Insights from EIA Analyses of Climate Change Policy Options

for
Workshop on Federal Policy to Reduce U.S. Greenhouse Gas Emissions
Session 2: Impacts of Different Targets and Design Choices

Resources for the Future
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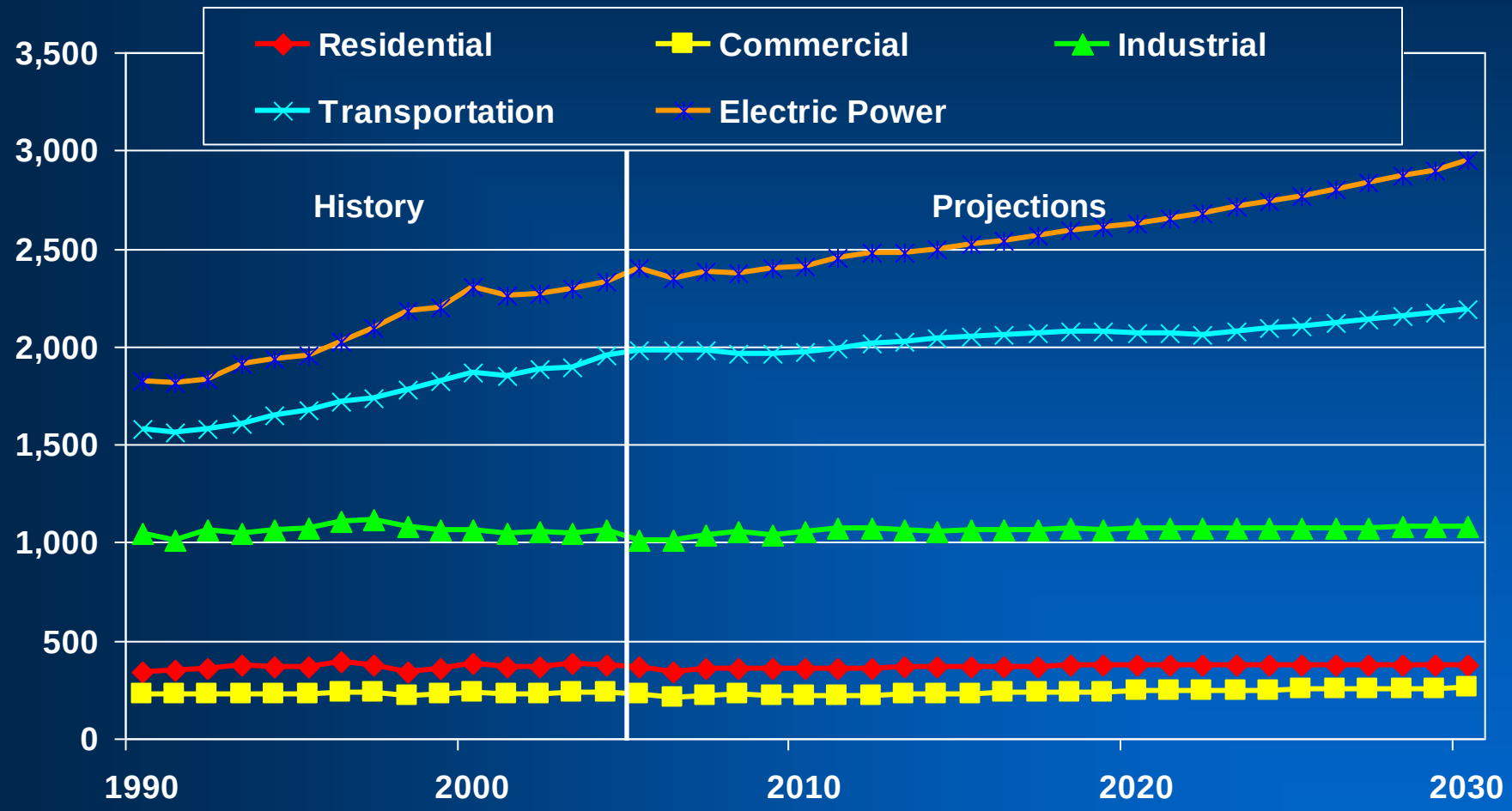
Energy Information Administration
Official Energy Statistics from the U.S. Government

Energy-related CO_2 emissions by sector AEO2008 Reference Case (million metric tons)



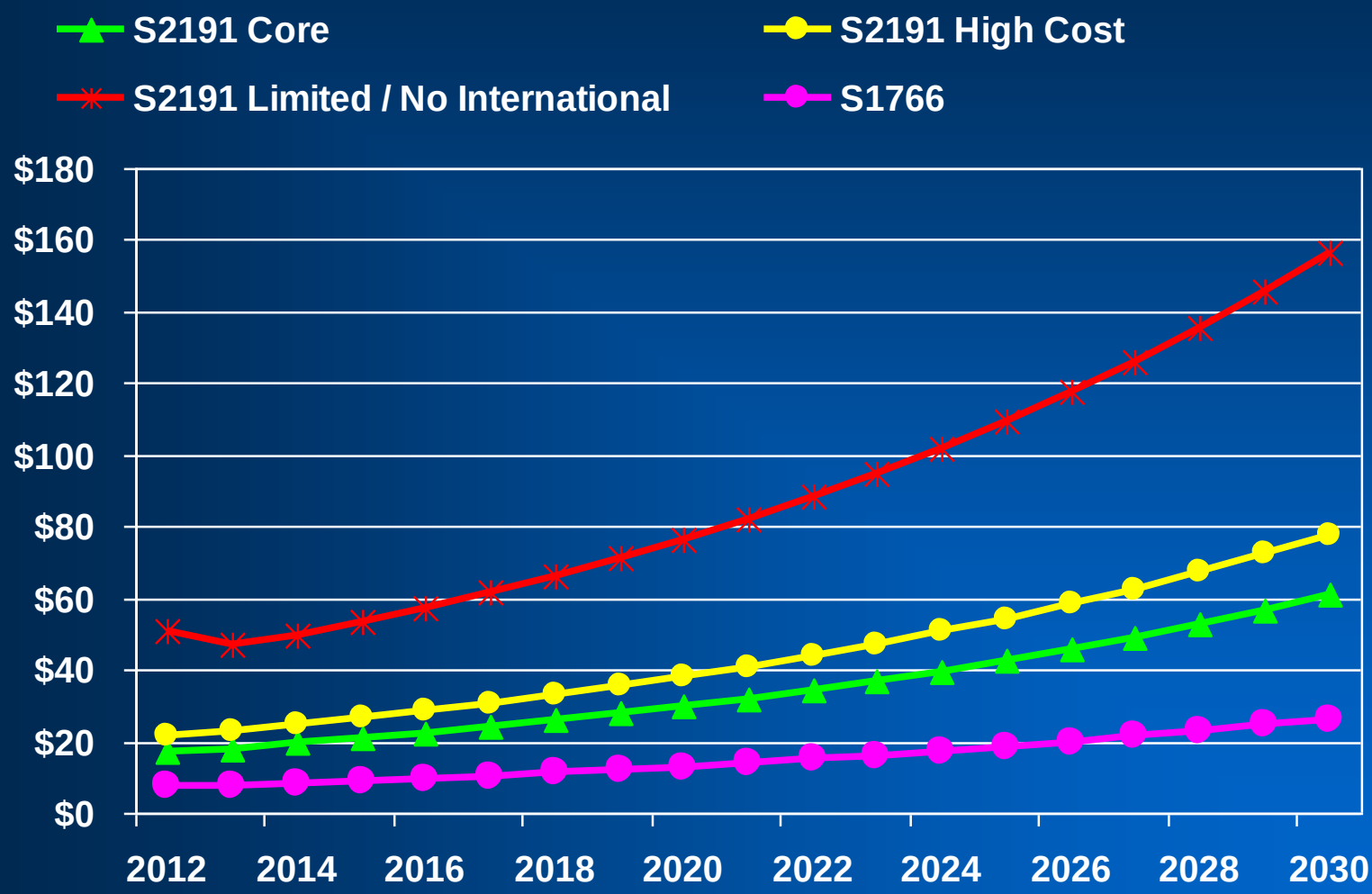
Recent and projected growth in U.S. GHG emissions is concentrated in the transportation and electric power sectors.

Selected Analysis Cases

Case Name	Assumptions
Reference	• **Updated *AEO2008* Reference case, which includes H. R. 6, the Energy Independence and Security Act of 2007, and assumes a continuance of other current laws and regulation** • **Non-CO_2 emissions growth based on the Environmental Protection Agency "with measures" and "voluntary technology adoption" cases**
Policy Cases	
S. 2191 Core	• **Cap and trade policy from Title I capping the emissions of Group I greenhouse gases (carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, and perfluorocarbons) and Group II gases (hydrofluorocarbons) emitted from HCFC production)** • **Key low-emissions technologies, including nuclear and coal with carbon capture and sequestration (CCS), are developed and deployed in a timeframe consistent with the emissions reduction requirements without encountering any major obstacles, even with rapidly growing use on a very large scale.** • **Bonus credit incentives for CCS** • **Non-energy GHG abatement supply, as a function of allowance costs, derived from information provided by the Environmental Protection Agency** • **The Title X program for hydrofluorocarbons not emitted from HCFC production is not represented**
S. 2191 High Cost	**S. 2191 Core case with assumed higher costs for key electricity generating technologies** • **CCS, nuclear and biomass plant costs 50 percent higher than in S. 2191 Core case**
S. 2191 Limited Alternatives / No International Offsets	**S. 2191 Core case with nuclear, coal with CCS and biomass held to Reference case levels and no international offsets.**
S. 1766 Update	**Updated evaluation of the Low Carbon Economy Act of 2007 (S. 1766) using AEO2008 Reference case assumptions. Key assumptions include:** • **S. 1766 cap and trade policy** • **S. 1766 bonus credit incentives for CCS** • **S. 1766 technology accelerator payment (TAP) price establishes a limit on the allowance price, growing at 5 percent per year in real dollars**

Projected Allowance Prices – S.2191 & S.1766

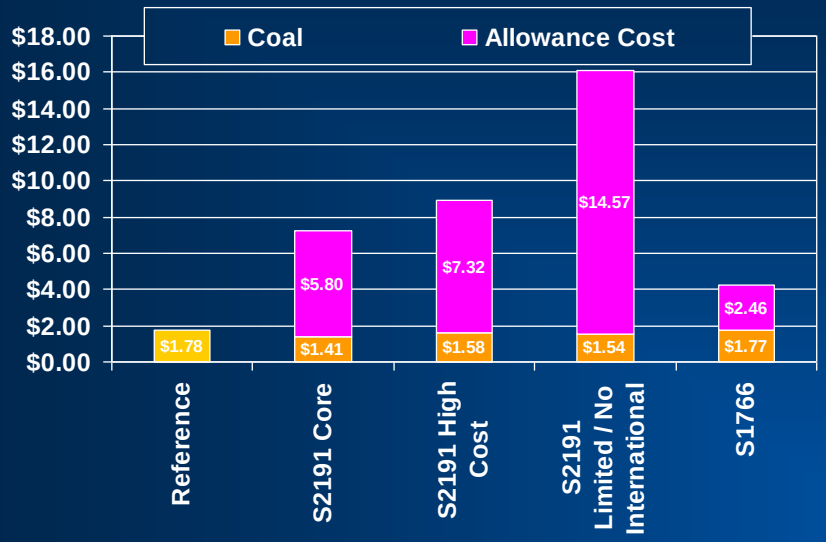
(2006 dollars per metric ton carbon dioxide equivalent)



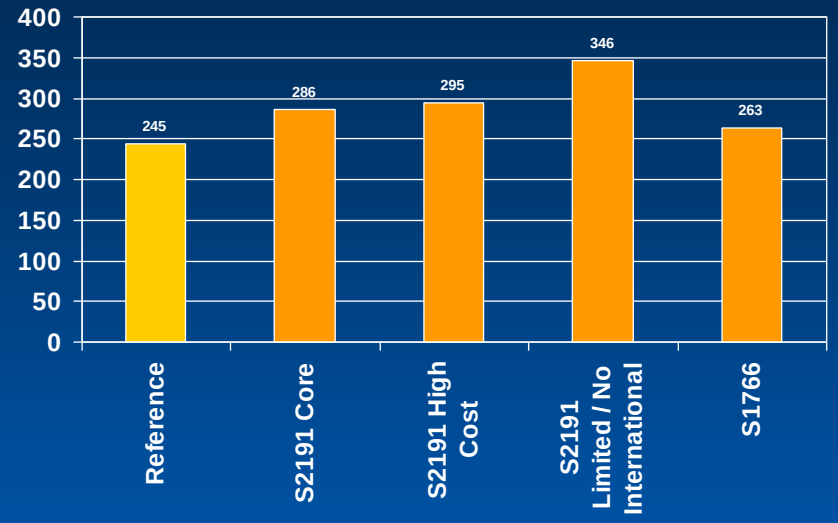
Allowance prices vary significantly with assumptions about the cost and availability of low-carbon generating technologies and offsets

Energy Prices: S.2191 Cases

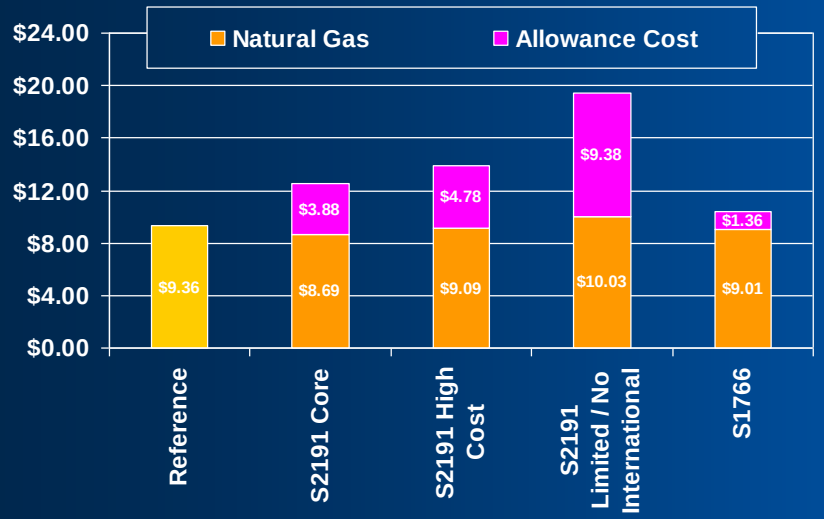
2030 Delivered Coal Costs (2006 $ per million Btu)



2030 Motor Gasoline Pump Prices (2006 cents per gallon)



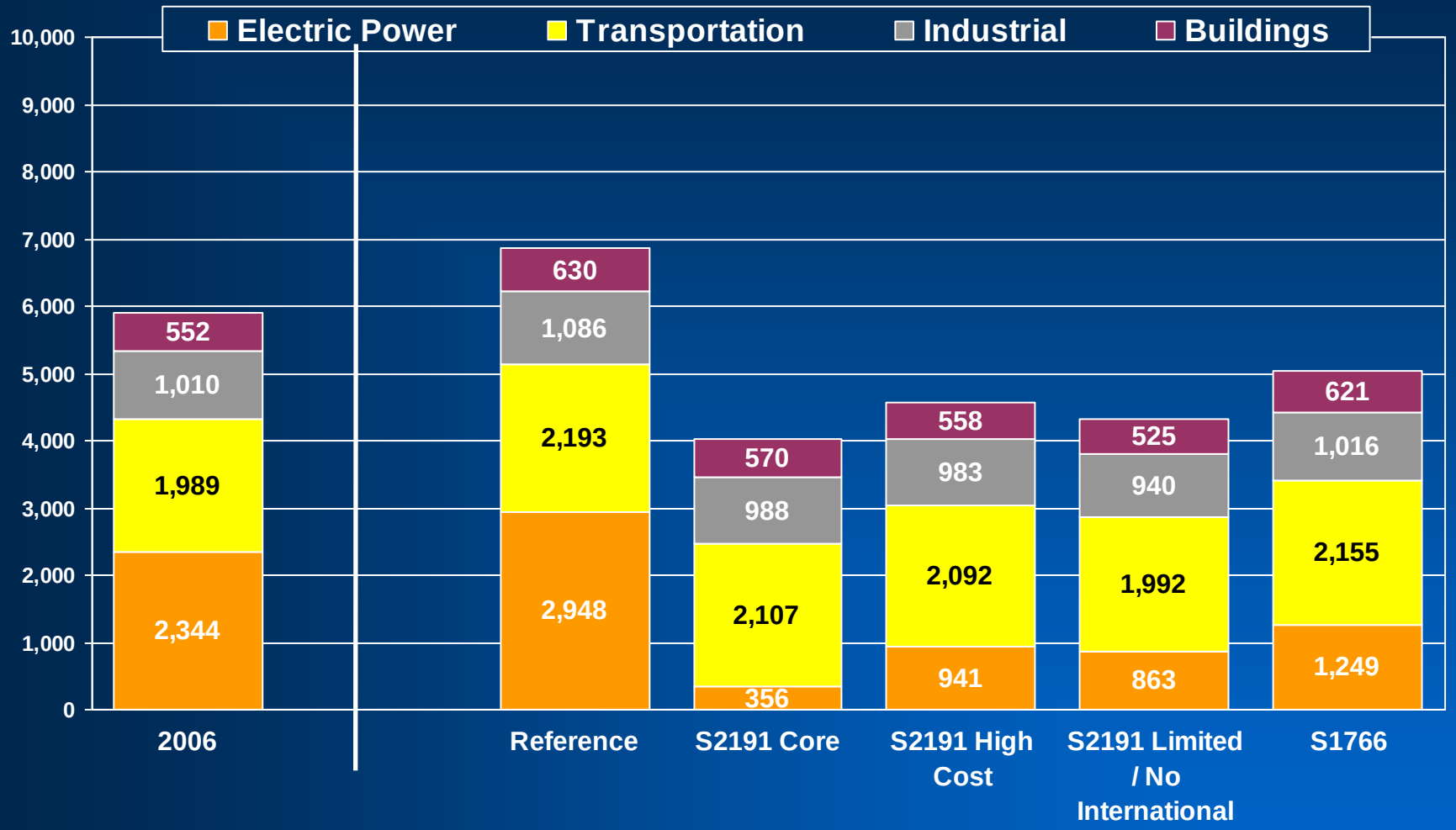
2030 Delivered Natural Gas Prices (2006$ per million Btu)



- **Among the S. 2191 cases, the delivered price of coal in 2030 in 2006 dollars, including allowances, increases dramatically, with increase ranging from 405 percent to 804 percent.**
- **The delivered price of natural gas in 2030 in 2006 dollars, including allowances, also increases, with increases across the S.2191 cases ranging from 34 percent to 107 percent.**
- **The increase in the retail price of gasoline in 2030 in the S. 2191 cases varies from 41 cents per gallon to 101 cents per gallon (17 percent to 41 percent).**

H. Gruenspecht, RFF Workshop, June 18

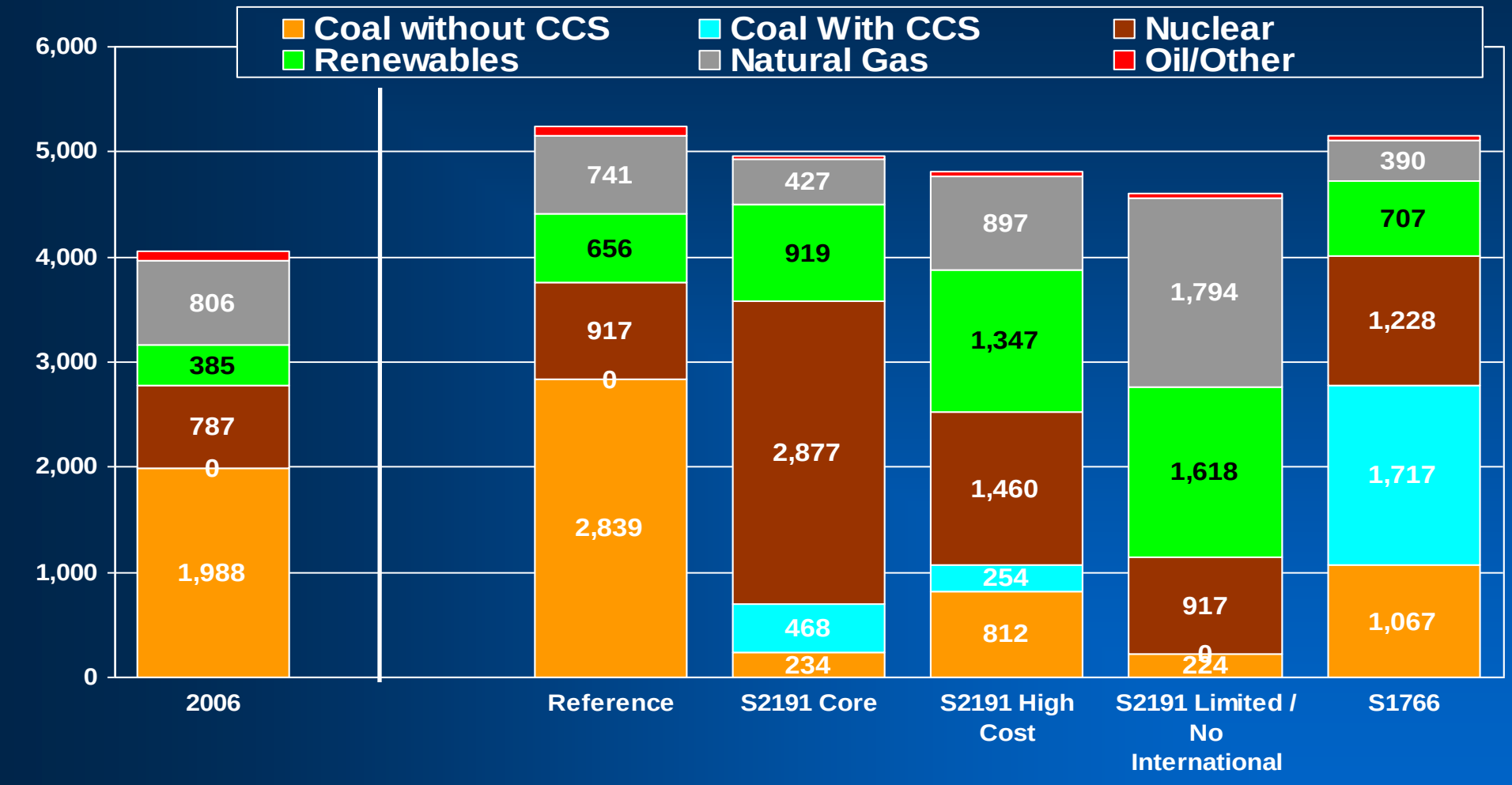
2030 Energy-Related CO_2 Emissions
(million metric tons)



- The electric power sector dominates energy-related CO_2 emission reductions in all S.2191 cases.
- Other sectors play a relatively small role, except in cases with the highest allowance prices.

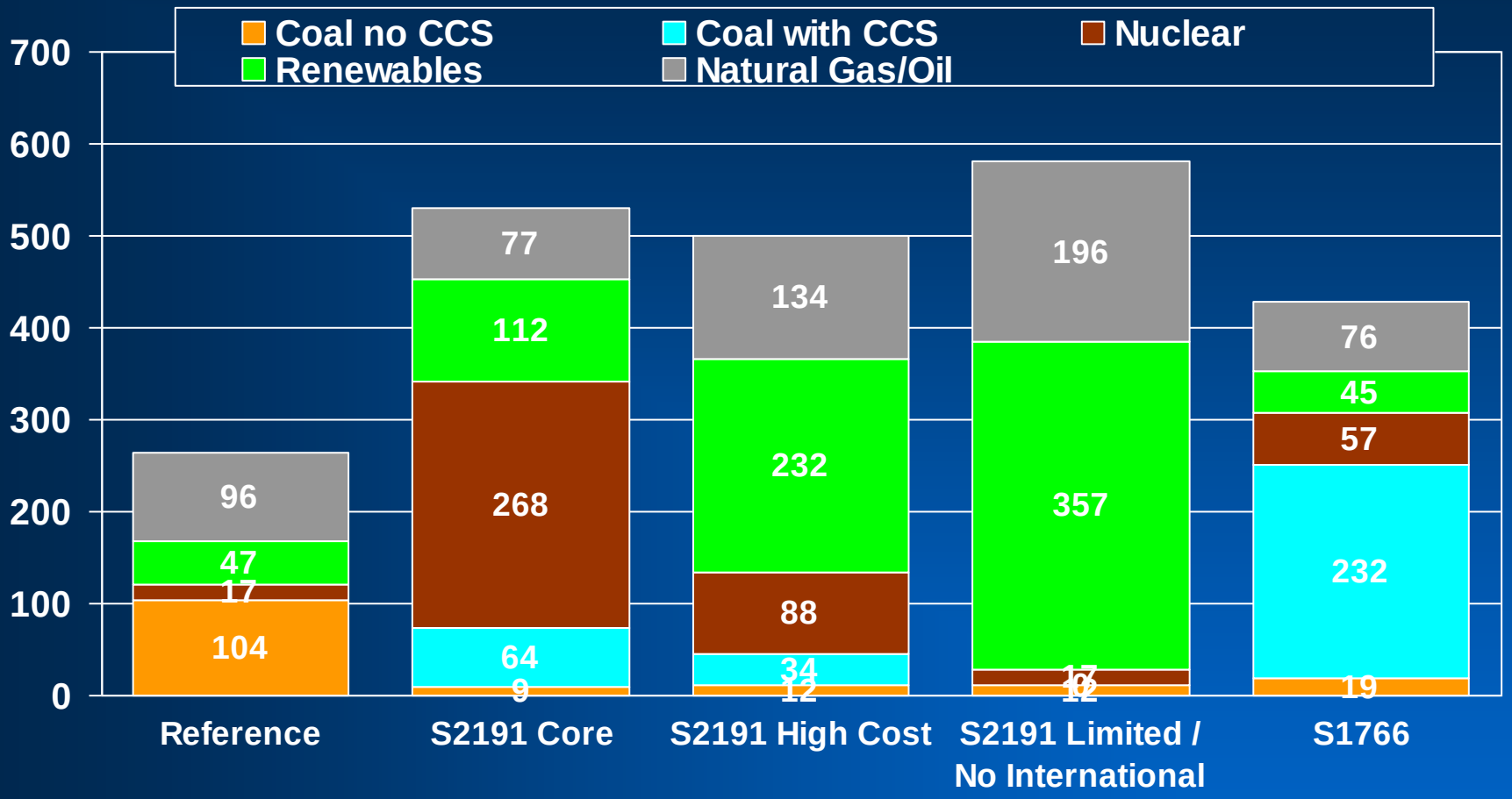
2030 Electricity Generation by Fuel

(billion kilowatthours)



- Coal generation declines significantly in all cases, while nuclear, renewables, and coal with CCS grows.
- Natural gas generation more than doubles if nuclear, renewables and coal with CCS are limited.

Cumulative Electric Capacity Additions,2007-2030 (gigawatts)

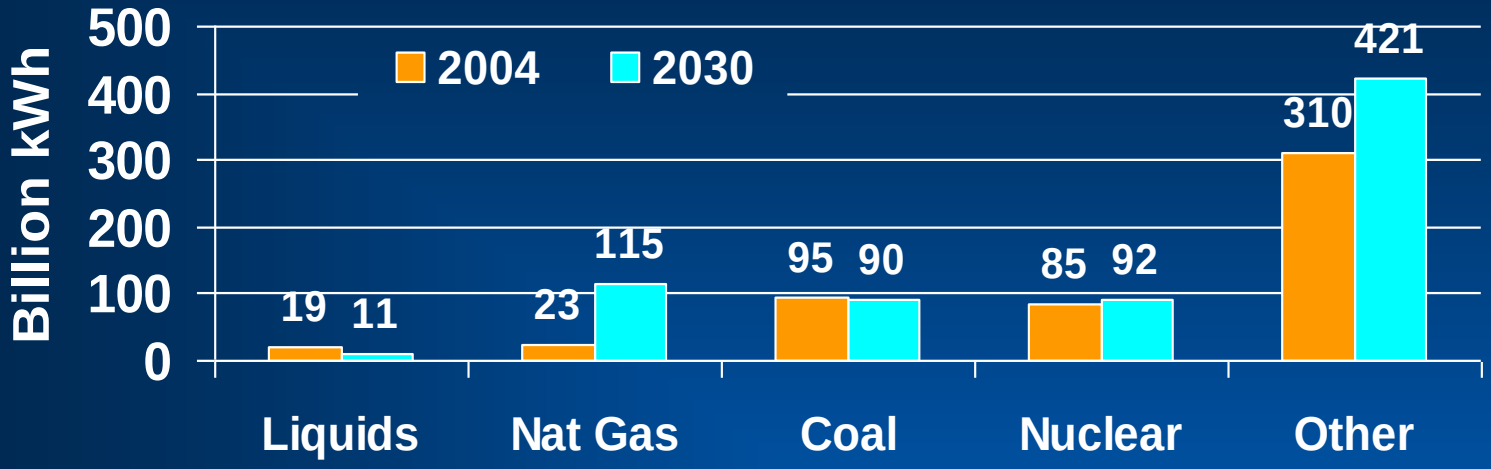


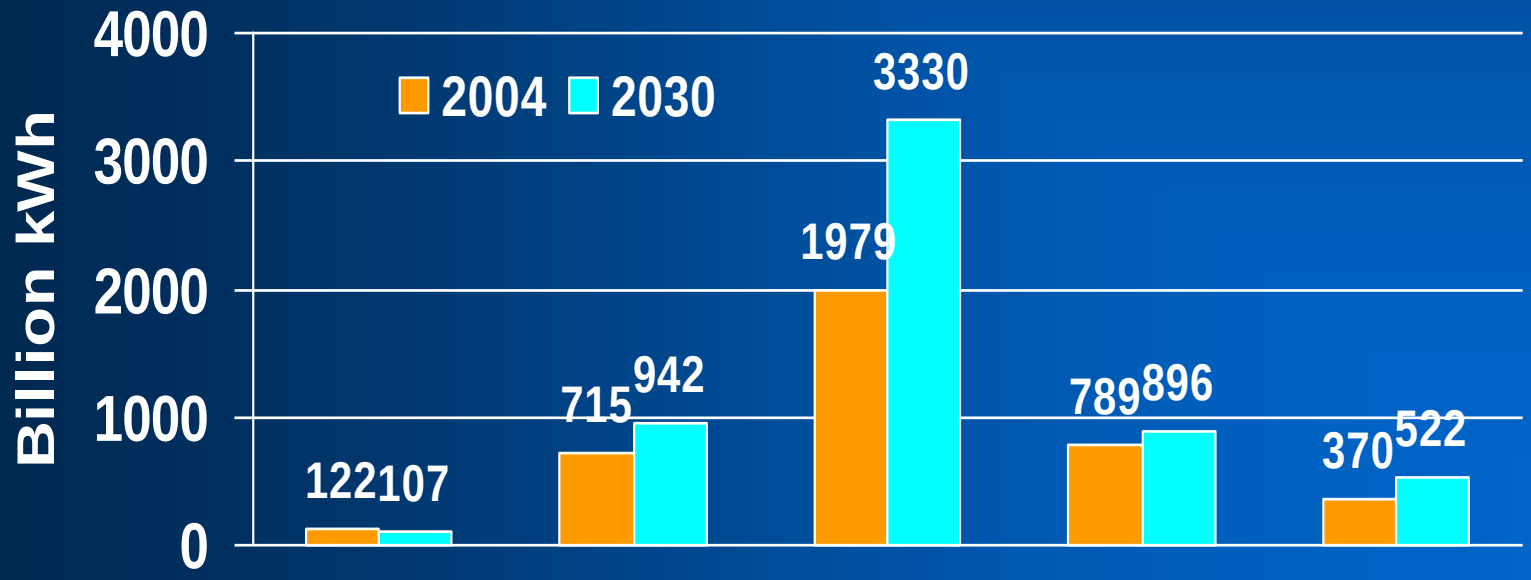
Additions of coal plants without CCS are virtually eliminated in the S. 2191 cases.

When nuclear, renewables and coal with CCS are all available at an economical cost, these technologies are used for new capacity and to replace existing conventional coal plants.

When the capital costs of these options are higher or other alternatives are limited, more natural gas plants are added.

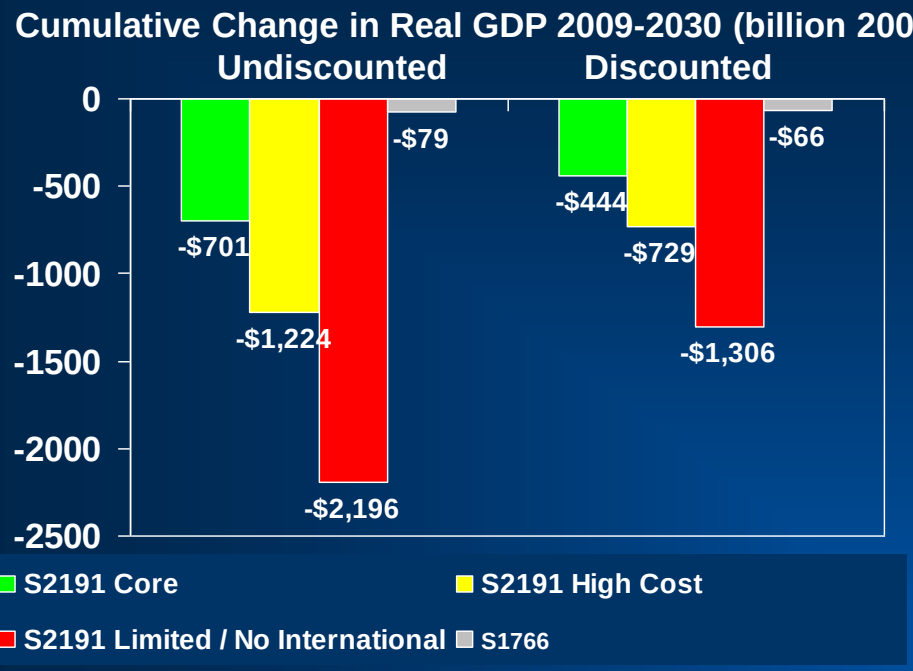
Canada would have a very different

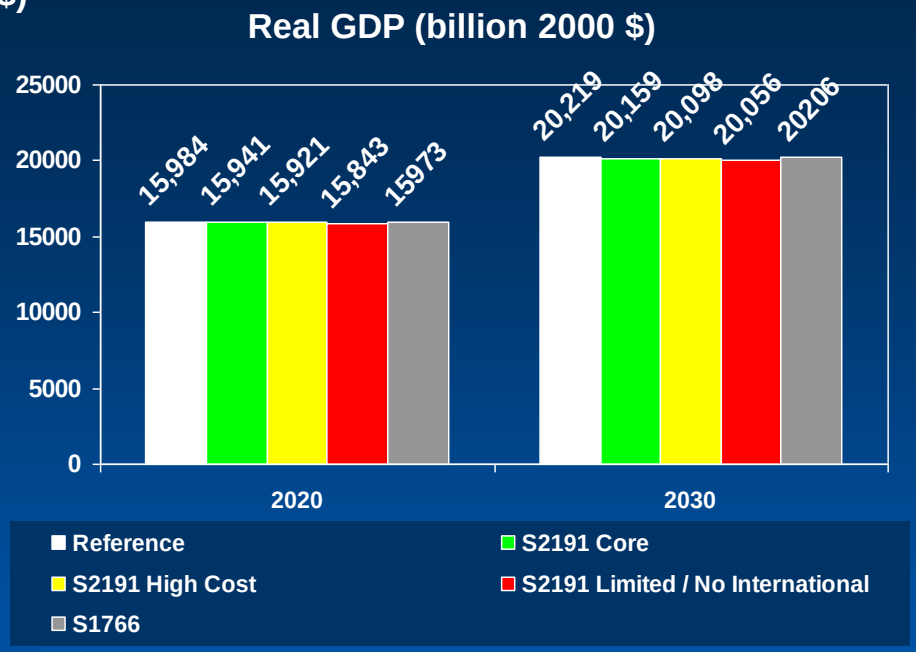


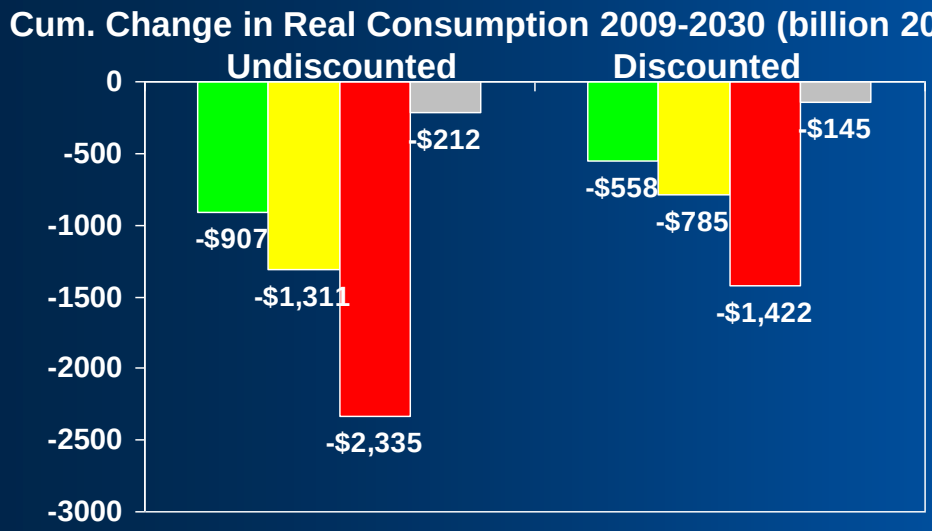


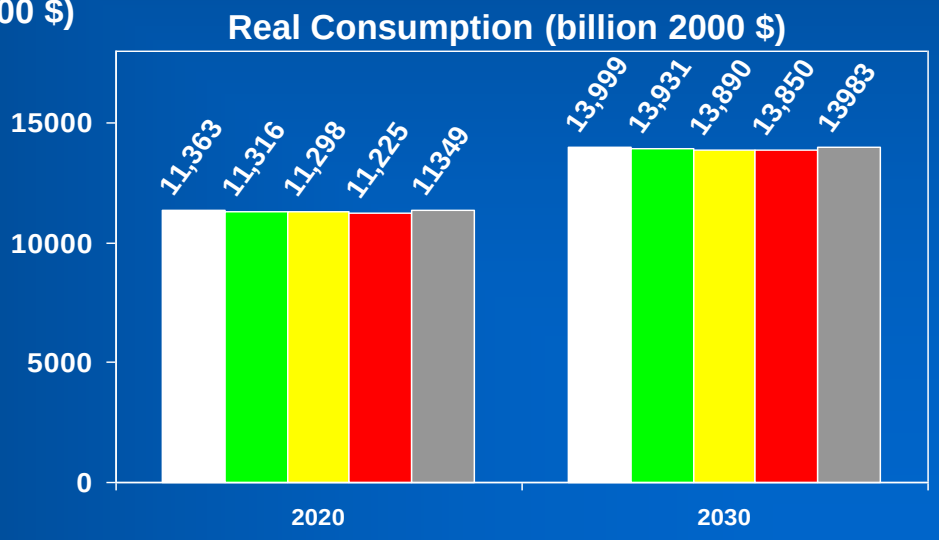
Source: EIA/NAEWG, October 2007

Real GDP And Consumption









Key Insights

- The delivered price of coal, and its use, would be impacted far more than the price and use of other fuels by a cap-and-trade program to limit greenhouse gas emissions.

- Electricity generation, which in the U.S. relies heavily on coal, is the easiest place to reduce energy-related carbon dioxide (CO_2) emissions within the U.S. energy system.

- Projected impacts of GHG mitigation depend on the availability and costs of low-carbon electricity technologies, such as nuclear and coal w/CCS, the prospects for their rapid deployment on a significant scale, and the availability of international offsets. Allowance prices and energy price increases are much higher in cases when these options are assumed more costly or unavailable.

  - One key question: the degree to which current energy infrastructure cost increases reflect a temporary "bubble" or a permanent shift.

  - Both technology and acceptance barriers to key technologies may be directly influenced by policy design choices. Policy design discussions to date have generally paid more attention to technology than acceptance.

Economic Analyses of Policy Design: Insights and Limitations

- Economic analyses of policy design choices, including the major contributions by RFF scholars and others, offer many useful insights.

- However, economic analyses of policy choices generally reflect the following assumptions:
  - the abatement supply curve does not depend on the instrument choice
  - there is no “policy instrument illusion”
  - the policymaker chooses among instruments rather than vice-versa
  - any desired distribution among affected parties can generally be achieved through some combination of instrument settings and side payments, so design decisions focus primarily on efficiency

- Much of the real dispute regarding instrument selection relates to impact of design choices reflects the questionable validity of these assumptions, rather than issues considered in the economic literature on policy design choice.

  EXAMPLES:
  - Dependence of the abatement supply curve on instrument choice
  - Two-way relationship between instruments and policymakers

Additional Insights

- Besides changing the projected mix of new electricity generation capacity, a strict GHG emissions cap is likely to significantly increase the total amount of new electric capacity that must be added between now and 2030.
  - This outcome reflects the retirement of many existing coal-fired power plants that would be expected to continue operating beyond 2030 absent GHG limitation requirements.
  - Provisions to promote the timely siting of energy infrastructure needed to reduce energy-related emissions could turn out to be an important policy design choice.

- Although not reflected in the Reference Case, public and industry awareness of climate change as a major policy issue can potentially impact energy investment decisions even if no specific policy change actually occurs.
  - Since policy impacts are measured in terms of the difference between cases that incorporate policy changes and the Reference Case baseline, the use of modeling adjustments to reflect such an effect would generally be to reduce, rather than increase, the estimated impact of a given policy response on delivered energy costs.

- Post-2030 emissions targets may be very challenging because opportunities for further reductions in the power sector are limited.

Thank You

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