INVESTING IN NEW BASE LOAD GENERATING CAPACITY

Paul L. Joskow

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THE 25-YEAR VIEW

- Significant investment in base-load generating capacity is required over the next 25 years to balance supply and demand efficiently
  - ~ 200 to 250 Gw (Gross)
  - Depends on retirements of older steam and peaking units
  - Depends on demand growth
    - electricity prices
    - aggregate economic activity
    - energy efficiency policies and responses
  - Depends on future state and federal CO_2 policies
  - Depends on cost and availability of key technologies

THE 25-YEAR VIEW

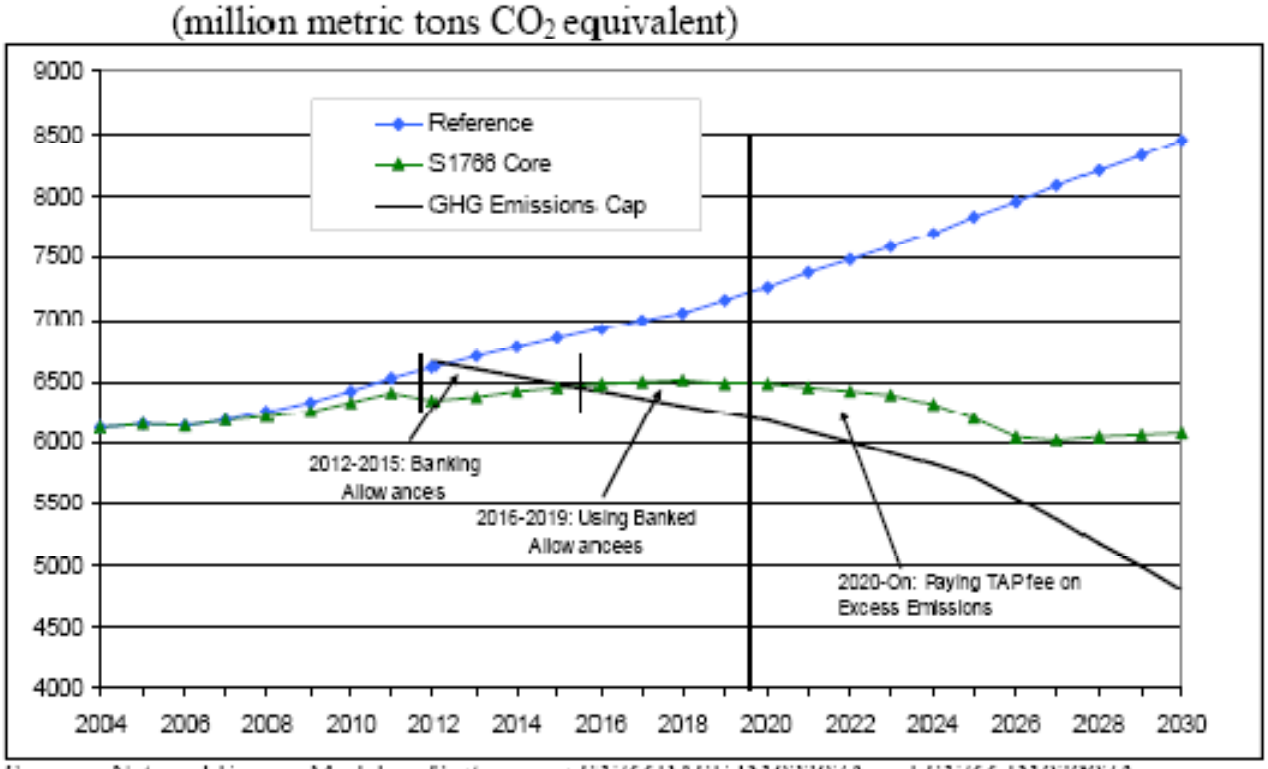
without CO_2 emissions prices

- Absent significant carbon prices or other constraints to curb CO_2 emissions the lowest cost alternative is typically supercritical coal
  - Transportation bottlenecks and rising coal prices due to export demand could impact coal's attractiveness in some areas
  - Significant reduction in gas price expectations could change the picture
- With existing government financial incentives and loan guarantees investment in new nuclear power plants is lower cost in some areas
  - Coal is likely to dominate significantly overall due to cost and other constraints on nuclear
- Gas combined-cycle will have a place primarily in areas where state and local policies make it impossible to build coal or nuclear plants (e.g. California and New England)
- This outcome is inconsistent with policies aimed at achieving significant (e.g. 60%) reductions in CO_2 emissions from 1990 levels by 2050

CO_2 PRICES

- The least cost investment portfolio could change significantly if high (life-cycle) prices are placed on CO_2 emissions
  - Supply-side effects
  - Demand-side effects
- Depends on
  - Level of CO_2 prices
  - How CO_2 prices are allowed to be reflected in retail electricity prices
  - Cost and availability of large scale CCS technology
  - Construction cost reductions for nuclear and renewables generation
  - Future gas price trajectory
- Achieving 60% reduction in CO_2 emissions by 2050 requires much higher CO_2 prices than the backstop price proposed in S. 1766 cap and trade program

Figure 1: Covered Greenhouse Gas Emissions Net of Offset Credits in the Reference and S. 1766 Core Cases (Bingaman-Specter)

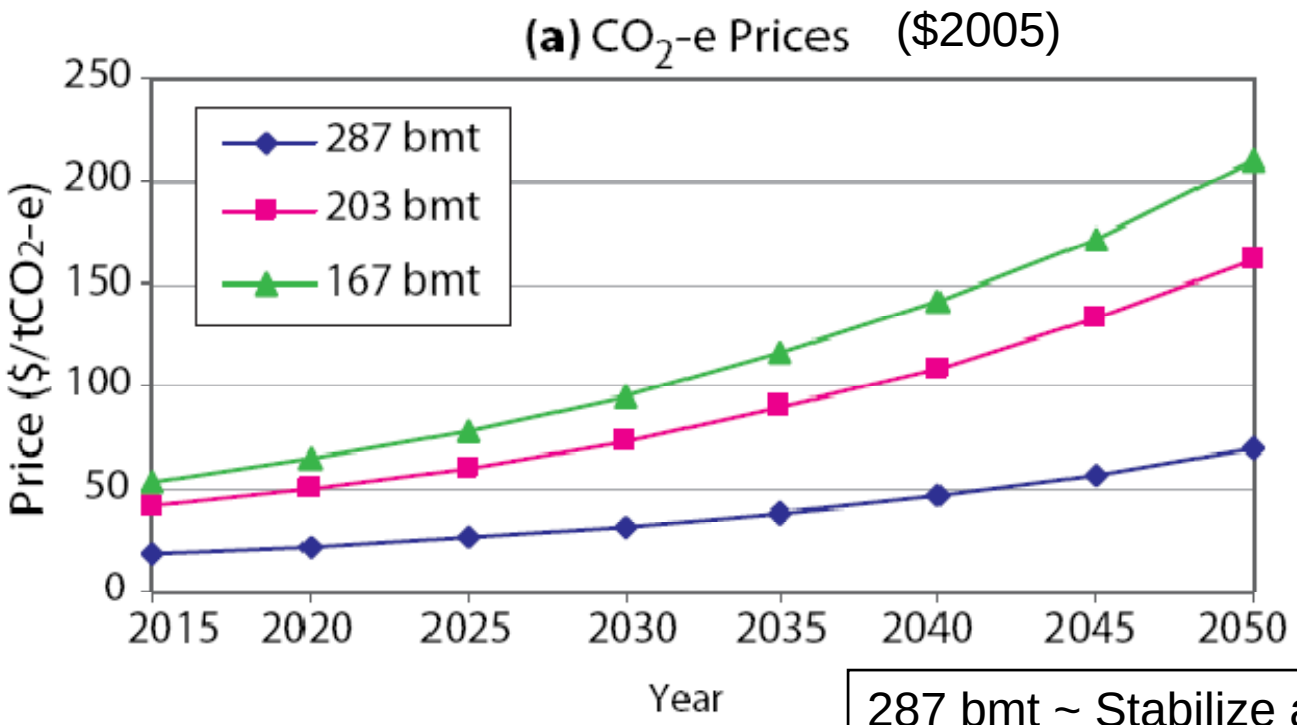


Source: National Energy Modeling System runs S1766BASE.D102307A and S1766.D103007A.

2030 CO_2 allowance price
Capped at \$25/ton CO_2

Optimistic CCS assumptions

EIA 2008



287 bmt ~ Stabilize at current levels by 2050
203 bmt ~ 60% below 1990 levels by 2050
167 bmt ~ 80% below 1990 levels by 2050

MIT Joint Program (Paltsev et. al. 2007)

Table 5. Relationship between ~$27 per ton CO_2-e price and recent average fuel prices.

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

Note: No adjustments for the effects of the policy on the producer price.

Source: U.S. average prices for 2002-2006 computed from DOE EIA price data. Base cost price is the 5-year average price, except coal (2001-2005). To the gasoline price we have added $0.42 to include the federal and an average of state gasoline excise taxes.

MIT Joint Program (Paltsev et. al. 2007)

BARRIERS TO INVESTMENT

- Uncertainties about future U.S. CO_2 policies and associated CO_2 prices (including international linkages)
- Uncertainties about the cost and availability of CCS for existing and (primarily) new coal generating capacity
- Uncertainties about the application of financial incentives and load guarantee policies to new nuclear plants
- Uncertainties to state and local restriction of nuclear capacity
- Dramatic increases in construction costs for all technologies and uncertainties about whether this is a short-run “bubble” or long-run adjustment to large increase in demand for infrastructure investments
- Uncertainties about regulatory treatment of construction costs in “regulated” states
- Uncertainties about the future of competitive wholesale and retail markets in “competitive” states
  - Balance sheet capacity of many U.S. utilities and IPPs is limited absent regulatory recovery and/or loan guarantees

REDUCING UNCERTAINTIES

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