

New Generating Technology to Reduce Greenhouse Gas Emissions

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The Target

- Energy related emissions of CO2 will increase by about 16% in AEO 2008 Reference Case between 2006 and 2030 (5,890 MM metric tons to 6,859 MM metric tons). (#s from Caruso Senate Energy testimony of 3/4/08).
- Last year, emissions from electricity generation were 40% of total energy-related GHG emissions.
- Based on projected annual electricity demand growth of 1.1%.

The Target Cont'd

- 16.4 GW of new nuclear + 2.7 GW Uprates of existing plants less 4.5 GW of retirements.
- Coal responsible for 54% of generation in 2030. 103 GW of capacity added, including:
 - 4 GW CTL
 - 30 GW IGCC
 - No CCS
- Renewable Generation, including CHP, grows 2.2% per year, resulting in about 70% more renewable generation in 2030 than 2006.

The Role of New Technology

- Only way to reconcile projections with 60-80% reductions in greenhouse gases by 2050.
- **Options:**
 - *More Nuclear* - Clean Air Task Force assumes 117 new GW by 2030 in modeling Lieberman-Warner; (EPA assumes 44 new 1-GW plants by 2025);
 - *CCS* - CATF L-W assumes 125 GW; EPA says coal +CCS = 1/3 of US demand by 2025, starting in 2015;
 - *More Renewables* - CATF L-W assumes 100+ GW; EPA has wind + renewables increasing by factor of 6 by 2025 to 13.4% of demand.

Lieberman-Warner (S. 2191)

- **Targets:** allowances in 2012 =5,775 MM metric tons CO₂ E; reductions to 4,924 in 2020 equivalent to 1990 levels; 2050 allowances of 1,732 MM tons (61% below 1990).
- **Auction and Use of Proceeds:** 21.5% of allowances auctioned in 2012; rising to 69.5% by 2031 and beyond. 52% of funds for energy technology deployment, including low carbon energy technologies, advanced coal and sequestration, cellulosic biomass and advanced vehicles.

Lieberman Warner (cont'd)

- One fourth of revenues reserved for loan guarantees, cost-sharing grants, and output based payments (15 cents/kWh) for “sustainable” energy.
- 4% of emission allowances for 2012-2030 placed in Bonus Allowance Account for qualifying CCS projects. Different standards for “new entrants” and not, and whether construction commences on or after 7-1-2018.

Bingaman-Specter (S. 1766)

- **Targets:** 6,652 MM Mt CO₂E allowances in 2012. To 2006 levels by 2020 and 1990 levels by 2030. 60% below 2006 levels by 2050.
- **Safety Valve:** \$12/ton in 2012, rising annually at 5% above inflation.
- **Auction and Use of Proceeds:** 24% of credits auctioned in 2012, to 53% in 2030. 23% of credits set aside for sequestration and state projects in 2012 (22% in 2030); bonus credits for carbon capture and sequestration. 80% of auction proceeds for “energy technology deployment” including low-carbon energy technologies, advanced coal and sequestration, cellulosic biomass, MSW and advanced vehicles.

Kerry-Stevens (S. 2323)

- **CCS Regulations:** EPA-led multi-agency task force to develop CCS regulatory framework three years from enactment. EPA to finalize CCS regs 5 five years from enactment.
- **CCS Demo Projects:** DOE competitive grant program for three 5-8 yr. commercial scale (>1MMtons per year) CCS demo projects, at least 2 of which must be deep saline aquifers. Authorizes \$1.6 billion for period FY2008-2015. Grant recipients to cover 20-50% of costs.

Kerry-Stevens (cont'd)

- **Coal Plants with CCS:** DOE grant program for 3-5 plants with CCS (250-500 MW). Grant recipients to cover >50% of costs. \$2.4 billion authorized for FY2008-2015.
- **Carbon Capture R&D:** for coal gasification and related technologies, and for pulverized coal combustion.
- **CO2 Storage:** capacity assessment and global Technology Sharing.

Does this Legislation Support Needed Technology?

- **Timing:** When will CCS be “ready?” EPA aims to complete CCS storage regs by 2011. UK predicts commercial by 2020 Does this legislation accelerate this timing?
- **Resources:** Is dedicating auction proceeds the way to fund needed technology development? Alternatives? User Fees?
- **Institutions:** Do we have the correct institutions to foster development/deployment of needed technologies? E.g., Do we need a CCS corporation? Sen. Domenici’s Clean Energy Bank?

Will the Technology Be Ready to Meet Statutory Deadlines?

- How much additional nuclear and renewable energy is feasible by 2030?
 - Permitting (4 years per nuclear plant)
 - Cost (\$5,300 per kW all-in for nuclear)
 - Transmission – no one talks about this (40,000 MW of renewables in CAL ISO queue; 40 years to study).
 - Availability – generation vs. capacity
- Have we identified the barriers to CCS?
 - Public acceptance, regulation, liability (cf. Yucca Mt?)
 - Pipelines; should we be talking about CCTS?
- Where is IGCC? All coals? Cost? (\$3700 per kW?) Only 3 “progressing” per NETL (2-18-08)

What Happens If We Get It Wrong?

- “In scenarios where technologies were constrained, i.e., nuclear power growth limited to ~75%, delay of CCS deployment until 2030 or limited use of biomass for electricity generation, costs were significantly higher: GHG allowances prices increased more than 80% in 2030 and 2050 and GDP losses increased by more than 150% in 2030 and 80% in 2050.” EPA Analysis of S. 2191, p.4.

Conclusion

- A Modest Proposal: Congress Needs to Recreate the Office of Technology Assessment
 - Develop Objective assessment of what is realistic given state of technology, markets, regulation AND infrastructure; technical and “soft” issues.
 - Can then address barriers and accelerate use of new technology.
 - Set deadlines that provide market “pull”, but don’t risk supply adequacy, energy security, a “bust” in the program.