.93 | 0.47 |
| RRI | 10.33 | 9.30 | 8.26 | 7.23 | 6.20 | 5.16 | 4.13 | 3.10 | 2.07 | 1.03 |
| SRE | 2.41 | 2.17 | 1.92 | 1.68 | 1.44 | 1.20 | 0.96 | 0.72 | 0.48 | 0.24 |
| SZEZY | 0.44 | 0.39 | 0.35 | 0.31 | 0.26 | 0.22 | 0.18 | 0.13 | 0.09 | 0.04 |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

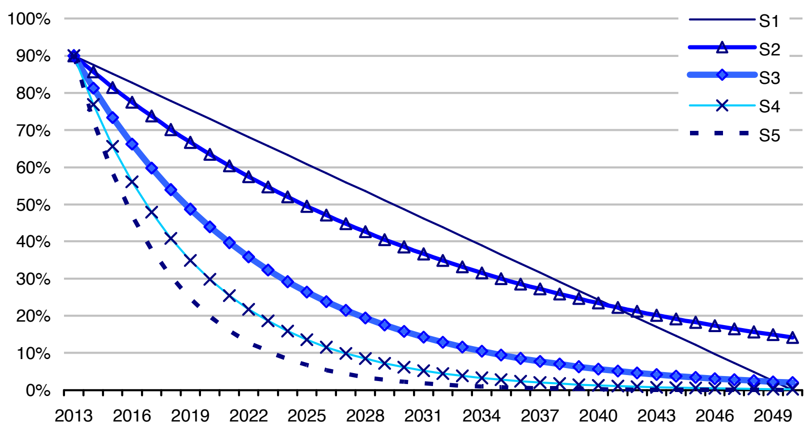
**Exhibit 42: Impact from Allocations Relative to No Allocations (Using $20/ short ton Price) as a % of Current Stock Price**

| 100% | | 80% | | 60% | | 40% | | 20% | |
|---|---|---|---|---|---|---|---|---|---|
| NRG | 47% | NRG | 37% | NRG | 28% | NRG | 19% | NRG | 9% |
| RRI | 46% | RRI | 37% | RRI | 28% | RRI | 18% | RRI | 9% |
| DYN | 41% | DYN | 33% | DYN | 25% | DYN | 16% | DYN | 8% |
| AYE | 30% | AYE | 24% | AYE | 18% | AYE | 12% | AYE | 6% |
| MIR | 27% | MIR | 22% | MIR | 16% | MIR | 11% | MIR | 5% |
| AEE | 25% | AEE | 20% | AEE | 15% | AEE | 10% | AEE | 5% |
| CPN | 25% | CPN | 20% | CPN | 15% | CPN | 10% | CPN | 5% |
| EIX | 25% | EIX | 20% | EIX | 15% | EIX | 10% | EIX | 5% |
| FE | 19% | FE | 15% | FE | 11% | FE | 8% | FE | 4% |
| PPL | 13% | PPL | 10% | PPL | 8% | PPL | 5% | PPL | 3% |
| AES | 11% | AES | 9% | AES | 7% | AES | 5% | AES | 2% |
| CEG | 11% | CEG | 9% | CEG | 7% | CEG | 4% | CEG | 2% |
| PEG | 10% | PEG | 8% | PEG | 6% | PEG | 4% | PEG | 2% |
| DUK | 9% | DUK | 7% | DUK | 5% | DUK | 3% | DUK | 2% |
| IPRPY | 8% | IPRPY | 7% | IPRPY | 5% | IPRPY | 3% | IPRPY | 2% |
| D | 7% | D | 5% | D | 4% | D | 3% | D | 1% |
| SRE | 4% | SRE | 3% | SRE | 3% | SRE | 2% | SRE | 1% |
| CMS | 4% | CMS | 3% | CMS | 2% | CMS | 2% | CMS | 1% |
| POM | 4% | POM | 3% | POM | 2% | POM | 1% | POM | 1% |
| FPL | 3% | FPL | 3% | FPL | 2% | FPL | 1% | FPL | 1% |
| NGG | 2% | NGG | 1% | NGG | 1% | NGG | 1% | NGG | 0% |
| ED | 1% | ED | 1% | ED | 1% | ED | 1% | ED | 0% |
| EXC | 1% | EXC | 1% | EXC | 1% | EXC | 0% | EXC | 0% |
| SZEZY | 1% | SZEZY | 1% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% |
| EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% |
| BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% |
| ORA | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% |
| ETR | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% |
| ENSTY | 0% | ETR | 0% | ETR | 0% | ETR | 0% | ETR | 0% |
| EDPFY | 0% | ORA | 0% | ORA | 0% | ORA | 0% | ORA | 0% |
| **Avg** | **12%** | | **10%** | | **7%** | | **5%** | | **2%** |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

While Exhibit 41 highlights the importance of allocation magnitude, the timing of an assumed phase out also has a material impact. In Exhibit 44 we highlight allocations starting at 90% in 2013 declining to 0% by 2050 under different phase out scenarios (Exhibit 43).

**Exhibit 43: Different Allocation Assumptions by Year**




*Source: Company data, Credit Suisse estimates*

**Exhibit 44: Total NPV Impact from Allocations Relative to No Allocations (Using $20/ short ton Price)**

| Allocations--> | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|
| AES | 1.47 | 1.34 | 1.03 | 0.84 | 0.70 |
| AYE | 10.76 | 9.77 | 7.43 | 5.98 | 5.00 |
| AEE | 7.24 | 6.58 | 5.03 | 4.07 | 3.41 |
| CPN | 3.76 | 3.40 | 2.55 | 2.04 | 1.68 |
| CMS | 0.41 | 0.38 | 0.30 | 0.25 | 0.22 |
| ED | 0.34 | 0.31 | 0.24 | 0.19 | 0.16 |
| CEG | 6.32 | 5.74 | 4.38 | 3.54 | 2.97 |
| D | 2.12 | 1.93 | 1.47 | 1.19 | 1.00 |
| DUK | 1.03 | 0.94 | 0.72 | 0.58 | 0.49 |
| DYN | 2.47 | 2.25 | 1.71 | 1.38 | 1.15 |
| EIX | 8.45 | 7.68 | 5.84 | 4.71 | 3.94 |
| ENSTY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EDPFY | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EAS | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 |
| TXU | | | | | |
| ETR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| EXC | 0.74 | 0.68 | 0.52 | 0.43 | 0.36 |
| FE | 10.41 | 9.46 | 7.20 | 5.81 | 4.87 |
| FPL | 1.42 | 1.29 | 0.98 | 0.79 | 0.66 |
| IPRPY | 4.58 | 4.14 | 3.12 | 2.49 | 2.07 |
| BRK.A | 57.07 | 51.89 | 39.64 | 32.05 | 26.88 |
| MIR | 7.60 | 6.95 | 5.41 | 4.44 | 3.77 |
| NGG | 0.79 | 0.72 | 0.57 | 0.47 | 0.40 |
| NRG | 13.23 | 11.95 | 8.90 | 7.04 | 5.80 |
| ORA | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| POM | 0.66 | 0.61 | 0.49 | 0.41 | 0.36 |
| PPL | 4.60 | 4.18 | 3.18 | 2.56 | 2.14 |
| PEG | 3.20 | 2.93 | 2.28 | 1.87 | 1.59 |
| RRI | 7.03 | 6.40 | 4.93 | 4.02 | 3.39 |
| SRE | 1.58 | 1.42 | 1.05 | 0.83 | 0.68 |
| SZEZY | 0.30 | 0.27 | 0.21 | 0.17 | 0.14 |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

**Exhibit 45: Impact from Allocations Relative to No Allocations (Using $20/ short ton Price) as a % of Current Stock Price**

| | S1 | | S2 | | S3 | | S4 | | S5 |
|---|---|---|---|---|---|---|---|---|---|
| RRI | 31% | RRI | 28% | RRI | 22% | RRI | 18% | RRI | 15% |
| NRG | 31% | NRG | 28% | NRG | 21% | NRG | 16% | NRG | 13% |
| DYN | 28% | DYN | 25% | DYN | 19% | DYN | 15% | DYN | 13% |
| AYE | 20% | AYE | 19% | AYE | 14% | AYE | 11% | AYE | 9% |
| MIR | 19% | MIR | 17% | MIR | 13% | MIR | 11% | MIR | 9% |
| AEE | 17% | AEE | 15% | AEE | 12% | AEE | 10% | AEE | 8% |
| CPN | 17% | CPN | 15% | EIX | 11% | EIX | 9% | EIX | 8% |
| EIX | 16% | EIX | 15% | CPN | 11% | CPN | 9% | CPN | 7% |
| FE | 13% | FE | 11% | FE | 9% | FE | 7% | FE | 6% |
| PPL | 9% | PPL | 8% | PPL | 6% | PPL | 5% | PPL | 4% |
| AES | 8% | AES | 7% | AES | 5% | AES | 4% | AES | 4% |
| CEG | 8% | CEG | 7% | CEG | 5% | CEG | 4% | CEG | 4% |
| PEG | 7% | PEG | 6% | PEG | 5% | PEG | 4% | PEG | 3% |
| DUK | 6% | DUK | 5% | DUK | 4% | DUK | 3% | DUK | 3% |
| IPRPY | 6% | IPRPY | 5% | IPRPY | 4% | IPRPY | 3% | IPRPY | 3% |
| D | 4% | D | 4% | D | 3% | D | 3% | D | 2% |
| SRE | 3% | SRE | 3% | CMS | 2% | CMS | 2% | CMS | 1% |
| CMS | 3% | CMS | 3% | SRE | 2% | POM | 2% | POM | 1% |
| POM | 3% | POM | 2% | POM | 2% | SRE | 1% | SRE | 1% |
| FPL | 2% | FPL | 2% | FPL | 1% | FPL | 1% | FPL | 1% |
| NGG | 1% | NGG | 1% | NGG | 1% | NGG | 1% | NGG | 1% |
| ED | 1% | ED | 1% | ED | 1% | ED | 0% | ED | 0% |
| EXC | 1% | EXC | 1% | EXC | 1% | EXC | 0% | EXC | 0% |
| SZEZY | 0% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% |
| EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% | EAS | 0% |
| BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% |
| ORA | 0% | ORA | 0% | ORA | 0% | ORA | 0% | ORA | 0% |
| ETR | 0% | ETR | 0% | ETR | 0% | ETR | 0% | ETR | 0% |
| ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% | ENSTY | 0% |
| EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% |
| | | | | | | | | | |
| **Avg** | **8%** | | **8%** | | **6%** | | **5%** | | **4%** |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Sensitivity to Derivative Implications – Demand

Perhaps one of the most surprising outcomes to us was the sensitivity to demand reduction. The demand element really comes into play from two angles: first the desire of politicians to push conservation methods and technologies to reduce $CO_2$ emissions and secondly price elasticity from consumers as power prices and thus electricity bills rise. We believe reducing demand will also be important in meeting $CO_2$ targets – our original 2007 analysis concluded that the Utility sector would have a hard time meeting reduction goals through fuel switching alone (displacing coal MWh with gas and new nuclear).

Through previous analysis we do see signs of elasticity when total dollar bills that customers pay reach more than $100–120 / month, but it's hard to accurately capture the price elasticity of customers because we don't have enough pricing history with meaningful price increases. In short, the topic of price elasticity deserves a much longer discussion than the room we can devote to the subject here (read: expect more from us on this topic). To short shift the topic but provide a sense of magnitude, we simply ran our analysis assuming a 50 basis point reduction to demand relative to our base case assumptions and a 100 basis point reduction (Exhibit 46). As Exhibit 47 highlights we can quickly see carbon gains wiped out through lower demand and the economic losses increased as heat rate expansion is tempered and utilization improvements comparatively disappoint.

**Exhibit 46: Credit Suisse Demand Assumptions**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Case | 1.75% | 1.75% | 1.60% | 1.50% | 1.40% | 1.30% | 1.20% | 1.10% | 1.00% | 0.90% | 0.80% | 0.60% | 0.50% |
| Base Case -- 50 bps | 1.75% | 1.75% | 1.60% | 1.50% | 1.40% | 0.80% | 0.70% | 0.60% | 0.50% | 0.40% | 0.30% | 0.10% | 0.00% |
| Base Case -- 100 bps | 1.75% | 1.75% | 1.60% | 1.50% | 1.40% | 0.30% | 0.20% | 0.10% | 0.00% | -0.10% | -0.20% | -0.40% | -0.50% |

*Source: Credit Suisse estimates*

**Exhibit 47: Sensitivity to Changes in Demand Using $20 / ton Scenario with No Allocations**

| NPV -- Change from S1 $ per Share | | | | NPV -- Change from S1 to Current Stock Price | | | |
|---|---|---|---|---|---|---|---|
| | S1 - 50bps | | S1 - 100bps | | S1 - 50bps | | S1 - 100bps |
| EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0% | EDPFY | 0% |
| ENSTY | (0.01) | ENSTY | (0.02) | BRK.A | 0% | BRK.A | 0% |
| EAS | (0.07) | EAS | (0.11) | ENSTY | 0% | ENSTY | 0% |
| SZEZY | (0.11) | SZEZY | (0.20) | SZEZY | 0% | SZEZY | 0% |
| ED | (0.35) | ED | (0.59) | EAS | 0% | EAS | 0% |
| DUK | (0.38) | DUK | (0.68) | NGG | -1% | NGG | -1% |
| ORA | (0.41) | CMS | (0.73) | ORA | -1% | ED | -1% |
| CMS | (0.42) | ORA | (0.79) | ED | -1% | ORA | -2% |
| AES | (0.47) | NGG | (0.82) | SRE | -1% | SRE | -2% |
| NGG | (0.49) | AES | (0.84) | IPRPY | -2% | IPRPY | -4% |
| SRE | (0.63) | POM | (1.08) | DUK | -2% | DUK | -4% |
| POM | (0.66) | SRE | (1.11) | AES | -2% | POM | -4% |
| DYN | (1.04) | DYN | (1.85) | POM | -3% | AES | -4% |
| D | (1.66) | D | (2.85) | ETR | -3% | CMS | -5% |
| IPRPY | (1.74) | IPRPY | (3.14) | CMS | -3% | ETR | -5% |
| CPN | (2.17) | FPL | (3.88) | FPL | -3% | FPL | -6% |
| AEE | (2.22) | CPN | (3.93) | D | -3% | D | -6% |
| FPL | (2.25) | AEE | (3.97) | PPL | -5% | PPL | -8% |
| PPL | (2.40) | PPL | (4.35) | EXC | -5% | EXC | -8% |
| EIX | (2.50) | EIX | (4.48) | EIX | -5% | EIX | -9% |
| NRG | (2.70) | NRG | (4.76) | AEE | -5% | AEE | -9% |
| ETR | (3.22) | PEG | (5.88) | CEG | -6% | CEG | -11% |
| PEG | (3.44) | ETR | (5.94) | NRG | -6% | NRG | -11% |
| AYE | (3.47) | AYE | (6.24) | FE | -7% | FE | -12% |
| EXC | (4.23) | EXC | (7.63) | AYE | -7% | AYE | -12% |
| CEG | (5.04) | CEG | (9.13) | PEG | -8% | PEG | -13% |
| FE | (5.36) | FE | (9.69) | CPN | -10% | CPN | -17% |
| MIR | (6.93) | MIR | (11.24) | DYN | -12% | DYN | -21% |
| RRI | (7.43) | RRI | (11.46) | MIR | -17% | MIR | -28% |
| BRK.A | (36.11) | BRK.A | (64.16) | RRI | -33% | RRI | -51% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Sensitivity to Derivative Implications – Gas Prices

Finally we looked at sensitivities to changing our base case gas price assumption of $9 / MMBtu long term. As the price of carbon rises to support an economic decision to switch from coal to gas fired generation, coal demand declines and natural gas demand increases, which should reduce the price of coal and increase the price of gas. These movements create what we think of as an upward spiraling event, forcing carbon prices to move higher as gas rises and coal falls in order to maintain the economic signal to replace a dirtier coal plant with a gas plant.

In mathematically illustrate the concept discussed above, we highlight the economic switching point using hypothetical fuel costs in Exhibit 48. In this example the carbon price (variable 'A') would have to rise above $59 / short ton to make gas assets cheaper than coal assets and thus shift the merit order of dispatch. Exhibit 49 highlights the carbon switching point based on various coal and gas prices – as coal declines and gas increases the price of carbon rises.

**Exhibit 48: Gas – Coal Parity**

| | Coal | | Natural Gas | Calculations |
|---|---|---|---|---|
| Fuel Expense ($ / MWh) | 37 | | 70 | = $10 / mcf * 7 HR |
| Variable O&M ($ / MWh) | 7 | | 4 | |
| | = | | = | |
| Cash Operating Expenses | 44 | | 74 | Cash Operating Expense |
| Difference in Operating Expenses | | 30 | | = 74 - 44 |
| Carbon Intensity (tons / MWh) | 1.00 | | 0.50 | |
| Carbon Price to Reach Parity ($ / ton) | | A | | Solve to Reach Cost Parity |
| Carbon Expense ($ / MWh) | A x 1.00 | | A x 0.50 | |
| Total Dispatch Costs | 40 + A | | 60 + 0.5A | Cash Oper Expense + Carbon |
| PARITY WHEN: coal = gas dispatch cost | Carbon Price, A = | **59** | | |
| Total Dispatch Costs | 104 | = | 104 | = Fuel + O&M + Carbon Cost |

*Source: Company data, Credit Suisse estimates*

**Exhibit 49: Carbon Price ($ / ton) Required to Reach Economic Parity Under Various Coal and Gas Commodity Assumptions**

| Coal Price $ / MWh | Gas Price $ / MMBtu: 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|
| 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 |
| 32 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 |
| 34 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 |
| 36 | 34 | 50 | 66 | 82 | 98 | 114 | 130 | 146 | 162 |
| 38 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 |
| 40 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 |
| 42 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 |
| 44 | 18 | 34 | 50 | 66 | 82 | 98 | 114 | 130 | 146 |
| 46 | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 |
| 48 | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 |

*Source: Company data, Credit Suisse estimates*

Quantifying the magnitude of swings in commodity prices is another macro model we are admittedly not smart enough to build. Instead we provide sensitivities around our gas assumption in Exhibit 50 assuming a $20 / ton carbon price, no allocations, and unchanged assumptions on all other commodities. In order for the dirtier companies to not see a negative impact from carbon policy, natural gas prices would have to increase by ~$1/MMBtu on average.

## Exhibit 50: Sensitivity to Gas Price Moves – Total NPV per Share

| | $8 | Base Case | $9 | | $10 | | $11 | | $12 | | $13 | | $14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXC | 5.79 | BRK.A | 23.49 | BRK.A | 65.04 | BRK.A | 102.80 | BRK.A | 140.62 | BRK.A | 179.12 | BRK.A | 217.20 |
| FPL | 4.57 | EXC | 12.05 | EXC | 18.22 | ETR | 26.10 | ETR | 33.96 | CEG | 42.77 | CEG | 52.26 |
| ETR | 2.52 | ETR | 10.08 | ETR | 18.03 | EXC | 24.43 | CEG | 33.43 | ETR | 41.89 | ETR | 49.87 |
| ORA | 0.67 | FPL | 6.56 | CEG | 14.77 | CEG | 24.10 | EXC | 30.80 | EXC | 37.19 | EXC | 43.74 |
| NGG | 0.34 | CEG | 4.14 | FE | 9.41 | FE | 17.29 | FE | 25.31 | FE | 33.29 | FE | 41.82 |
| CPN | 0.33 | PEG | 2.47 | FPL | 8.49 | FPL | 10.59 | NRG | 13.20 | NRG | 19.89 | NRG | 26.67 |
| PEG | 0.31 | CPN | 2.04 | PEG | 4.71 | PPL | 8.13 | FPL | 12.71 | PPL | 16.36 | AYE | 19.82 |
| ED | 0.18 | FE | 1.54 | PPL | 4.48 | PEG | 7.16 | PPL | 11.85 | FPL | 14.86 | FPL | 17.06 |
| CMS | 0.05 | ORA | 1.16 | ORA | 3.20 | NRG | 6.60 | PEG | 9.72 | AYE | 14.69 | PEG | 14.89 |
| EAS | 0.02 | PPL | 0.87 | D | 2.70 | D | 4.77 | AYE | 9.63 | PEG | 12.28 | EIX | 13.18 |
| ENSTY | 0.02 | D | 0.87 | CPN | 2.64 | AYE | 4.53 | D | 6.89 | EIX | 9.65 | D | 11.39 |
| SRE | 0.01 | IPRPY | 0.52 | IPRPY | 0.81 | ORA | 4.43 | EIX | 6.29 | D | 9.12 | AEE | 10.65 |
| EDPFY | 0.00 | SRE | 0.19 | SRE | 0.32 | CPN | 3.79 | ORA | 5.67 | AEE | 7.56 | ORA | 8.20 |
| SZEZY | (0.17) | CMS | 0.18 | DYN | 0.19 | EIX | 2.90 | CPN | 4.94 | ORA | 6.92 | CPN | 7.50 |
| POM | (0.24) | ED | 0.09 | CMS | 0.18 | IPRPY | 2.35 | AEE | 4.64 | CPN | 6.12 | IPRPY | 6.93 |
| DUK | (0.98) | ENSTY | 0.00 | ED | 0.15 | AEE | 1.66 | IPRPY | 3.86 | IPRPY | 5.40 | RRI | 6.85 |
| D | (1.16) | POM | 0.00 | ENSTY | 0.06 | DYN | 1.05 | RRI | 2.65 | RRI | 4.62 | PPL | 5.42 |
| AES | (1.34) | EDPFY | (0.08) | NRG | 0.02 | RRI | 0.83 | DYN | 1.91 | MIR | 3.42 | MIR | 5.30 |
| DYN | (1.47) | SZEZY | (0.11) | POM | 0.02 | AES | 0.77 | MIR | 1.64 | DYN | 2.77 | DYN | 3.75 |
| IPRPY | (2.09) | NGG | (0.18) | AES | 0.01 | DUK | 0.51 | AES | 1.53 | AES | 2.29 | AES | 3.16 |
| PPL | (2.83) | EAS | (0.18) | EAS | 0.01 | SRE | 0.45 | DUK | 1.06 | DUK | 1.61 | DUK | 2.18 |
| CEG | (3.19) | DUK | (0.51) | EDPFY | 0.00 | CMS | 0.27 | SRE | 0.62 | POM | 0.84 | POM | 1.16 |
| RRI | (3.69) | DYN | (0.64) | DUK | (0.03) | POM | 0.22 | POM | 0.52 | SRE | 0.83 | SRE | 1.04 |
| MIR | (5.25) | AES | (0.69) | SZEZY | (0.04) | ED | 0.15 | CMS | 0.35 | CMS | 0.43 | CMS | 0.50 |
| FE | (6.12) | RRI | (2.26) | NGG | (0.38) | ENSTY | 0.09 | ED | 0.16 | SZEZY | 0.19 | SZEZY | 0.27 |
| AEE | (6.96) | MIR | (3.47) | EIX | (0.41) | SZEZY | 0.03 | ENSTY | 0.11 | ED | 0.17 | ED | 0.19 |
| EIX | (7.03) | EIX | (3.69) | AYE | (0.44) | EAS | 0.00 | SZEZY | 0.11 | ENSTY | 0.14 | ENSTY | 0.16 |
| BRK.A | (8.93) | AEE | (4.14) | RRI | (0.80) | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 | EDPFY | 0.00 |
| AYE | (10.42) | AYE | (5.39) | AEE | (1.32) | MIR | (0.11) | EAS | (0.00) | EAS | (0.01) | EAS | (0.02) |
| NRG | (12.64) | NRG | (6.43) | MIR | (1.83) | NGG | (0.71) | NGG | (0.98) | NGG | (1.13) | NGG | (1.26) |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

## Exhibit 51: Sensitivity to Gas Price Moves – Total NPV per Share as a % of Current Share Price

| | $8 | Base Case | $9 | | $10 | | $11 | | $12 | | $13 | | $14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FPL | 7% | EXC | 13% | EXC | 20% | CEG | 29% | CEG | 40% | CEG | 51% | CEG | 63% |
| EXC | 6% | FPL | 10% | CEG | 18% | EXC | 27% | EXC | 34% | NRG | 46% | NRG | 62% |
| ETR | 2% | CPN | 9% | ETR | 15% | ETR | 21% | FE | 31% | EXC | 41% | FE | 51% |
| CPN | 1% | ETR | 8% | FPL | 13% | FE | 21% | NRG | 31% | FE | 40% | EXC | 48% |
| ORA | 1% | PEG | 5% | CPN | 12% | CPN | 17% | ETR | 28% | ETR | 34% | DYN | 42% |
| PEG | 1% | CEG | 5% | FE | 11% | FPL | 16% | PPL | 23% | PPL | 31% | ETR | 41% |
| NGG | 1% | ORA | 2% | PEG | 10% | PEG | 16% | CPN | 22% | DYN | 31% | AYE | 38% |
| ED | 0% | FE | 2% | PPL | 9% | PPL | 15% | DYN | 21% | AYE | 28% | CPN | 33% |
| CMS | 0% | D | 2% | ORA | 6% | NRG | 15% | PEG | 21% | CPN | 27% | PEG | 33% |
| ENSTY | 0% | PPL | 2% | D | 6% | DYN | 12% | FPL | 19% | PEG | 27% | RRI | 30% |
| EAS | 0% | CMS | 1% | DYN | 2% | D | 10% | AYE | 18% | FPL | 23% | FPL | 26% |
| SRE | 0% | IPRPY | 1% | CMS | 1% | AYE | 9% | D | 14% | RRI | 21% | EIX | 26% |
| EDPFY | 0% | SRE | 0% | IPRPY | 1% | ORA | 9% | EIX | 12% | D | 19% | AEE | 25% |
| BRK.A | 0% | ED | 0% | ENSTY | 1% | EIX | 6% | RRI | 12% | EIX | 19% | D | 24% |
| SZEZY | 0% | BRK.A | 0% | SRE | 1% | AES | 4% | ORA | 11% | AEE | 18% | AES | 17% |
| POM | -1% | ENSTY | 0% | ED | 0% | AEE | 4% | AEE | 11% | ORA | 13% | ORA | 16% |
| D | -2% | POM | 0% | AES | 0% | RRI | 4% | AES | 8% | AES | 12% | MIR | 13% |
| IPRPY | -3% | EDPFY | 0% | POM | 0% | DUK | 3% | DUK | 6% | DUK | 9% | DUK | 12% |
| CEG | -4% | SZEZY | 0% | NRG | 0% | IPRPY | 3% | IPRPY | 5% | MIR | 8% | PPL | 10% |
| PPL | -5% | NGG | 0% | BRK.A | 0% | CMS | 2% | MIR | 4% | IPRPY | 7% | IPRPY | 9% |
| DUK | -6% | EAS | -1% | EAS | 0% | ENSTY | 1% | CMS | 2% | POM | 3% | POM | 4% |
| AES | -7% | DUK | -3% | EDPFY | 0% | POM | 1% | POM | 2% | CMS | 3% | CMS | 3% |
| FE | -7% | AES | -4% | SZEZY | 0% | SRE | 1% | ENSTY | 1% | SRE | 1% | SRE | 2% |
| MIR | -13% | DYN | -7% | DUK | 0% | ED | 0% | SRE | 1% | ENSTY | 1% | ENSTY | 2% |
| EIX | -14% | EIX | -7% | NGG | -1% | BRK.A | 0% | ED | 0% | ED | 0% | ED | 0% |
| AEE | -16% | MIR | -9% | EIX | -1% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% | SZEZY | 0% |
| DYN | -16% | AEE | -10% | AYE | -1% | EAS | 0% | BRK.A | 0% | BRK.A | 0% | BRK.A | 0% |
| RRI | -16% | RRI | -10% | AEE | -3% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% | EDPFY | 0% |
| AYE | -20% | AYE | -10% | RRI | -4% | MIR | 0% | EAS | 0% | EAS | 0% | EAS | 0% |
| NRG | -29% | NRG | -15% | MIR | -5% | NGG | -1% | NGG | -1% | NGG | -2% | NGG | -2% |

*Source: Publicly Available Company Data, CS Global Commodity Prices, CS Carbon Macro Model, Factset, Bloomberg, Energy Velocity, SNL*

# Appendix A: Methodology

In order to more accurately calculate company specific impacts under a system where the market assesses a cost for carbon, we need to consider changes to four variables to calculate the gross margin impact:

- Plant specific variable operating costs ($ / MWh cost) – different fuel types have different levels of carbon; for example, electricity from coal has about twice as much $CO_2$ as electricity from gas compared with zero $CO_2$ emissions from nuclear. The cost structure (fuel, O&M, carbon) is key to shaping the economic dispatch conversation.

- Price of power ($ / MWh revenue) – in a competitive system where the price of power is determined through the intersection of supply and demand, how does the supply curve shift and what are the implications for market clearing power prices?

- Plant dispatch (number of MWh) – how does plant specific utilization change with carbon? Does this economic element impact the plant's cost competitiveness?

- Sale of excess credits – if the legislative solution allocates credits and a company does not use them, what are they worth?

**Exhibit 52: Changes to Plant Margins Under Carbon Regime**

△ Plant Margins = ( △ Power Prices -- △ Operating Costs ) X △ Dispatch + Sale of Excess Credits

From new supply curve with marginal cost for CO2

$ / ton x tons emitted

Change in supply curve stack with new marginal costs

*Source: Credit Suisse Estimates*

Unfortunately doing an easy back of the envelope analysis fails to capture all four pieces since they all depend on one another in a non linear fashion. Never opposed to a challenge, we have set out to analyze all four pieces on a plant–by–plant basis under various carbon scenarios and describe our broad methodology in the following section.

## The Model

Our supply / demand curves are made up from all existing operating plants across 10 different regions. We analyze margin impacts (revenues, costs, and dispatch) for 1,260 individual merchant plants in these curves on an hour by hour basis through 2050 (42 years) under 4 different carbon scenarios – the hourly treatment is for competitive markets (PJM, NEPOOL, NYISO, CAISO, MISO, ERCOT), where changes in economic dispatch are more relevant. For reference, this works out to about 450 million calculations per scenario.

# Operating Cost Changes with Carbon

We forecast the change in marginal operating costs by taking the cost of carbon ($ / ton) and multiplying by the carbon content per MWh of output (tons $CO_2$ / MWh). $CO_2$ emissions are a function of fuel specific carbon content (lbs / MMBtu) and the efficiency (heat rate) of the plant at turning fuel into electricity. Exhibit 53 highlights our generalized assumptions about carbon intensity by fuel type and plant heat rate.

**Exhibit 53: Tons of $CO_2$ / MWh by Plant**

| CO2 Fuel Content -- tons CO2 / MMBtu | | HR --> | Plant Emissions -- Tons CO2 / MWh 7.5 | 8.0 | 8.5 | 9.0 | 9.5 | 10.0 | 10.5 | 11.0 | 11.5 | 12.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal | 0.1075 | Coal | 0.81 | 0.86 | 0.91 | 0.97 | 1.02 | 1.08 | 1.13 | 1.18 | 1.24 | 1.29 |
| Gas | 0.0585 | Gas | 0.44 | 0.47 | 0.50 | 0.53 | 0.56 | 0.59 | 0.61 | 0.64 | 0.67 | 0.70 |
| Oil | 0.0870 | Oil | 0.65 | 0.70 | 0.74 | 0.78 | 0.83 | 0.87 | 0.91 | 0.96 | 1.00 | 1.04 |
| Biomass | 0.0925 | Biomass | 0.69 | 0.74 | 0.79 | 0.83 | 0.88 | 0.93 | 0.97 | 1.02 | 1.06 | 1.11 |
| Waste | 0.1075 | Waste | 0.81 | 0.86 | 0.91 | 0.97 | 1.02 | 1.08 | 1.13 | 1.18 | 1.24 | 1.29 |

| HR --> | Change to marginal operating costs $ / MWh with $10 carbon 7.5 | 8.0 | 8.5 | 9.0 | 9.5 | 10.0 | 10.5 | 11.0 | 11.5 | 12.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Coal | 8.06 | 8.60 | 9.14 | 9.68 | 10.21 | 10.75 | 11.29 | 11.83 | 12.36 | 12.90 |
| Gas | 4.39 | 4.68 | 4.97 | 5.27 | 5.56 | 5.85 | 6.14 | 6.44 | 6.73 | 7.02 |
| Oil | 6.53 | 6.96 | 7.40 | 7.83 | 8.27 | 8.70 | 9.14 | 9.57 | 10.01 | 10.44 |
| Biomass | 6.94 | 7.40 | 7.86 | 8.33 | 8.79 | 9.25 | 9.71 | 10.18 | 10.64 | 11.10 |
| Waste | 8.06 | 8.60 | 9.14 | 9.68 | 10.21 | 10.75 | 11.29 | 11.83 | 12.36 | 12.90 |

*Source: Credit Suisse Estimates, EIA*

*HR = Plant specific heat rate (MMBtu / MWh)*

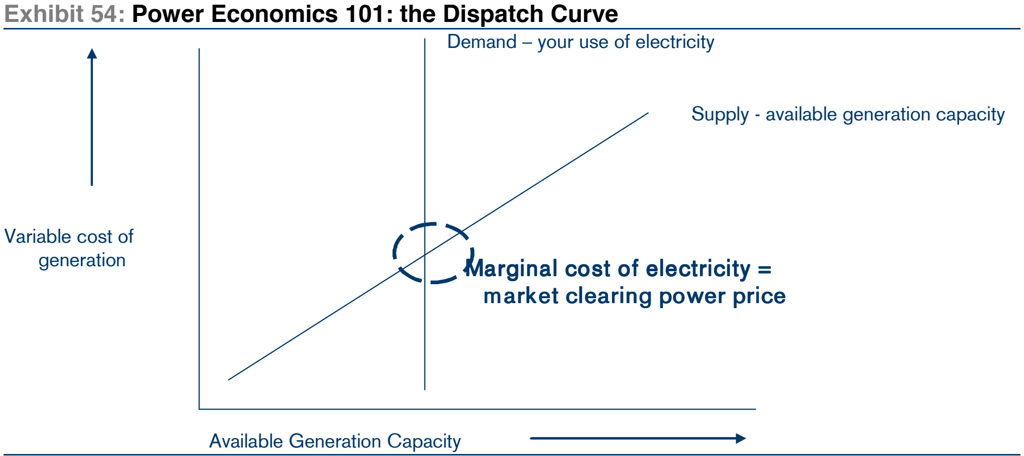
# Power Price Changes with Carbon

In a world where one has to pay for the right to emit $CO_2$, we need to understand how any given price for carbon will affect the supply curve and thus the intersection with demand. Building on our prior supply / demand macro work (known as dispatch curves in the industry), we have now incorporated the cost of carbon into plant by plant operating data that makes up regional supply curves. With the addition of carbon pricing into our curves, we have reshaped the merit order of dispatch (the next most cost efficient plant to turn on) at any level of demand, which allows us to then calculate the market clearing power price.

### What is a Dispatch Curve Again?

For those less familiar with the dispatch curve term, we are referring to a theoretical design that determines which asset is the next to turn on to meet a particular level of demand based on the variable cost to deliver power – all things being equal, the least expensive available plant should be the next to meet demand in an efficient market.

**Exhibit 54: Power Economics 101: the Dispatch Curve**




*Source: Credit Suisse Estimates*

To construct the curve, we need to consider two primary variables:

(1) Cost of generation (fuel, non fuel, and carbon expenses to generate power); and

(2) Level of demand at different points in time to indicate which assets should be operating.

**Supply Assumptions**

The hardest part of constructing dispatch curves is building the plant specific cost data necessary to form the shape of the cost / dispatch curve. Using data from FERC Form 1 filings, the EIA 860 and Annual 906 filings, in addition to SNL, Energy Velocity, and our own cost assumptions, we have estimated variable operating costs for every power plant in the country (more than 6,500 plants) as the starting point for our cost curves for 10 US regions.

We then incorporate our estimate of capacity additions by year (based on our reserve margin work). Our power plant additions are collated from a multitude of sources including Energy Velocity, SNL Financial, trade rags, and company specific data, with our analysis containing a much more robust data set than in past years as we continue to refine our methodology and knowledge base.

**Including only plants under construction until 2010**

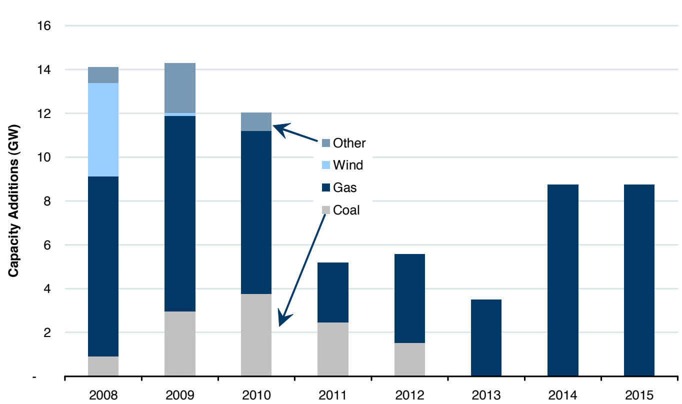
Over the next few years, we assume only assets currently under construction are added to the generation fleet, a move that reflects the economic and permitting challenges facing new construction of power plants in the US. Generally speaking, this shift in methodology has led to tighter looking reserve margins but also reflects, in our minds, the more extreme declines in reserve margins since new assumed generation is awfully firm at this point.

Beyond 2010, we assume a rebalancing of the market toward a 15% reserve margin with gas fired power plants filling the gap given the relative ease to build (permits not as hard), lower front end capital costs (versus solid fuel plants), as well as a nod to environmentalists with a growing global warming voice.

**New generation will be needed, but only assume 30% of proposed**

Relative to total proposed generation, we assume 30% is actually built on average in 2008–2015 (Exhibit 55)

**Exhibit 55: US Capacity Additions by Fuel Type**



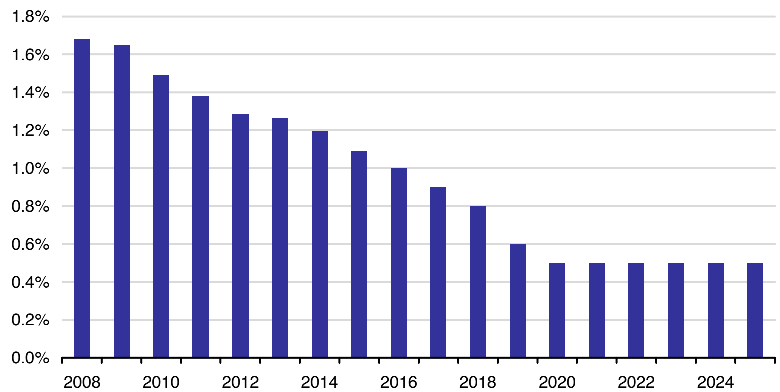

| MW | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|
| Coal | 890 | 2,975 | 3,762 | 2,445 | 1,530 | - | - | - |
| Gas | 8,248 | 8,914 | 7,435 | 2,737 | 4,044 | 3,500 | 8,750 | 8,750 |
| Wind | 4,246 | 123 | - | - | - | - | - | - |
| Other | 717 | 2,272 | 824 | - | - | - | - | - |
| **Total** | **14,101** | **14,285** | **12,022** | **5,183** | **5,574** | **3,500** | **8,750** | **8,750** |
| **% Contribution** | | | | | | | | |
| Coal | 6% | 21% | 31% | 47% | 27% | 0% | 0% | 0% |
| Gas | 58% | 62% | 62% | 53% | 73% | 100% | 100% | 100% |
| Wind | 30% | 1% | 0% | 0% | 0% | 0% | 0% | 0% |
| Other | 5% | 16% | 7% | 0% | 0% | 0% | 0% | 0% |

*Source: Credit Suisse estimates*

**Demand Assumptions**

Demand continues to be the hardest part of the equation to model and remains an incredibly important driver to the health of power markets. We are maintaining our prior demand forecast with our regional deviations mostly unchanged, which we highlight in Exhibit 56.

**Exhibit 56: US Consolidated Demand Growth per Year: 2008–2025**



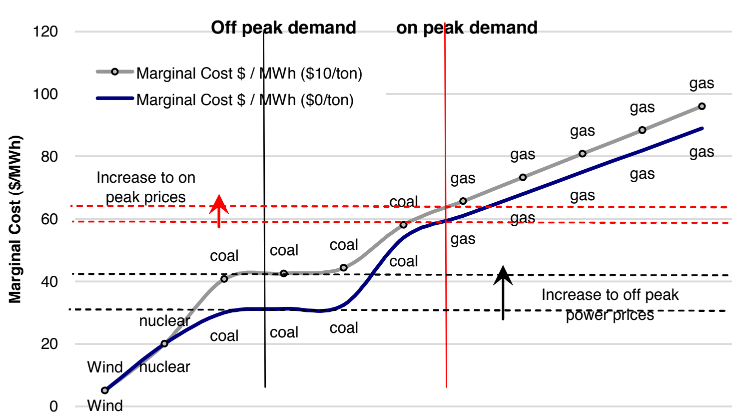

*Source: Credit Suisse Estimates*

**How Does the Dispatch Curve Reshape with Carbon?**

Including carbon costs into plant variable operating costs has a material impact on the shape of the dispatch curve and hence plant economics. To help solidify the concepts discussed above, we walk through a hypothetical example of how a carbon tax would effect the supply curve at $10 per ton and $50 per ton. The math behind our hypothetical is shown in Exhibit 61 for those wanting to dig into the details.

Exhibit 57 highlights how the supply curve shifts with carbon costed at $10 / ton. Prior to the implementation of a tax, nuclear and coal assets run most frequently, setting the marginal price of power during off peak hours – assets above the "off peak demand" line are not required to run. However, during peak periods when the market is using more electricity, the higher cost gas units are needed to meet demand, and thus gas becomes the marginal price setter. At this point, coal and nuclear units will make outsized margins since gas is setting the marginal price which is much higher than those units' operating costs.

**Exhibit 57: Change in the Supply Curve Under a $10 carbon tax**

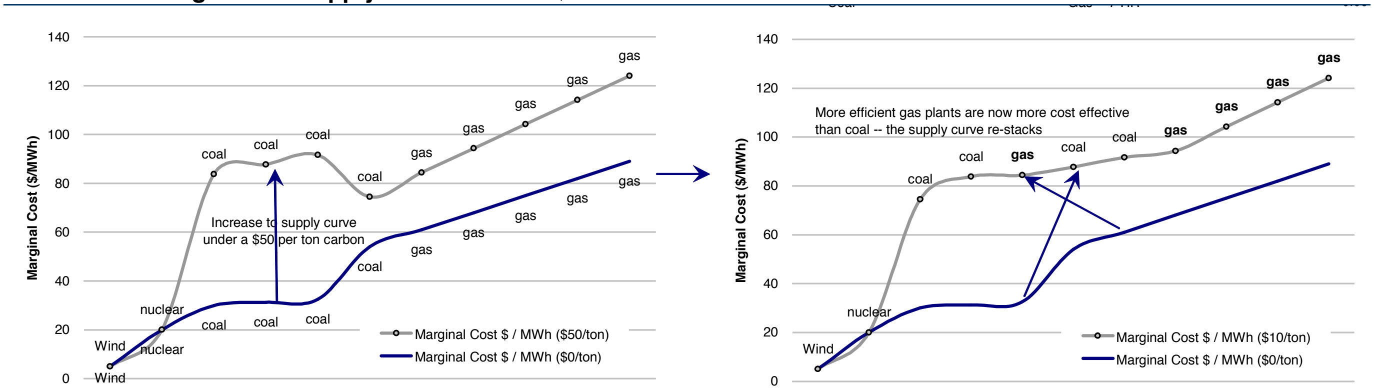



*Source: Credit Suisse Estimates*

With the implementation of a \$10 per ton carbon tax (meaning no allocations so all $CO_2$ is expensed), the supply curve moves up but does not reshape the order of plant dispatch. Coal plants continue to dispatch before gas plants (even though there is a higher burden from $CO_2$) since the relative cost advantage for coal was more than big enough to absorb the higher $CO_2$ cost. During off peak hours, we see that prices rise by the entire marginal cost of carbon for coal plants. However, during on peak hours prices only rise by the cost of the tax for gas units (about half the cost of coal plants on a per MWh basis). In this scenario, coal plants are still making an increased profit in on-peak compared to off-peak hours, but not as much as with no carbon tax. We also note that assets with zero emissions – wind and nuclear in this example – benefit whether coal or gas is setting the marginal price since power prices rise in both scenarios but the plant's marginal costs do not (zero $CO_2$ emissions).

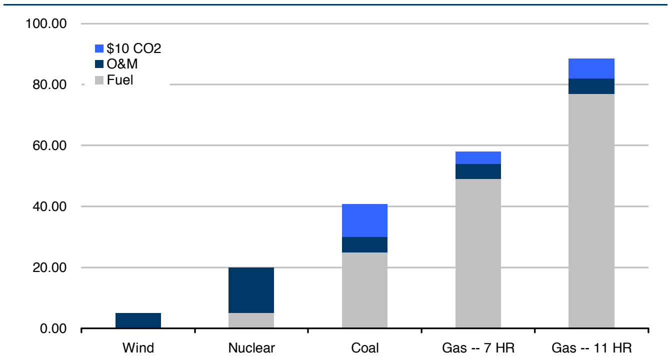
In a \$10 world it's hard to really make a dent in dispatch or $CO_2$ emissions because the financial disincentives are not high enough to reshape economics. However, Exhibit 58 highlights how the supply curve could restack under a \$50 per ton carbon tax. In this scenario the tax is high enough to make gas more cost effective to run during off peak hours than some coal plants, which would result in lower $CO_2$ emissions and less coal plant dispatch. Exhibit 59 and Exhibit 60 illustrate the variable operating costs for different plant types under these carbon hypotheticals.

**Exhibit 58: Change in the Supply Curve Under a \$50 carbon tax**



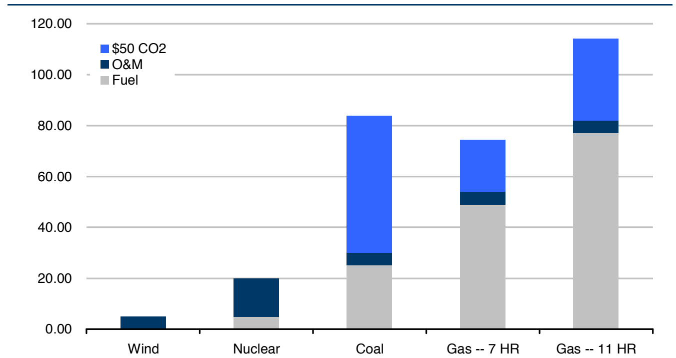

*Source: Credit Suisse Estimates*

**Exhibit 59: Marginal Variable Operating Costs with \$10 / ton Carbon Cost**




*Source: Credit Suisse Estimates*

**Exhibit 60: Marginal Variable Operating Costs with \$50 / ton Carbon Cost**




*Source: Credit Suisse Estimates*

**Exhibit 61: Power Plant Marginal Operating Costs (Numbers Used to Generate Curves)**

| | Wind | Nuclear | Coal | | | Gas | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Heat Rate (MMBtu/MWh) -->** | | | **10.0** | **10.5** | **11.0** | **7.0** | **8.0** | **9.0** | **10.0** | **11.0** | **12.0** |
| Tons CO2/MMBtu | 0.000 | 0.000 | 0.108 | 0.108 | 0.108 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 |
| Tons CO2/MWh | 0.00 | 0.00 | 1.08 | 1.13 | 1.18 | 0.41 | 0.47 | 0.53 | 0.59 | 0.64 | 0.70 |
| Fuel $ / MMBtu | | | 2.50 | 2.50 | 2.50 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| Fuel $ / MWh | 0.00 | 5.00 | 25.00 | 26.25 | 27.50 | 49.00 | 56.00 | 63.00 | 70.00 | 77.00 | 84.00 |
| Non Fuel $ / MWh | 5.00 | 15.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Carbon Cost $ / MWh ($0/ton) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Marginal Cost $ / MWh ($0/ton)** | **5.00** | **20.00** | **30.00** | **31.25** | **32.50** | **54.00** | **61.00** | **68.00** | **75.00** | **82.00** | **89.00** |
| Carbon Cost $ / MWh ($10/ton) | 0.00 | 0.00 | 10.75 | 11.29 | 11.83 | 4.10 | 4.68 | 5.27 | 5.85 | 6.44 | 7.02 |
| **Marginal Cost $ / MWh ($10/ton)** | **5.00** | **20.00** | **40.75** | **42.54** | **44.33** | **58.10** | **65.68** | **73.27** | **80.85** | **88.44** | **96.02** |
| Carbon Cost $ / MWh ($50/ton) | 0.00 | 0.00 | 53.75 | 56.44 | 59.13 | 20.48 | 23.40 | 26.33 | 29.25 | 32.18 | 35.10 |
| **Marginal Cost $ / MWh ($50/ton)** | **5.00** | **20.00** | **83.75** | **87.69** | **91.63** | **74.48** | **84.40** | **94.33** | **104.25** | **114.18** | **124.10** |

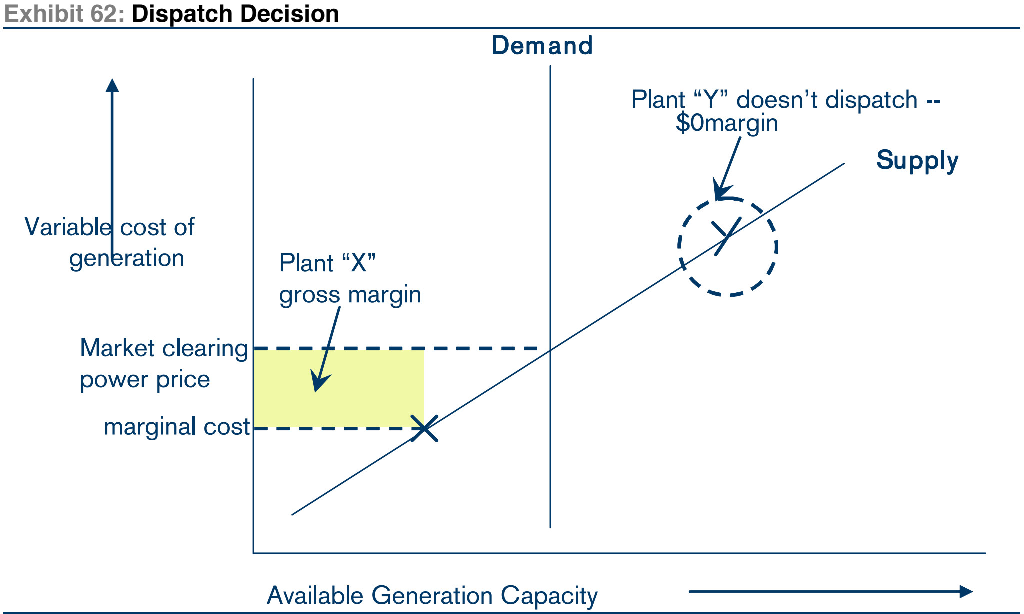
*Source: Credit Suisse Estimates*

## Plant Utilization Changes with Carbon

With updated market clearing power prices and plant specific operating costs, we can then estimate the change to plant dispatch. One basic rule applies: we assume a plant will run whenever marginal revenues are greater than plant specific marginal costs (Exhibit 62). Simply shown, lower cost plant X turns a profit while higher cost plant Y does not run.

To move from back of the envelope to something some substantive, and in our minds predictive, we have re-run all of our dispatch curves through 2050 to calculate hourly market clearing power prices using hourly demand from the Independent System Operators (ISOs) and Regional Transmission Operators (RTOs) to better understand which plants dispatch every hour. Yes, that really was 450 million iterations per carbon scenario – our computers are still catching their breath.

**Exhibit 62: Dispatch Decision**




*Source: Credit Suisse Estimates*

# Sale of Excess Credits

We must also assess the economic value of any allocated credits. Under a carbon tax, this part of the equation is zero – we simply default to the discussion above. However, the dynamics become more complicated under an allocated system. The easiest way to appreciate the economic value of credits is to assume a company sells all its allocated credits into the market and then buys back the credits it needs to operate. Said another way, we calculate company gross margins as we do in an auction environment and add in the value of allocated credits afterwards. For those mathematically inclined, we walk through the "proof" to show the above statement holds true.

In reality under a cap and trade system the supply curves shift in a more complex fashion. In a traded system where companies are allocated a proportion of credits for free, companies could choose to sell those credits at the market price and not generate electricity, or collect the margin from selling power and pay the price – i.e. an economic decision of whether it's more profitable to run the plants versus monetize the allocated credits. Since the lights need to stay on, market clearing prices need to rise enough such that companies are indifferent between receiving dollars for selling credits and the margin earned for generating power while using the credits. Mathematically, the price by which market power prices will rise must equal the traded price of carbon for the marginal plant (Exhibit 63).

**Exhibit 63: Marginal Price of Power Set by Cost of Carbon Credit, Not Marginal Operating Cost**

Value of CO2 credits = change in gross margin from generating power

Value of credits = % allowances x CO2 price ($ / ton) x rate of emissions (tons / MWh) x MWh
A x CO2 price x E rate x MWh

Change in gross margin = ( $\nabla$ market clearing Price - cost of tax credits unallocated) x MWh
= ( $\nabla$ P - (1-A) x CO2 price x E rate ) x MWh

A x CO2 price x E rate x MWh = ($\nabla$ P - (1 - A) x CO2 price x E rate) x MWh

A x CO2 price x E rate = $\nabla$ P - CO2 price x E rate + A x CO2 price x E rate

$\nabla$ P = = CO2 price x E rate

**Change in market clearing price = CO2 price ($ / ton) x rate of emissions (tons / MWh)**
**of marginal unit**

*Source: Credit Suisse Estimates*

# Estimating Valuation Implications

Armed with the margin per hour (anything greater than or equal to $0), the number of hours a plant dispatches, and proportion of allocations, we can estimate the change to gross margin from a change in carbon pricing. We estimate this gross margin impact by plant by year through 2050 using our dispatch curves and present value the after tax impact (40% tax rate) using a 50 year DCF and an 8.5% discount rate for all assets aside from wind (we assume life of asset on wind, generally around 30 years).

## US Carbon Merchant Design Options

Obviously the design of any potential system will have a big impact on resulting economics for the Electric Utility industry going forward and planning implications for needed newbuild generation. In the following section we break down the economic choices and resulting implications for the industry.

## Carbon Tax

Most simply, a carbon tax is a tax on energy sources which emit carbon dioxide into the atmosphere (assesses an economic cost to a negative externality). A carbon tax is the simplest mechanism to understand how policy impacts the competitive power market: the government collects tax revenues from polluters, raising polluters' marginal operating costs, which in turn alters the dispatch curve's shape ultimately leading to reductions in output by higher emitting plants (and inevitably higher power prices). For the Utility industry, a carbon tax could reduce emissions 3 ways:

(1) **Changing existing plant economics such that cleaner plants are more cost effective to run.** Presently coal plants, which emit about twice as much $CO_2$ per MWh compared to gas fired units, are more cost effective due the disparity between coal and gas commodity costs. The implementation of a carbon tax, if high enough, will change economics such that gas plants are more cost effective to run than coal plants – in this scenario gas plants will run more frequently and coal will run less resulting in lower $CO_2$ emissions;

(2) **Create incentives to build cleaner power plants.** If economic incentives are high enough, companies will invest capital to build clean renewable energy, nuclear power plants, and other carbon friendly generation; and

**(3) Create incentives to capture carbon from existing plants.**

The higher the carbon tax, the higher the carbon reductions, so the government in theory would base the value of a carbon tax on the desired amount of reductions. Over the short term, the utility industry really only has two options to reduce emissions to change which assets dispatch (more gas, less coal) by applying a cost to $CO_2$ emissions or build new carbon friendly generation because carbon capture and sequestration technology is still new from a commercial perspective.

## Emissions Trading: Cap & Trade with 100% Auction

Unlike a carbon tax that allows companies to emit $CO_2$ as long as they pay for it, a cap and trade system sets a limit on the amount of a pollutant than can be emitted. For every ton of $CO_2$ emitted, companies most hold a credit or allowance that represents the right to emit that ton. The total amount of credits in the system cannot exceed the cap, limiting emissions to that level. Companies that cannot economically reduce their emissions can buy credits from those who pollute less (hence the "trade" part). Said another way, the buyer of credits is fined for polluting while the seller is rewarded for reducing emissions. In theory, those that can easily reduce emissions most cheaply will do so, achieving emission reductions at the lowest cost to society.

Under a cap and trade system, the price of carbon credits should equate to the market cost associated with reducing emissions to the cap (the cheapest way to achieve said reductions). Most carbon legislation bills introduced by both the Senate and the House represent cap and trade systems – use of "tax" in legislation is generally political suicide. But the key players remain split on a critical question behind cap and trade: how to distribute credits? Unfortunately lots of options exist from free allocations to an auction system.

To be clear, a 100% auction is nothing more than a politically correct name for a carbon tax: the government collects revenues for credits auctioned. The only difference is that the market sets the price of carbon required to achieve the emissions cap. Of course, if Congress decides to put a safety valve on the cost of a credit in this scenario, the “cap and trade” system becomes nothing more than a carbon tax with a soft cap.

We note that the US already has several cap-and-trade systems, the largest being the effective, but not immediately gratifying, Acid Rain program with $SO_2$ and $NO_x$ trading.

## Cap & Trade with 100% Allocation

A cap and trade system with 100% allocations is no longer a carbon tax – at this point dollars float between companies, not from companies to the government. Unfortunately, analyzing the impact to companies becomes more challenging under this scenario as dollars float between more entities. As we saw in Europe’s first carbon push, when excess credits are in the market behavior seldom changes and room for making a profit from the scheme actually exists.

# Appendix B: SOTP Valuation

Exhibit 64: **AYE Sum of the Parts Valuation**

| | | LOW CASE | | BASE CASE | | HIGH CASE | |
|---|---|---|---|---|---|---|---|
| | **EPS / EBITDA** | **Multiple** | **EV** | **Multiple** | **EV** | **Multiple** | **EV** |
| DCF | | 6.9% | 3,484 | 6.7% | 3,661 | 6.5% | 3,849 |
| EBITDA (2011) | 626 | 7.5 | 3,960 | 8.0 | 4,257 | 8.5 | 4,558 |
| PE (2011) | 1.14 | 15.0 | 3,895 | 15.5 | 3,988 | 16.5 | 4,160 |
| **Average T&D EV** | | 9.6% | **3,780** | 9.2% | **3,969** | 8.8% | **4,189** |
| PV 2011 EBITDA | 1,805 | 7.0 | 11,002 | 7.5 | 11,910 | 8.0 | 12,849 |
| DCF | | 9.0% | 9,417 | 8.5% | 9,880 | 8.0% | 10,390 |
| **Average Generation EV** | | 13.8% | **10,209** | 12.8% | **10,895** | 11.8% | **11,619** |
| EBITDA '09 | 8 | 7.5 | 63 | 8.0 | 67 | 8.5 | 71 |
| PE '09 | (0.07) | 16.0 | 790 | 15.0 | 802 | 15.0 | 802 |
| **Average Other EV** | | | **426** | | **435** | | **437** |
| **Total Enterprise Value** | | | **14,415** | | **15,298** | | **16,245** |
| Net Debt | | | 4,109 | | 4,109 | | 4,109 |
| PV of NOLs | | | 0 | | 0 | | 0 |
| Equity Value | | | 10,306 | | 11,189 | | 12,136 |
| | | | | **CS Weighted Assumption** | | | |
| **Carbon NPV per Share** | | | **(2.50)** | | **(2.50)** | | **0.00** |
| **Price** | | | **58.14** | | **63.34** | | **71.41** |
| Shares | | | 170 | | 170 | | 170 |

*Source: Company data, Credit Suisse estimates*

**Exhibit 65: CEG Sum of the Parts Valuation**

| | | | LOW CASE | | BASE CASE | | HIGH CASE |
|---|---|---|---|---|---|---|---|
| | **EBITDA** | **Multiple** | **EV** | **Multiple** | **EV** | **Multiple** | **EV** |
| EBITDA (2009) | 593 | 7.5x | 4,449 | 8.0x | 4,745 | 8.5x | 5,042 |
| DCF - Discount Rate | | 6.90% | 4,631 | 6.70% | 4,828 | 6.50% | 5,040 |
| **BG&E Enterprise Value** | | | **4,540** | | **4,786** | | **5,041** |
| 2009 Net Income | 1.33 | 10.0x | 2,318 | 11.0x | 2,550 | 12.0x | 2,782 |
| 2009 EBITDA | 396 | 7.0x | 2,772 | 7.5x | 2,970 | 8.0x | 3,167 |
| DCF - Discount Rate | | 17.00% | 2,286 | 15.00% | 2,587 | 13.00% | 2,989 |
| **Global Commodities** | | | **2,458** | | **2,702** | | **2,979** |
| 2009 EBITDA | 345 | 7.0x | 2,412 | 7.5x | 2,584 | 8.0x | 2,757 |
| DCF - Discount Rate | | 10.00% | 2,134 | 9.00% | 2,354 | 8.00% | 2,633 |
| **Customer Supply** | | | **2,273** | | **2,469** | | **2,695** |
| **Unistar Nuclear Development Company** | | | **250** | | **300** | | **350** |
| EBITDA (2009) | 1,412 | 7.5x | 10,588 | 8.0x | 11,294 | 8.5x | 12,000 |
| EBITDA (2012 discounted to 2009) | 2,645 | 7.5x | 15,342 | 8.0x | 16,662 | 8.5x | 18,069 |
| DCF - Discount Rate | | 9.00% | 11,766 | 8.50% | 12,414 | 8.00% | 13,129 |
| **Generation** | | | **12,565** | | **13,457** | | **14,399** |
| 2008 EBITDA | (33) | 8.0x | (267) | 8.5x | (284) | 9.0x | (301) |
| DCF - Discount Rate | | 9.00% | (166) | 8.50% | (172) | 8.00% | (179) |
| **Other Enterprise Value** | | | **(217)** | | **(228)** | | **(240)** |
| **Total Enterprise Value** | | | **21,870** | | **23,486** | | **25,225** |
| Net Debt | | | 6,178 | | 6,178 | | 6,178 |
| | | | | | **CS Weighted Assumption** | | |
| **Carbon NPV per Share** | | | **0.00** | | **14.00** | | **14.00** |
| **Target Price** | | | **89.70** | | **112.94** | | **122.88** |
| Shares Out | | | 175 | | 175 | | 175 |

*Source: Company data, Credit Suisse estimates*

**Exhibit 66: D Sum of the Parts Valuation**

| | | | LOW CASE | | BASE CASE | | HIGH CASE | |
|---|---|---|---|---|---|---|---|---|
| | | **Estimate** | **Multiple** | **EV** | **Multiple** | **EV** | **Multiple** | **EV** |
| | DCF | | 7.1% | 17,326 | 6.7% | 19,197 | 6.5% | 20,246 |
| | EBITDA '10 discounted | 2,540 | 7.5x | 17,788 | 8.0x | 19,045 | 8.5x | 20,274 |
| | PE '10 discounted | 1.50 | 14.5 | 18,758 | 15.5 | 19,660 | 16.5 | 20,525 |
| **VEPCO Avg EV** | | | 10.8% | **17,957** | 10.0% | **19,301** | 9.6% | **20,348** |
| | DCF | | 6.8% | 5,394 | 6.7% | 5,513 | 6.6% | 5,637 |
| | EBITDA '10 discounted | 648 | 8.5x | 5,155 | 9.0x | 5,463 | 9.5x | 5,772 |
| | PE '10 discounted | 0.49 | 15.5 | 5,471 | 16.5 | 5,750 | 17.5 | 6,030 |
| **Pipelines / Storage / LNG Avg EV** | | | 9.1% | **5,340** | 8.9% | **5,575** | 8.7% | **5,813** |
| | DCF | | 6.9% | 1,798 | 6.7% | 1,912 | 6.5% | 2,034 |
| | EBITDA '09 | 204 | 7.0x | 1,428 | 8.0x | 1,632 | 9.0x | 1,836 |
| | PE '09 | 0.07 | 14.5x | 1,810 | 15.5x | 1,852 | 16.5x | 1,894 |
| **Gas LDCs Avg EV** | | | | **1,679** | | **1,799** | | **1,921** |
| | EBITDA '09 | 1,414 | 7.0x | 9,897 | 8.0x | 11,310 | 9.0x | 12,724 |
| | EBITDA '13 | 2,439 | 7.0x | 11,560 | 8.0x | 13,201 | 9.0x | 14,958 |
| | DCF | | 9.0% | 13,869 | 8.5% | 14,557 | 8.0% | 15,316 |
| | *Average* | | 12.9% | *12,714* | 11.9% | *13,879* | 10.9% | *15,137* |
| | Environmental | | 9.0% | (784) | 8.5% | (795) | 8.0% | (807) |
| **Merchant Gen Avg EV** | | | | **11,931** | | **13,084** | | **14,330** |
| | EBITDA '09 | 129 | 6.0x | 772 | 7.0x | 901 | 8.0x | 1,029 |
| | DCF | | 9.0% | 996 | 8.5% | 1,050 | 8.0% | 1,110 |
| **Retail Avg EV** | | | | **884** | | **975** | | **1,070** |
| | EBITDA '09 | 23 | 7.5x | 170 | 7.0x | 159 | 6.5x | 147 |
| **Corporate Avg EV** | | | | **170** | | **159** | | **147** |
| **Appalachia Value NAV** | | | | **2,682** | | **2,682** | | **2,682** |
| **Marcellus Acreage** | | 700,000 | 1,500 | **1,050** | 1,750 | **1,225** | 2,000 | **1,400** |
| **Lower Huron Acreage** | | 300,000 | 100 | **30** | 200 | **60** | 300 | **90** |
| **Enterprise Value** | | | | **41,724** | | **44,861** | | **47,803** |
| Net Debt | | | | 18,886 | | 18,886 | | 18,886 |
| Equity | | | | 22,837 | | 25,974 | | 28,916 |
| | | | | | **CS Weighted Assumption** | | | |
| **Carbon NPV per Share** | | | | **0.00** | | **2.50** | | **2.50** |
| **2008 Price** | | | | **38.88** | | **46.72** | | **51.73** |

*Source: Company data, Credit Suisse estimates*

**Exhibit 67: EIX Sum of the Parts Valuation**

| | Estimate | Low Case Multiple | Low Case EV | Base Case Multiple | Base Case EV | High Case Multiple | High Case EV |
|---|---|---|---|---|---|---|---|
| EPS 2009 | 2.42 | 14.5x | 19,551 | 15.5x | 20,386 | 16.5x | 21,220 |
| EBITDA 2009 | 2,886 | 6.5x | 18,760 | 7.0x | 20,203 | 7.5x | 21,646 |
| DCF | | 6.90% | 19,125 | 6.70% | 20,559 | 6.50% | 22,151 |
| **SCE Enterprise Value** | | 8.5% | **19,145** | 8.1% | **20,383** | 7.7% | **21,672** |
| | | | | | | | |
| EBITDA '09 | 1,540 | 7.0x | 10,779 | 8.0x | 12,319 | 9.0x | 13,859 |
| EBITDA '13 | 1,637 | 7.0x | 9,879 | 8.0x | 11,000 | 9.0x | 12,198 |
| DCF | | 9.0% | 10,971 | 8.5% | 11,466 | 8.0% | 12,010 |
| *Average* | | 13.8% | *10,543* | 12.8% | *11,595* | 11.8% | *12,689* |
| Environmental | | 9.0% | (2,437) | 8.5% | (2,483) | 8.0% | (2,529) |
| **Merchant Enterprise Value** | | | **8,106** | | **9,113** | | **10,160** |
| | | | | | | | |
| Capital DCF | | 7.0% | 53 | 6.5% | 51 | 6.0% | 49 |
| Other DCF | | 7.5% | (961) | 7.5% | (961) | 7.5% | (961) |
| **Capital & Other** | | | **(908)** | | **(910)** | | **(912)** |
| | | | | | | | |
| DCF | | 6.60% | 2,437 | 6.40% | 2,501 | 6.40% | 2,501 |
| PV Tax Credits | | 6.60% | 1,435 | 6.40% | 1,448 | 6.40% | 1,448 |
| **Wind Enterprise Value** | | | **3,871** | | **3,949** | | **3,949** |
| | | | | | | | |
| Less Net Debt | | | 11,901 | | 11,901 | | 11,901 |
| Less Operating Lease Debt | | | 1,229 | | 1,229 | | 1,229 |
| Plus NOLs | | | 0 | | 0 | | 0 |
| Less Leverage Lease Liability | | | 0 | | 740 | | 1,480 |
| **Equity Value** | | | **17,084** | | **18,664** | | **20,258** |
| | | | | **CS Weighted Assumption** | | | |
| **Carbon NPV per Share** | | | **(1.50)** | | **(1.50)** | | **0.00** |
| | | | | | | | |
| **Price** | | | **47.98** | | **52.55** | | **58.67** |

*Source: Company data, Credit Suisse estimates*

**Exhibit 68: ETR Sum of the Parts Valuation**

| | Estimate | Low Case | | Base Case | | High Case | |
|---|---|---|---|---|---|---|---|
| | | Multiple | EV | Multiple | EV | Multiple | EV |
| 2009 EBITDA | 2,701 | 7.0 | 18,910 | 7.5 | 20,261 | 8.0 | 21,611 |
| DCF | | 6.9% | 21,260 | 6.7% | 21,360 | 6.5% | 21,461 |
| **Avg Reg Utilities** | | | **20,085** | | **20,810** | | **21,536** |
| EBITDA '09 | 1,517 | 7.0 | 10,616 | 8.0 | 12,133 | 9.0 | 13,649 |
| EBITDA '13 discounted | 1,996 | 7.0 | 10,965 | 8.0 | 12,680 | 9.0 | 14,541 |
| DCF | | 9.0% | 10,973 | 8.5% | 11,562 | 8.0% | 12,215 |
| **Avg Nuclear** | | 14.5% | **10,851** | 13.2% | **12,125** | 12.0% | **13,468** |
| DCF | | 6.9% | (110) | 6.7% | (112) | 6.5% | (115) |
| **Avg Commodities & Other** | | | **(110)** | | **(112)** | | **(115)** |
| Total Enterprise Value | | | 30,827 | | 32,823 | | 34,890 |
| Net Debt | | | 11,418 | | 11,418 | | 11,418 |
| Carbon NPV per Share | | | 0.00 | | 17.50 | | 17.50 |
| **Equity Value** | | | **103.53** | | **131.68** | | **142.71** |
| Shares | | | 187 | | 187 | | 187 |

*Source: Company data, Credit Suisse estimates*

**Exhibit 69: EXC Sum of the Parts Valuation**

| | Estimate | Low Case Multiple | Low Case EV | Base Case Multiple | Base Case EV | High Case Multiple | High Case EV |
|---|---|---|---|---|---|---|---|
| EBITDA 2011 Discounted | 7,491 | 7.5x | 47,381 | 8.0x | 51,165 | 8.5x | 55,079 |
| EBITDA 2013 Discounted | 8,374 | 7.5x | 44,883 | 8.0x | 49,140 | 8.5x | 53,671 |
| DCF | | 9.0% | 52,251 | 8.5% | 55,119 | 8.0% | 58,304 |
| **Generation EV** | | 13.7% | **48,172** | 12.7% | **51,808** | 11.7% | **55,685** |
| | | | | | | | |
| EPS 2012 discounted | 0.40 | 14.5x | 4,836 | 15.5x | 5,047 | 16.5x | 5,229 |
| EBITDA 2012 discounted | 700 | 7.0x | 4,106 | 7.5x | 4,427 | 8.0x | 4,728 |
| DCF | | 6.90% | 4,950 | 6.70% | 5,178 | 6.70% | 5,178 |
| **PECO EV** | | 9.9% | **4,631** | 9.5% | **4,884** | 9.5% | **5,045** |
| | | | | | | | |
| EPS 2012 discounted | 0.81 | 14.5x | 10,881 | 15.5x | 11,313 | 16.5x | 11,680 |
| EBITDA 2012 discounted | 1,804 | 7.0x | 10,458 | 7.5x | 11,289 | 8.0x | 12,060 |
| DCF | | 6.90% | 11,578 | 6.70% | 12,164 | 6.70% | 12,164 |
| **ComEd EV** | | 10.1% | **10,972** | 9.7% | **11,589** | 9.7% | **11,968** |
| | | | | | | | |
| DCF | | 6.90% | 1,023 | 6.70% | 1,047 | 6.50% | 1,072 |
| **Other EV** | | | **1,023** | | **1,047** | | **1,072** |
| | | | | | | | |
| **NPV of Regulatory Amortizations** | | 6.90% | 826 | 6.70% | 828 | 6.50% | 829 |
| | | | | | | | |
| Total Enterprise Value | | | 65,624 | | 70,155 | | 74,599 |
| Less Net Debt | | | 15,808 | | 15,808 | | 15,808 |
| Remaining IL Settlement not in Debt | | | 22 | | 22 | | 22 |
| **Equity Value** | | | **49,793** | | **54,325** | | **58,768** |
| | | | | **CS Weighted Assumption** | | | |
| **Carbon NPV per Share** | | | **0.00** | | **21.00** | | **21.00** |
| | | | | | | | |
| **Price** | | | **77.33** | | **105.37** | | **112.27** |
| Share Count 2009 | | | 644 | | 644 | | 644 |

*Source: Company data, Credit Suisse estimates*

**Exhibit 70: FE Sum of the Parts Valuation**

| | | Estimate | Low Case | | Base Case | | High Case | |
|---|---|---|---|---|---|---|---|---|
| | | | Multiple | EV | Multiple | EV | Multiple | EV |
| | 2013 EBITDA | 4,586 | 7.0x | 21,518 | 8.0x | 25,904 | 9.0x | 29,916 |
| | DCF thru 2020 | | 9.5% | 24,151 | 8.5% | 26,896 | 8.0% | 28,486 |
| | Average | | 15.3% | 22,834 | 13.3% | 26,400 | 12.3% | 29,201 |
| | Environmental | | 9.5% | (155) | 8.5% | (156) | 8.0% | (157) |
| **FES EV** | | | | **22,680** | | **26,244** | | **29,044** |
| | PE 2012 discounted | 0.47 | 15.0x | 5,183 | 15.5x | 5,250 | 16.0x | 5,319 |
| | DCF | | 6.90% | 4,988 | 6.70% | 5,163 | 6.50% | 5,353 |
| **OH Utilities EV** | | | 10.3% | **5,085** | 9.9% | **5,207** | 9.5% | **5,336** |
| | PE 2012 discounted | 0.51 | 15.0x | 3,681 | 15.5x | 3,754 | 16.0x | 3,829 |
| | DCF | | 6.90% | 3,517 | 6.70% | 3,655 | 6.50% | 3,804 |
| **PA Utilities EV** | | | 10.2% | **3,599** | 9.8% | **3,705** | 9.4% | **3,817** |
| | PE 2012 discounted | 0.66 | 15.0x | 3,412 | 15.5x | 3,505 | 16.0x | 3,601 |
| | DCF | | 6.90% | 3,206 | 6.70% | 3,333 | 6.50% | 3,471 |
| **NJ Utilities EV** | | | 10.5% | **3,309** | 10.1% | **3,419** | 9.7% | **3,536** |
| | EBITDA 2012 discounted | 134 | 7.5x | 888 | 8.0x | 951 | 8.5x | 1,015 |
| | DCF | | 6.90% | 851 | 6.70% | 879 | 6.50% | 908 |
| **ATSI EV** | | | 8.0% | **870** | 7.7% | **915** | 7.3% | **962** |
| | DCF | | 8.50% | (1,072) | 8.30% | (1,096) | 8.10% | (1,121) |
| **Corporate & Other EV** | | | | **(1,072)** | | **(1,096)** | | **(1,121)** |
| **NPV of Regulatory Amortizations** | | | 6.90% | 808 | 6.70% | 812 | 6.50% | 815 |
| Total Enterprise Value | | | | 35,278 | | 39,205 | | 42,389 |
| Less Net Debt | | | | 12,196 | | 12,196 | | 12,196 |
| Less Operating Lease Debt | | | | 2,079 | | 2,079 | | 2,079 |
| **Equity Value** | | | | **21,003** | | **24,930** | | **28,114** |
| | | | | | **CS Weighted Assumption** | | | |
| **Carbon NPV per Share** | | | | **0.00** | | **10.00** | | **10.00** |
| **Price** | | | | **69.08** | | **92.00** | | **102.47** |
| Share Count Q408 | | | | 304 | | 304 | | 304 |

*Source: Company data, Credit Suisse estimates*

**Exhibit 71: FPL Sum of the Parts**

| | | | | Low Case | | Base Case | | High Case |
|---|---|---|---|---|---|---|---|---|
| FPL Utility | EBITDA '09 | 2,520 | 7.5x | 18,903 | 8.0x | 20,163 | 8.5x | 21,424 |
| | PE '09 | 2.16 | 15.0x | 18,831 | 15.5x | 19,269 | 16.0x | 19,708 |
| | DCF | | 6.90% | 18,624 | 6.70% | 19,009 | 6.50% | 19,402 |
| **FPL Utility Enterprise Value** | | | | **18,786** | | **19,481** | | **20,178** |
| | EBITDA '09 | 938 | 7.0x | 6,566 | 8.0x | 7,504 | 9.0x | 8,442 |
| | EBITDA '13 | 1,156 | 7.0x | 8,583 | 8.0x | 9,261 | 9.0x | 9,988 |
| | DCF | | 9.0% | 7,647 | 8.5% | 7,984 | 8.0% | 8,355 |
| **Merchant Enterprise Value** | | | **14.3%** | **7,599** | **13.3%** | **8,250** | **12.3%** | **8,928** |
| Contracted | DCF | | 8.5% | 3,344 | 8.0% | 3,495 | 7.5% | 3,662 |
| **Contracted Enterprise Value** | | | | **3,344** | | **3,495** | | **3,662** |
| FPLE Other | EBITDA | (30) | 7.5x | (228) | 7.0x | (213) | 6.5x | (198) |
| Corp. & Other | EBITDA | 6 | 7.5x | 48 | 8.0x | 52 | 8.5x | 55 |
| **FPLE & Other Enterprise Value** | | | | **10,763** | | **11,584** | | **12,448** |
| Wind | DCF | | 6.60% | 9,374 | 6.40% | 9,629 | 6.20% | 9,892 |
| | PV Tax Credits | | 6.60% | 4,315 | 6.40% | 4,349 | 6.20% | 4,382 |
| **Wind Enterprise Value** | | | | **13,689** | | **13,977** | | **14,275** |
| Less Net Debt | | | | 17,515 | | 17,515 | | 17,515 |
| Equity Value | | | | 25,723 | | 27,527 | | 29,385 |
| | | | | | **CS Weighted Assumption** | | | |
| **Carbon NPV per Share** | | | | **0.00** | | **11.50** | | **11.50** |
| **Price** | | | | **63.52** | | **79.47** | | **84.06** |

*Source: Company data, Credit Suisse estimates*

**Exhibit 72: PEG Sum of the Parts Valuation**

| | | | LOW CASE | | BASE CASE | | HIGH CASE | |
|---|---|---|---|---|---|---|---|---|
| | | Estimate | Mult/Discount | EV | Mult/Discount | EV | Mult/Discount | EV |
| **PSE&G** | DCF | | 6.9% | 9,275 | 6.7% | 9,857 | 6.5% | 10,498 |
| | 2009 EBITDA | 1,231 | 7.5 | 9,234 | 8.0 | 9,849 | 8.5 | 10,465 |
| | 2009 PE | 0.64 | 14.5 | 10,004 | 15.5 | 10,325 | 16.5 | 10,646 |
| | **PSE&G EV** | | | **9,504** | | **10,010** | | **10,536** |
| **Power** | 2011 EBITDA | 3,324 | 7.0 | 19,404 | 8.0 | 22,507 | 9.0 | 25,719 |
| | DCF | | 9.0% | 20,498 | 8.5% | 21,497 | 8.0% | 22,597 |
| | *Average* | | 13.7% | *19,951* | 12.7% | *22,002* | 11.7% | *24,158* |
| | Environmental | | 9.0% | (367) | 8.5% | (372) | 8.0% | (378) |
| | **Average** | | | **19,584** | | **21,630** | | **23,780** |
| **Holdings** | DCF | | 8.5% | 1,001 | 8.0% | 1,040 | 7.5% | 1,082 |
| | EBITDA | 186 | 7.0 | 1,305 | 7.5 | 1,399 | 8.0 | 1,492 |
| | **Holdings EV** | | | **1,153** | | **1,219** | | **1,287** |
| **Corporate / Other** | EBITDA | (6) | 7.5 | (45) | 8.0 | (48) | 8.5 | (51) |
| | **Corp/Other EV** | | | **(45)** | | **(48)** | | **(51)** |
| **Leverage Lease (IRS Tax Liabilities)** | | | 9% | **(963)** | | **(500)** | | **0** |
| **Enterprise Value** | | | | **29,233** | | **32,311** | | **35,553** |
| Net Debt | | | | 8,229 | | 8,229 | | 8,229 |
| Equity Value | | | | 21,003 | | 24,082 | | 27,323 |
| | | | | | **CS Weighted Assumption** | | **Bingaman Bill** | |
| **Carbon NPV per Share** | | | | **0.00** | | **6.50** | | **6.50** |
| **Price** | | | | **41.85** | | **54.49** | | **60.95** |
| Shares | | | | 502 | | 502 | | 502 |

*Source: Company data, Credit Suisse estimates*

**Exhibit 73: DYN Sum of the Parts Valuation**

| | | LOW CASE | | BASE CASE | | HIGH CASE | |
|---|---|---|---|---|---|---|---|
| | **Estimate** | **Multiple** | **EV** | **Multiple** | **EV** | **Multiple** | **EV** |
| EBITDA '09 | 1,482 | 7.0x | 10,373 | 8.0x | 11,855 | 9.0x | 13,337 |
| EBITDA '13 discounted | 2,009 | 7.0x | 11,773 | 8.0x | 13,563 | 9.0x | 15,479 |
| DCF | | 9.0% | 10,558 | 8.5% | 11,084 | 8.0% | 11,667 |
| *Average* | | | *10,901* | | *12,167* | | *13,494* |
| Environmental | | 9.0% | (525) | 8.5% | (531) | 8.0% | (538) |
| **Average Enterprise Value** | | 13.9% | **10,376** | 12.9% | **11,636** | 11.9% | **12,957** |
| Net Debt ex. devel | | | 3,711 | | 3,711 | | 3,711 |
| Operating Lease Debt | | | 667 | | 667 | | 667 |
| **Equity Value** | | | **5,999** | | **7,258** | | **8,579** |
| | **Value / shr** | **Prob** | **EV** | **Prob** | **EV** | **Prob** | **EV** |
| Newbuild Projects | 0.96 | 0% | 0 | 50% | 398 | 100% | 796 |
| Plum Point | 0.10 | 0% | 0 | 50% | 42 | 100% | 83 |
| **Price ex. Carbon** | | | **7.21** | | **9.25** | | **11.36** |
| | | | | CS Weighted Assumption | | | |
| Carbon NPV per Share | | | 0.00 | | 0.50 | | 0.50 |
| **Price w/ Carbon** | | | **7.21** | | **9.75** | | **11.86** |

*Source: Company data, Credit Suisse estimates*

**Exhibit 74: RRI Sum of the Parts Valuation**

| | | | Low Case | | Base Case | | High Case |
|---|---|---|---|---|---|---|---|
| | **Estimate** | **Mult / DR** | **Value** | **Mult / DR** | **Value** | **Mult / DR** | **Value** |
| 09 EBITDA | 453 | 7.0 | 3,173 | 7.5 | 3,400 | 8.0 | 3,626 |
| DCF | | 9.00% | 3,167 | 8.50% | 3,309 | 8.00% | 3,466 |
| **Average Retail EV** | | | **3,170** | | **3,354** | | **3,546** |
| 2009 EBITDA | 1,010 | 7.0x | 6,487 | 8.0x | 7,448 | 9.0x | 8,418 |
| 2013 EBITDA | 1,425 | 7.0x | 9,475 | 8.0x | 11,065 | 9.0x | 12,762 |
| DCF thru 2020 | | 9.00% | 8,537 | 8.50% | 8,950 | 8.00% | 9,404 |
| *Average* | | | *8,167* | | *9,154* | | *10,195* |
| Evironmental | | 9.00% | (461) | 8.50% | (472) | 8.00% | (484) |
| **Average Wholesale EV** | | **13.4%** | **7,706** | **12.4%** | **8,682** | **11.4%** | **9,711** |
| 09 EBITDA | (142) | 8.5 | (1,211) | 8.0 | (1,139) | 7.5 | (1,068) |
| DCF | | 7.50% | (1,174) | 8.00% | (1,127) | 8.50% | (1,083) |
| **Average Other EV** | | | **(1,193)** | | **(1,133)** | | **(1,076)** |
| **Enterprise Value** | | | **9,683** | | **10,903** | | **12,181** |
| Net Debt | | | 1,800 | | 1,800 | | 1,800 |
| Equity Value | | | 7,883 | | 9,103 | | 10,381 |
| | | | | **CS Weighted Assumption** | | | **Bingaman Bill** |
| **Carbon NPV per Share** | | | **0.00** | | **0.50** | | **0.50** |
| **Share Value** | | | **26.46** | | **31.05** | | **35.34** |

*Source: Company data, Credit Suisse estimates*

**Companies Mentioned** *(Price as of 26 Jun 08)*
AES Corporation (AES, $19.04)
Allegheny Energy Inc. (AYE, $51.22, OUTPERFORM, TP $63.00)
Ameren Corp. (AEE, $43.04)
Berkshire Hathaway Inc. (BRKA, $122000.00)
Calpine (CPN, $22.75)
CMS Energy (CMS, $15.28, OUTPERFORM [V], TP $18.50)
Con Edison (ED, $40.10, NEUTRAL, TP $46.00)
Constellation Energy Group Inc. (CEG, $81.15, OUTPERFORM, TP $113.00)
Dominion Resources (D, $46.95, NEUTRAL, TP $47.00)
Duke Energy (DUK, $17.74, NEUTRAL, TP $20.00)
Dynegy Inc. (DYN, $8.67, NEUTRAL, TP $9.50)
Edison International (EIX, $50.49, NEUTRAL, TP $52.50)
Enel (ENEI.MI, Eu6.20, UNDERPERFORM, TP Eu7.00, UNDERWEIGHT)
Energias de Portugal (EDP.LS, Eu3.43, NEUTRAL, TP Eu4.50, UNDERWEIGHT)
Entergy Corporation (ETR, $117.88, NEUTRAL, TP $132.00)
Exelon Corporation (EXC, $87.43, OUTPERFORM, TP $105.50)
FirstEnergy (FE, $80.10, OUTPERFORM, TP $92.00)
FPL Group (FPL, $63.82, OUTPERFORM, TP $79.00)
International Power (IPR.L, 415.00 p, OUTPERFORM, TP 537.08 p, UNDERWEIGHT)
Mirant Corporation (MIR, $40.58)
National Grid (NG.L, 665.50 p, NEUTRAL, TP 880.00 p, UNDERWEIGHT)
NRG Energy (NRG, $43.44, RESTRICTED)
Ormat Technologies (ORA, $52.84)
Pepco Holdings Inc. (POM, $26.23, NEUTRAL, TP $29.50)
PPL Corporation (PPL, $53.67)
Public Svc Ent (PEG, $44.44, OUTPERFORM, TP $54.50)
Reliant Energy (RRI, $21.68, OUTPERFORM, TP $31.00)
Rochester Gas & Electric (EAS, $23.95)
Sempra Energy (SRE, $55.98)
Suez (LYOE.PA, Eu43.47)

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