Electric Market National Overview
This map was created using Energy Velocity, August 2009.
Weekly U.S. Electric Generation Output and Temperatures

Source: Derived from EEI and NOAA data.

Updated September 8, 2009
Electric Market Overview: Financial Market Volumes

Financial Trading on ICE by Contract Month

Source: Derived from ICE data. ICE on-peak swaps (financial) volume include monthly, dual monthly, quarterly, and calendar year contracts traded for each month.

Updated September 8, 2009
Regional Wind Capacity Growth

West w/o CA: CO, HI, ID, MT, NM, OR, UT, WA, WY
Great Plains: KS, NE, ND, OK, SD
Midwest: IL, IN, IA, MI, MN, MO, OH, WI
East: ME, MA, NH, NJ, NY, PA, RI, TN, VT
Source: Energy Velocity Generating Unit Capacity Dataset

Updated April 7, 2009
2008 Review of Wind Capacity and Generation

Installed wind capacity grew 8,358 MW to 25,170 MW in 2008 from 16,818 MW in 2007, a 50% increase. Wind power was 43% of new U.S. new electric capacity in 2008, surpassing gas-fired generation.

Installed capacity grew at a compound annual growth rate (CAGR) of 39% from 2004-08, compared to 28% for 2003-07.

National wind policy and developments included:

- Congress extended the production tax credit (PTC) through Dec 2009. Indexed to inflation, it is now worth 2.1¢ per kWh for the first ten years a project operates.
- In Feb. 2009, Congress extended the credit through 2012, its longest renewal ever. This extension provides developers and equipment companies better long-term assurance to invest in projects and manufacturing facilities. The three times the PTC lapsed this decade were followed by declines in new capacity in subsequent years: 2000, 2002, and 2004 (see next chart, “Growth in Installed U.S. Capacity”).
- Foreign turbine, tower, and component manufacturers have opened U.S. facilities with the PTC’s steady renewal, lowering equipment transportation costs. In 2008, 30 facilities were announced, 10 opened, and 18 existing facilities expanded; 9 came online and 11 were announced in 2007.
- The economic downturn has led to some facility cutbacks, employee layoffs, project delays, and equipment order postponements.

State policies encouraged wind’s growth:

- 16 of the top 25 states by cumulative MW had an RPS (14 in 2007), 3 had renewable goals (3 in 2007) while 6 had neither.
- 34% of 2008 capacity additions – 7,454 MW – were in the 20 states with the highest wind potential; 86% of total U.S. wind capacity – 21,741 MW – is in those states.

State policies (continued):

- 80% of total U.S. wind is in the top ten states. The top 5 states by installed capacity (new 2008 MW) are:
  - Texas: 7,116 MW (2,670)
  - Iowa: 2,790 MW (1,519)
  - California: 2,517 MW (78)
  - Minnesota: 1,752 MW (454)
  - Washington: 1,375 MW (212)

- Texas kept its lead as the state with the most wind capacity; Iowa passed California for 2nd place. Oregon and Colorado each have more than 1,000 MW installed.

The Commission acted to improve wind interconnection:

- Wind's rapid capacity growth created a backlog in many interconnection queues. FERC held a technical conference in December 2007 (AD08-2) to re-examine its Large Generator Interconnection Rule (Order 2003). ISOs and RTOs reported that queuing procedures specified in the Order impeded their timely interconnection of wind resources.
- In March 2008, FERC directed RTOs and ISOs to report on the status of their efforts to improve the processing of projects in their queues; it offered guidance on reforms including increased staffing, more efficient modeling, or clustering requests. Queue reform Orders were subsequently approved for the Midwest ISO (2008), California (2008), and ISO-New England (2009).
- FERC accepted the tariff provisions NYISO proposed, which allowed it to implement a centralized program to incorporate wind output into its day-ahead and real-time energy markets. Ongoing costs are recovered from wind plant operators.

Source: Energy Velocity Generating Unit Capacity Dataset

Updated April 7, 2009
Electric Market Overview: 2008 Review of Wind

2008 Review of Wind Capacity and Generation

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* CAGR is a better indicator of growth rates over time than a straight percent.
** Interconnection Queuing Practices, 122 FERC ¶ 61,252 (2008)

Source: OE analysis, derived from data in Commission filings; American Wind Energy Association (AWEA); DOE, Annual Report on U.S. Wind Power; Energy Velocity; Lawrence Berkeley National Laboratory; and trade press.
31 States including D.C. have Renewable Energy Portfolio Standards (RPS)

Notes: An RPS requires a percent of an electric provider’s energy sales (MWh) or installed capacity (MW) to come from renewable resources. Most specify sales (MWh). Map percents are final years’ targets. “TVA’s goal is not state policy; it calls for 50% zero- or low-carbon generation by 2020. Alaska has no RPS.

Sources: Derived from data in: LBNL, RPS in the U.S. through 2007 (4/08), PUCs, State legislative tracking services, Pew Center, and the Union of Concerned Scientists. Details, including timelines, are in the Database of State Incentives for Renewables and Energy Efficiency: http://www.dsireusa.org

Updates at: http://www.ferc.gov/market-oversight/mkt-electric/overview/elec-ovr-rps.pdf
21 States have Energy Efficiency Resource Standards

NE: Interim Energy Plan stresses multi-sector EE improvements
KS: Voluntary utility programs
OK: PSC approved quick-start utility EE & DR programs
WA: pursue all cost-effective conservation: ~ 10% by 2025
OR: IOU 2008 goals 34 MW; administered by Energy Trust OR
CA: 8% energy savings; 4,885 MW peak reduction by 2013 (from ‘04)
ID: Energy Plan set conservation, DR, EE as priority resources
NV: EE up to 25% of RPS: ~ 5% electric reduction by 2015
UT: EE earns incentive credits in RE goal
CO: 11.5% energy savings by 2020: ~ 3,669 GWh (from ‘08)
NM: 10% retail electric sales savings by 2020 (from ‘05)
TX: 20% of load growth by 2010, using average growth rate of prior 5 years
HI: 30% electricity reduction: ~ 4,300 GWh by 2030 (from ‘09)

MN: 1.5% annual savings based on prior-3 years average, to 2015
IA: 5.4% energy savings by 2020 - 1.5% annual
MI: 1% annual energy savings as a percent of from prior year’s sales
IL: reduce energy use 2% by 2015 and peak 0.1% from prior year
OH: 22% energy savings by 2025 (from 2009); reduce peak 8% by 2018
KY: proposed RPS-EE to offset 18% of projected 2025 demand
ME: 30% energy savings; 100 MW peak electric reduction by 2020
VT: 11% energy reductions by 2011 (2% annual); administered by Efficiency VT
MA: 25% of electric load from DSR, EE by 2020: capacity and energy
NY: reduce electric use 15% by 2015 from levels projected in 2008
CT: 4% energy savings (1.5% annual) & 10% peak reduction by 2010 (from ‘07)
RI: reduce 10% of 2006 sales by 2022
NJ: proceeding on Energy Master Plan to reduce consumption, peak
DE: Sustainable Energy Utility charged with 30% energy reduction by 2015
PA: reduce consumption 3%, peak 4.5% by 2013 as percent of 2009-10 sales
MD: reduce per capita electricity use and peak 15% by 2015 from 2007
VA: reduce electric use 10% by 2022 (from ‘06)
WV: EE & DR earn one credit for each MWh conserved in the 25% by 2025 A&RES
NC: EE to meet up to 25% of RPS to 2011
TVA: reduce electricity consumption 25% and cut peak 1,400 MW by 2012 (from ‘08) in 7-state territory ★


* TVA is a Public Power Authority – this is not a state action.
Abbreviations: A&RES – Alternative & Renewable Energy Standard; DR - demand response; DSR – demand-side resources; EE - energy efficiency; E&G: electric and gas utilities; RPS: Renewable Portfolio Standard;
Sources: ACEEE, DOE- EERE, EPA, Institute for Electricity Efficiency (IEE); Regulatory Assistance Project, State regulatory and legislative sites, State Efficiency Agency reports, trade press

Updated July 8, 2009
Energy Efficiency Resource Standards (EERS)

- An Energy Efficiency Resource (or Portfolio) Standard (EERS) aims to reduce or flatten electric and gas load growth using energy efficiency (EE). It requires distribution utilities to achieve annual savings levels. An EERS may specify reductions for energy use (MWh or therms), peak demand (MW), or both.

- Energy Efficiency uses less fuel to produce the same or greater amount of usable energy from a given energy source. Reductions normally create multi-year effects over an investment’s useful life. Alternatively, conservation can be temporary reductions in energy use.

STATE ENERGY EFFICIENCY ACTIVITIES:

- 21 states have an EERS, including three signed in June: Hawaii, West Virginia, and Maine. 10 others include EE in procurement orders or Integrated Resource Plan (IRP) requirements. 17 include EE as an eligible RPS resource or in an RE goal.

- Three states are developing regulations for an EERS: MA, NJ, and RI. Two states issued energy plans that stress economy-wide energy efficiency use, and propose an EERS: KY and NE.

- Hawaii enacted an EERS targeting a 4,300 GWh electricity reduction by 2030 – more than one-third of 2008 retail sales. EE will be an approved RPS-resource only through 2014. (June 25)

- West Virginia’s Alternative & Renewable Energy (A&RE) Standard provides that each megawatt-hour (MWh) conserved in an approved EE or DR program earns one A&RE credit towards a utility’s 25% by 2025 target. (June 17)

- Maine’s law requires 30% energy savings and 100 MW peak electric reduction by 2020. The PUC needs to adopt regulations, including base year for reductions. (June 12)

- Virginia directed the SCC to conduct a proceeding to determine achievable, cost-effective conservation and DR targets; its findings are due by Nov 15. A second law authorizes the SCC to allow utilities to recover costs both of EE programs and of revenue reductions due to EE programs. (both April 8)

STATE DECOUPLING ACTIVITY:

- Decoupling is one mechanism to incent EE programs. It sever utility profits from the quantity of therms or kilowatt-hours sold. Some State Utility Commissioners express concerns about potential “one-size-fits-all” national decoupling provisions. Gas decoupling mechanisms exist in 16 states; they are pending in 6 others.

- State electric decoupling actions include:
  - Four adopted decoupling: CA, CT, MD, and WI.
  - Nine will consider or have approved decoupling in individual rate cases: KS, MA, MI, MT, NY, OH, OK, OR, and WA.
  - Six opened proceedings or dockets to explore decoupling or to approve utility proposals: DC, DE, HI, NH, NJ, and WI.
  - Two have laws or orders to study decoupling: FL and NM.
  - One has a residential decoupling pilot: ID.

NATIONAL ENERGY EFFICIENCY LEGISLATION:


- Utility coverage: Large utilities are included, defined by retail sales volume; they serve 95% of electric customers.

- Cumulative Savings: Electric savings ramp from 1.5% in 2012 to 5% in 2020. States with difficulty meeting the full RPS target may petition FERC to increase EE to 8%.

- EE as a Resource: States would be required to consider EE as a resource in utility planning and procurement.

- Costs: States should procure all EE available at lower costs than energy supply options. ACEEE testimony on companion bill S 548 cited average EE program costs of 3¢/kWh, relative to new power plant costs of up to 13¢/kWh.


Updated July 8, 2009
Electric Market Overview: Renewable Portfolio Standards

Renewable Energy Portfolio Standards

A Renewable Portfolio Standard (RPS) or Renewable Energy Standard (RES) requires a percent of energy sales (MWh) or installed capacity (MW) to come from renewable resources. Percents usually increase incrementally from a base year to an ultimate target. The percents shown on the map are ultimate targets.

- 31 states – including D.C. – have renewable mandates.
- Six have renewable goals without financial penalties.

State Renewable Actions:

- West Virginia became the 31st state with an RES when Gov. Manchin signed the Alternative and Renewable and Energy (A&RE) Portfolio Standard (June 17). It calls for 25% of electricity sales to come from A&RE resources by 2025, including advanced coal technologies. WV is the 5th state to authorize alternative energy resources to meet part of an RPS. Others are IL, PA, OH, and MI.


National Renewable Actions:

- The House passed the “American Clean Energy and Security Act” ("Waxman-Markey") on June 26. Title I, Subtitle A, “Combined Energy Efficiency and Renewable Energy Standard,” includes a national RES. It begins at 4.5% of retail sales in 2012 and increases to 15% in 2020. Efficiency reductions are the second part of the combined standard; they begin at 1.5% and rise to 5%. A Governor who determines that local utilities cannot meet the renewables requirement may petition FERC to reduce that target to 12%. If granted, the EE requirement would increase to 8%.


Renewable Energy Zone Plans Advance:

- The Western Governors Association and DOE released a report on June 15, “Western Renewable Energy Zones.” This Phase I report begins to identify Western Interconnection areas with the best potential for large-scale renewable development yet low environmental impacts. The Western Renewable Energy Zones (WREZ) initiative was launched in May 2008, with representatives from 11 states, two Canadian provinces, and areas in northern Mexico.

- The California Energy Commission issued a draft report June 1 for its Renewable Energy Transmission Initiative (RETI). RETI was established in 2008 to plan transmission needed to meet the state’s 33% by 2020 renewable goals. Phase 1 identified and ranked Competitive Renewable Energy Zones (CREZ). Phase 2 developed conceptual plans to access the best of those zones. The report identified two sets of major lines by re-ranking the 35 zones identified in Phase 1, and by focusing on the most feasible areas for biomass, geothermal, solar, and wind projects.

- Eight Northeast and Mid-Atlantic Governors sent a joint letter to Congressional leaders urging them to recognize the potential both of onshore and of off-shore wind resources (May 4). The Governors urged them to consider regional differences in devising renewable energy transmission corridors. They proposed the creation of an offshore wind transmission regime, with new FERC policies tailored to offshore’s special circumstances. “Meeting New England’s Renewable Energy Targets,” a white paper on transmission requirements, accompanied the letter.

- The Texas Public Utility Commission issued an order selecting entities to build transmission projects to renewable-rich areas under its CREZ process (March 31). Developers were awarded nearly $5 billion to build 14 projects. In 2005, SB 20 set up the CREZ process so the vast renewable energy potential in remote Texas zones could delivered to population centers. The PUCT opened two docket to sequence priority and secondary projects and to consider applications for transmission line certificates of convenience and necessity.

Updated July 8, 2009
Collaborative Regional GHG Programs:
- Three North American groups with goals to lower regional GHG emissions were initiated by state Governors.
- 32 U.S. states, D.C., eight Canadian provinces, and six Mexican states are Participants or Observers.
- Observer jurisdictions do not commit to group GHG reduction goals, but participate in proceedings should they opt to join later. RGGI Observers are not on its Board.

Western Climate Initiative (WCI):
- Created February 2007
- Partners: 7 states, 4 provinces; Observers: 5 states, 1 province
- Announced its design for a market-based, multi-sector cap-and-trade program, Sept 2008:
  - 15% CO₂ reduction below 2005 levels by 2020
  - Phase I to take effect Jan 2012

Midwest Greenhouse Gas Reduction Accord:
- Established November 2007
- Participants: 6 states, 1 province; Observers: 3 states, 1 province
- Preliminary design recommendations issued Dec 2008: 15 - 25% reductions by 2020, 60 - 80% by 2050

Regional Greenhouse Gas Initiative (RGGI):
- Compliance period began Jan 1, 2009
- Participants: 10 states
- Observers: 1 state, D.C., 3 provinces
- Market-based cap-and-trade effort to reduce power-sector CO₂ emissions.
- 10% CO₂ reduction by 2018 covers over 200 plants
- One allowance is the right to emit 1 ton of CO₂
- Annual RGGI cap is 188 million tons

RGGI Auction Data

<table>
<thead>
<tr>
<th>Auction Date</th>
<th>Allocation Year</th>
<th>Allowances Sold (000s)</th>
<th>Clearing Price</th>
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<td>9/25/08</td>
<td>2009</td>
<td>12,565</td>
<td>$3.07</td>
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<td>12/17/08</td>
<td>2009</td>
<td>31,506</td>
<td>$3.38</td>
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<td>3/18/09</td>
<td>2009</td>
<td>31,514</td>
<td>$3.51</td>
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<tr>
<td>3/18/09</td>
<td>2012</td>
<td>2,176</td>
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<td>6/17/09</td>
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<td>30,888</td>
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<tr>
<td>6/17/09</td>
<td>2012</td>
<td>2,173</td>
<td>$2.06</td>
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</tbody>
</table>

Notes: Kansas is a MGGRA participant and WCI observer. Ontario and Quebec are Partners to WCI and Observers to RGGI; Ontario is also an observer to RGGI.

Updates at: http://www.ferc.gov/market-oversight/mkt-electric/overview/elec-ovr-ghg.pdf

Updated June 19, 2009
Collaborative Greenhouse Gas Programs

National Energy and Environment Update:
- Congressmen Waxman and Markey announced a compromise on HR 2454 Energy and Emissions bill (May 21), which includes:
  - Allowance allocation: 35% for utilities; 15% for low-moderate income families; 9% for natural gas distribution companies

RGGI launches offset module:
- Offset projects can now be registered and tracked in the RGGI CO2 Allowance Tracking System (RGGI-COATS).
- Projects must open a RGGI-COATS account and obtain a project ID, register the project in their home state, and then complete the project verification process.
- There are five offset categories: avoided methane from agriculture; afforestation; landfill methane capture and destruction; SF6 (sulfur hexa-flouride) reduction in electricity transmission; and CO2 reduction from natural gas, propane, or oil end-use.

RGGI Auctions:
- Auction 4 conducted on June 17, 2009 raising $104 million for energy efficiency, renewable energy, and other consumer-benefit programs in participating states.
- Participant states are: CT, DE, ME, MD, MA, NH, NJ, NY, RI, VT.
- 2009 allowances cleared at $3.23 per allowance, 28¢ lower than Auction 3.
- 2012 allowances cleared at $2.06 per allowance, a 99¢ or 32% drop from the Auction 3 price of $3.05
- Auction 5 is scheduled for September 9, 2009.

Midwest Greenhouse Gas Regional Accord:
- Signed at Midwestern Governors Association (MGA) Energy Summit to establish GHG reduction targets (Nov 2007):
  - Participants: IA, IL, KS, Manitoba, MI, MN, WI
  - Observers: IN, OH, Ontario, SD
- Preliminary recommendations included GHG reduction ranges and multiple sector cap-and-trade. (Dec 2008)
- Draft Plan and Recommendations released by MGA stakeholder advisory group (June 8, 2009):
  - Reductions from 2005 levels: 18-20% by 2020; 80% by 2050
  - Trading will begin in 2012.
  - Allowances would transition from low-cost allocation in early years to 100% auction after 9 years. The plan left allocation distribution decisions to participant jurisdictions.
  - 5 sectors to be covered by cap-and-trade, in proportion to their emissions share are: electricity generation, industrial combustion, industrial process sources, other fuels serving buildings, and transportation fuels.
  - Offsets can count towards 20% of compliance, but will be limited initially to projects within participating jurisdictions or those who’ve signed MOUs with the Accord. “Offsets must be real, additional, verifiable, and enforceable.”

Western Climate Initiative (WCI):
- Launched at Western Governors' Association meeting to reduce regional GHG collectively, Feb 2007:
  - Partners: AZ, British Columbia, CA, Manitoba, MT, NM, Ontario, OR, Quebec, UT, WA
  - Observers: AK, CO, ID, KS, NV, Saskatchewan, WY
- Initial design released for a market-based, multi-sector cap-and-trade program (Sept 2008):
  - Phase I to take effect Jan 2012
  - Phase II to begin 2015; will cover 90% of regional emissions
- Released its 2009 - 2010 Work Plan (Feb 2009), including primary committee tasks.

Abbreviations: CO2 – Carbon dioxide (emissions); DG - distributed generation; DR - demand response; EE - Energy Efficiency; EPA – U.S. Environmental Protection Agency; GHG - Greenhouse Gases; RECs - Renewable Energy Credits; SF6 – sulfur hexafluoride

Updated June 19, 2009
June-August Implied Heat Rates, 2008 vs. 2007

Source: Implied heat rates derived from Platts Megawatt Daily data.

Updated September 9, 2008
Electric Market Overview: On-Peak Spot Electric Prices

Average On-Peak Spot Electric Prices 2008

Source: Derived from Platts data.

Updated February 6, 2009
### Regional Spot Prices: 2006-2008

#### On-peak Spot Prices

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<tr>
<th>Region</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>% Change 06-07</th>
<th>% Change 07-08</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>% Change 06-07</th>
<th>% Change 07-08</th>
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<td>Mass Hub</td>
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<td>77.39</td>
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<td>18.3%</td>
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<td>Ny Zone G*</td>
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<td>61.20</td>
<td>66.88</td>
<td>18.1%</td>
<td>9.3%</td>
<td>27.66</td>
<td>28.94</td>
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<td>4.6%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Michigan Hub</td>
<td>55.29</td>
<td>64.43</td>
<td>69.15</td>
<td>16.5%</td>
<td>7.3%</td>
<td>30.20</td>
<td>31.04</td>
<td>31.81</td>
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<td>2.4%</td>
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<td>Minnesota Hub</td>
<td>59.47</td>
<td>72.32</td>
<td>67.46</td>
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<td>-6.7%</td>
<td>27.57</td>
<td>29.32</td>
<td>25.76</td>
<td>6.4%</td>
<td>-13.8%</td>
</tr>
<tr>
<td>NI Hub</td>
<td>52.52</td>
<td>58.93</td>
<td>66.13</td>
<td>12.2%</td>
<td>12.2%</td>
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<td>29.32</td>
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<td>Illinois Hub</td>
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<td>-4.3%</td>
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<td>13.1%</td>
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<td>34.00</td>
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<td>9.4%</td>
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<tr>
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<tr>
<td>SPP North</td>
<td>55.84</td>
<td>60.21</td>
<td>68.77</td>
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<td>14.2%</td>
<td>33.96</td>
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<td>33.66</td>
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<td>39.03</td>
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<td>38.36</td>
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<tr>
<td>Four Corners</td>
<td>58.52</td>
<td>63.21</td>
<td>71.84</td>
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<td>13.7%</td>
<td>37.91</td>
<td>40.19</td>
<td>49.40</td>
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<td>18.7%</td>
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<tr>
<td>Palo Verde</td>
<td>57.59</td>
<td>61.74</td>
<td>71.87</td>
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<td>16.4%</td>
<td>38.21</td>
<td>41.94</td>
<td>52.16</td>
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<td>19.6%</td>
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<td>Mead</td>
<td>59.93</td>
<td>64.49</td>
<td>75.63</td>
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<td>17.3%</td>
<td>39.92</td>
<td>44.15</td>
<td>54.90</td>
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<td>Mid-C</td>
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<td>56.57</td>
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<td>14.9%</td>
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<td>COB</td>
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<td>62.14</td>
<td>73.86</td>
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<td>18.9%</td>
<td>40.71</td>
<td>46.38</td>
<td>55.81</td>
<td>13.9%</td>
<td>16.9%</td>
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<tr>
<td>California</td>
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<tr>
<td>NP15</td>
<td>61.08</td>
<td>66.59</td>
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<td>9.0%</td>
<td>20.3%</td>
<td>40.77</td>
<td>47.10</td>
<td>59.22</td>
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<td>20.5%</td>
</tr>
<tr>
<td>SP15</td>
<td>61.95</td>
<td>66.48</td>
<td>79.36</td>
<td>7.3%</td>
<td>19.4%</td>
<td>41.62</td>
<td>46.76</td>
<td>57.86</td>
<td>12.4%</td>
<td>19.2%</td>
</tr>
</tbody>
</table>

Note: * Off Peak as of April 2, 2007.

Source: Derived from Platts data.
## Regional Electric and Input Prices: 2006-2008

**Electricity and Input Prices, 2006-08**

<table>
<thead>
<tr>
<th>Electric Spot Prices (On-Peak $ per MWh)</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass Hub</td>
<td>$69.85</td>
<td>$77.39</td>
<td>$91.55</td>
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<tr>
<td>Cinergy</td>
<td>$51.81</td>
<td>$61.20</td>
<td>$66.88</td>
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<tr>
<td>SP-15</td>
<td>$61.95</td>
<td>$66.48</td>
<td>$79.36</td>
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</tbody>
</table>

**Input Prices**

<table>
<thead>
<tr>
<th>Natural Gas ($ per MMBtu)</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henry Hub</td>
<td>$6.74</td>
<td>$6.94</td>
<td>$8.85</td>
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<tr>
<td>New York</td>
<td>$7.37</td>
<td>$8.46</td>
<td>$10.13</td>
</tr>
<tr>
<td>Southern California</td>
<td>$6.10</td>
<td>$6.41</td>
<td>$7.80</td>
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</table>

<table>
<thead>
<tr>
<th>Coal ($ per ton)</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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</thead>
<tbody>
<tr>
<td>Central Appalachian (Eastern)</td>
<td>$51.64</td>
<td>$45.00</td>
<td>$92.37</td>
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<tr>
<td>Powder River Basin (Western)</td>
<td>$13.21</td>
<td>$10.24</td>
<td>$13.62</td>
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</table>

<table>
<thead>
<tr>
<th>Emissions ($ per ton)</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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</thead>
<tbody>
<tr>
<td>SO₂ Allowances</td>
<td>$738.12</td>
<td>$527.58</td>
<td>$280.43</td>
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<tr>
<td>NOₓ allowances</td>
<td>$1,862.03</td>
<td>$815.87</td>
<td>$786.64</td>
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</table>

<table>
<thead>
<tr>
<th>Oil</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTI (Crude - $ per barrel)</td>
<td>$66.12</td>
<td>$72.45</td>
<td>$99.63</td>
</tr>
<tr>
<td>Residual Fuel, New York ($ per barrel)</td>
<td>$55.07</td>
<td>$64.35</td>
<td>$91.94</td>
</tr>
<tr>
<td>Distillate Fuel, New York ($ per gallon)</td>
<td>$2.04</td>
<td>$2.22</td>
<td>$3.08</td>
</tr>
</tbody>
</table>

Source: Derived from *Platts & Bloomberg* data. Updated February 6, 2009

September 2009
Central Appalachian and Powder River Basin Coal Prices

Source: Derived from Bloomberg data.

Updated September 8, 2009
SO$_2$ Allowance Spot Prices and NOx Seasonal Allowance Spot Prices

Source: Bloomberg

Updated September 8, 2009
Brief Overview of the SO2 and NOx Emissions Markets

The electric power industry is a major source of sulfur dioxide emissions (SO2) and nitrogen dioxide emissions (NOx) – both precursors of acid rain and smog. According to the Environmental Protection Agency’s (EPA) 2006 Acid Rain Progress Report, the power sector is responsible for 70% of SO2 emissions and 20% of NOx emissions. Currently US policy encourages reduction in SO2 and NOx emissions which can be achieved through a cap and trade program. This market based model also allows for relative flexibility in compliance options. An emitting source may choose pollution control technology such as add-on controls like flue gas desulfurization (FGD) for SO2 and selective catalytic reduction (SCR) for NOx, fuel switching, and/or participation in the respective cap and trade markets. The decision is primarily driven by the regulatory environment, fuel input type, the level of emission output, and compliance costs, the latter of which affects wholesale and retail prices.

**The Acid Rain Program**

http://www.epa.gov/airmarkets/progsregs/arp/index.html

EPA’s Acid Rain Program (ARP), established under the 1990 Clean Air Act Amendments, requires reductions of SO2 and NOx emissions from the electric power industry. The Acid Rain Program was the first cap and trade program implemented nationwide to reduce SO2 emissions.[1] The SO2 program set a permanent cap on the total amount of SO2 that can be emitted by fossil fuel-fired generating units and allows allowance trading so affected sources have some flexibility in their compliance method. Currently, SO2 sources must surrender one allowance to emit one ton of SO2. If a source falls short on the number of allowances it needs to comply with its individual cap, it can purchase allowances from another source that has a surplus of allowances. An emitting source may have a surplus of allowances for several reasons. For example, if it chose to install and/or run scrubbers, it can “bank” those unused allowances for future use or sell the leftover allowances to other emitting sources.

**The NOx Budget Trading Program**

http://www.epa.gov/airmarkets/cap-trade/docs/nox.pdf

In 2003, the cap-and-trade method was also implemented to reduce seasonal (primarily summer) NOx emissions from fossil fuel-fired plants. While the EPA administers the program, states are required to share the responsibility for allowance allocation and enforcement. Currently, NOx sources must surrender one allowance to emit one ton of NOx.

[1] The Acid Rain Program also required NOx emission reductions by select coal units but under a rate-based regulatory program [http://www.epa.gov/airmarkets/progsregs/arp/nox.html].

Source – EPA