

# **EIA Analysis of the L-W Climate Security Act of 2007**

**for:**

**Electric Power Research Institute  
Understanding Economic Cost Estimates of Climate Policy:  
Assumptions and Results of Lieberman-Warner Analyses**

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# Analysis Cases

Case Name	Assumptions
<b>Reference</b>	<ul style="list-style-type: none"> <li>Updated <i>AEO2008</i> 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</li> <li>Non-CO<sub>2</sub> emissions growth based on the Environmental Protection Agency “with measures” and “voluntary technology adoption” cases</li> </ul>
<b>Policy Cases</b>	
<b>S. 2191 Core</b>	<ul style="list-style-type: none"> <li>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)</li> <li>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.</li> <li>Bonus credit incentives for CCS</li> <li>Non-energy GHG abatement supply, as a function of allowance costs, derived from information provided by the Environmental Protection Agency</li> <li>The Title X program for hydrofluorocarbons not emitted from HCFC production is not represented</li> </ul>
<b>No International Offsets</b>	S. 2191 Core case with the compliance option from international offsets assumed to be unavailable
<b>S. 2191 High Cost</b>	S. 2191 Core case with assumed higher costs for key electricity generating technologies <ul style="list-style-type: none"> <li>CCS, nuclear and biomass plant costs 50 percent higher than in S. 2191 Core case</li> </ul>
<b>S. 2191 Limited Alternatives</b>	S. 2191 Core case with assumed limits on several carbon reduction technologies for electric power generation and limits on LNG imports: <ul style="list-style-type: none"> <li>CCS not available by 2030</li> <li>Nuclear and biomass power plant additions limited to <i>AEO2008</i> Reference case level</li> <li>LNG imports limited to <i>AEO2008</i> Reference case level</li> </ul>
<b>S. 2191 Limited / No Int'l</b>	Combines the assumptions in the Limited Alternatives and No International Offsets cases.
<b>S. 1766 Update</b>	Updated evaluation of the Low Carbon Economy Act of 2007 (S. 1766) using <i>AEO2008</i> Reference case assumptions. Key assumptions include: <ul style="list-style-type: none"> <li>S. 1766 cap and trade policy</li> <li>S. 1766 bonus credit incentives for CCS</li> <li>S. 1766 technology accelerator payment (TAP) price establishes a limit on the allowance price, growing at 5 percent per year in real dollars</li> </ul>

Provisions not addressed in analysis:

- Title III - Section 3902 allocation of allowances to new entrant fossil fuel-fired power generating facilities
- Title X – Control of Hydrofluorocarbon Consumption
- Title XI – Section 11003, Low Carbon Transportation Fuel Standard

# Key Findings

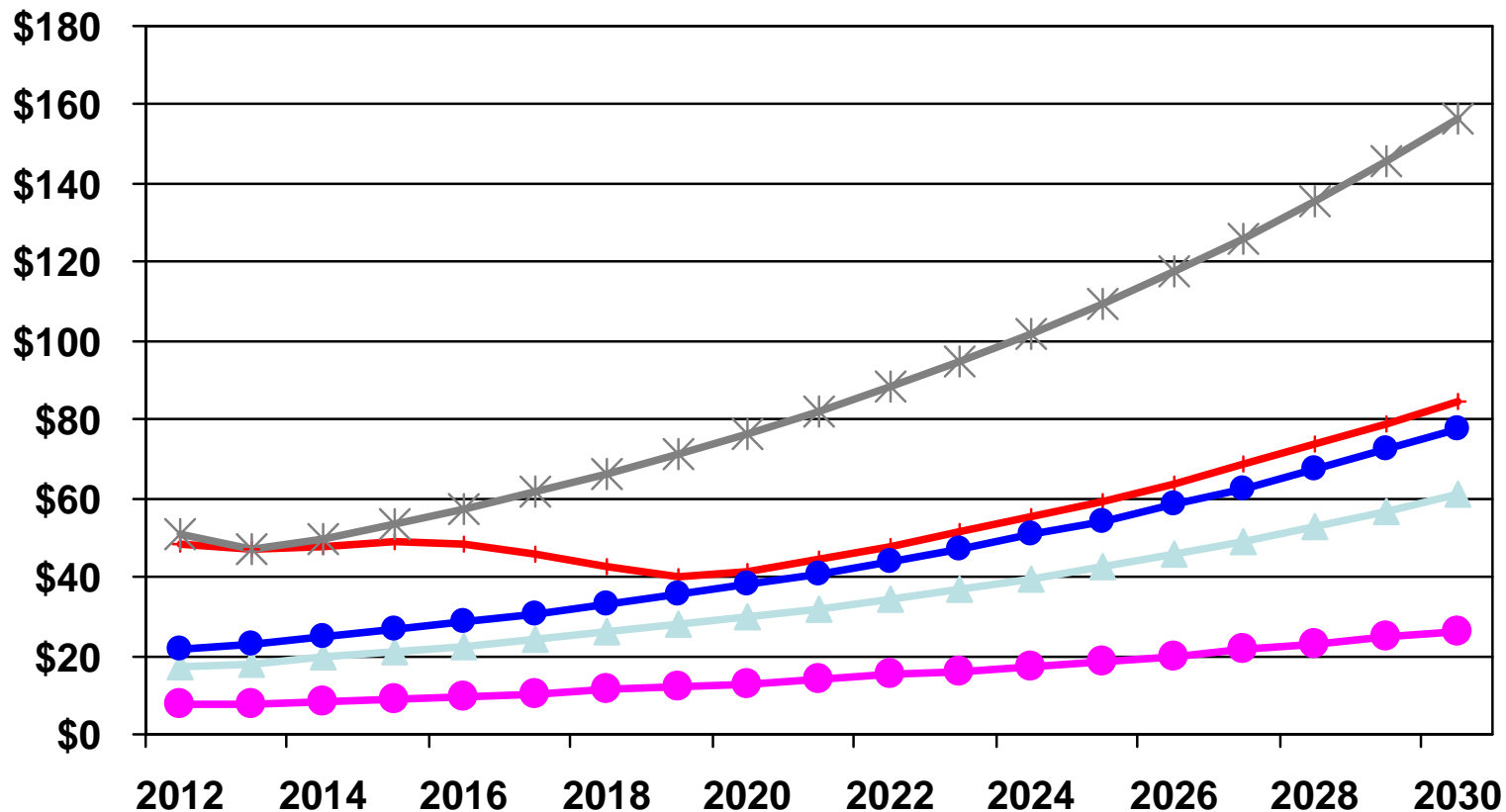
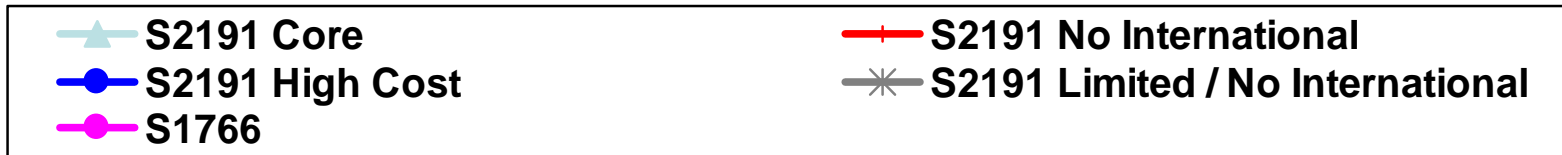
- **Impacts depend on the availability and costs of low-carbon electricity technologies, such as nuclear and CCS, the prospects for their rapid deployment on a significant scale, and the availability of international offsets. Allowance prices and energy price increases are much higher in cases when these 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.**
- **Between 80% and 90% of CO<sub>2</sub> reductions through 2030 are achieved through the electricity-related reductions, requiring a rapid expansion of low- and no- carbon generation.**
- **The reduction in GDP from reference case levels in the S.2191 cases is between 0.3% and 0.9% in 2020 and between 0.3% and 0.8% in 2030. The reduction in real consumption is between 0.4% and 1.2% in 2020 and between 0.5% and 1.1% in 2030. The range of GDP and consumption impacts reflects alternative assumptions about the availability of low-carbon electricity technologies.**
- **Manufacturing impacts are significantly higher than GDP impacts. Total manufacturing output is 1.5% to 5.4% lower than the Reference case in 2020 and 3.0% to 9.5% lower in 2030.**

# Additional Insights

- **Besides changing the projected mix of new electricity generation capacity, the S.2191 program significantly increases 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.**
- **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.**

# Projected Allowance Prices

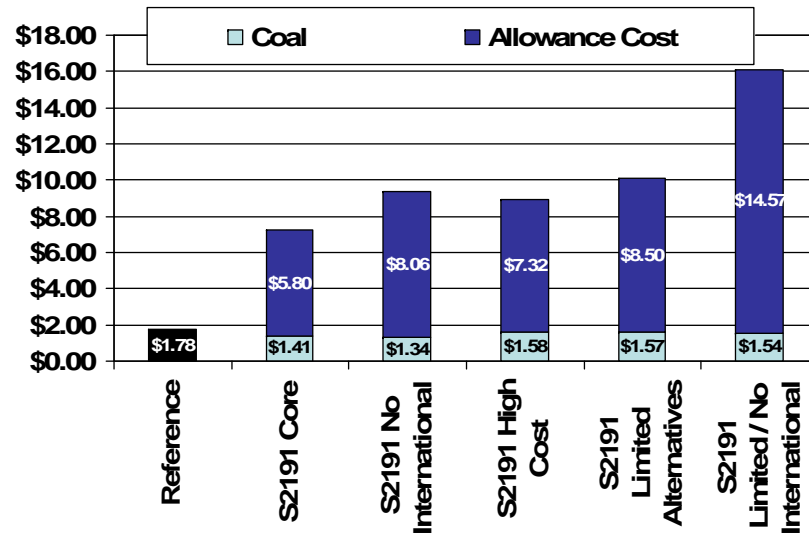
(2005 dollars per metric ton carbon dioxide equivalent)



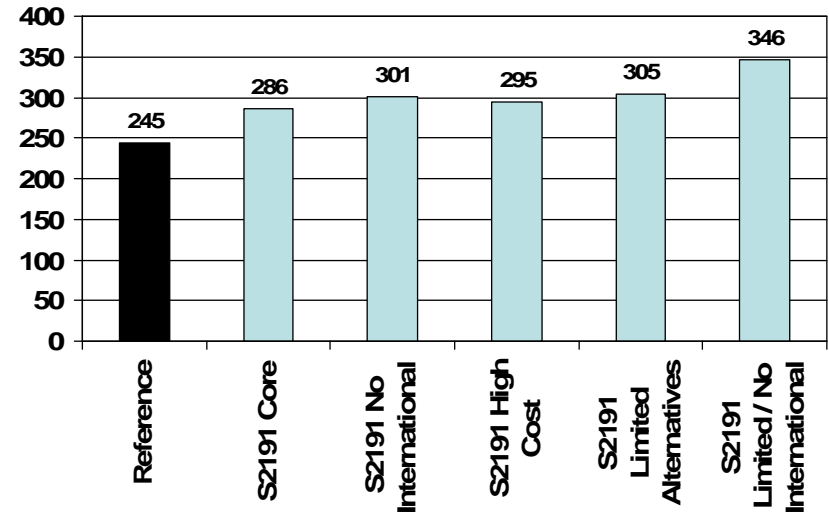
Allowance prices vary significantly with assumptions about the cost and availability of low-carbon generating technologies and offsets

# Energy Prices

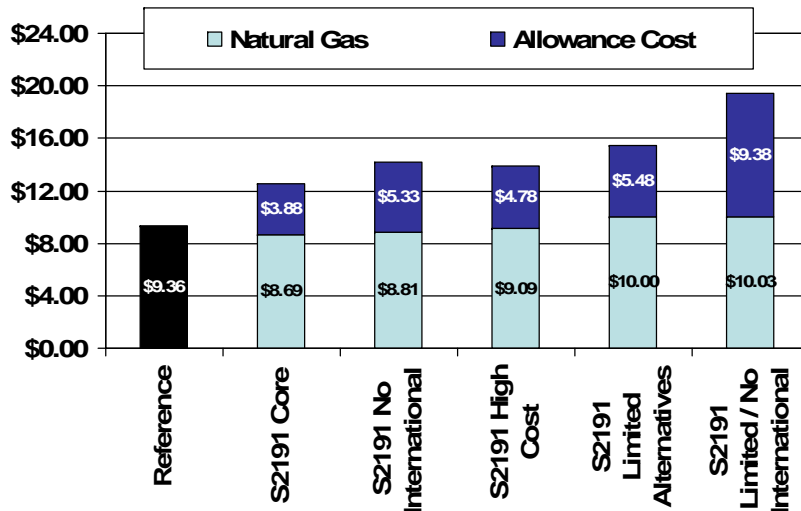
2030 Delivered Coal Costs (2006 \$ per million Btu)



2030 Motor Gasoline Pump Prices (2006 cents per gallon)

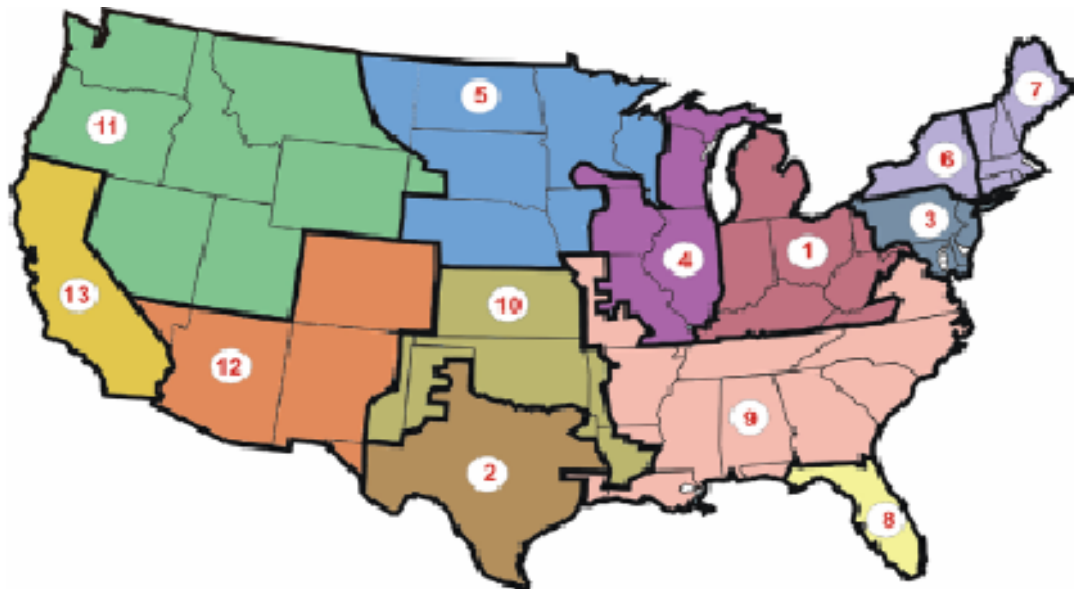
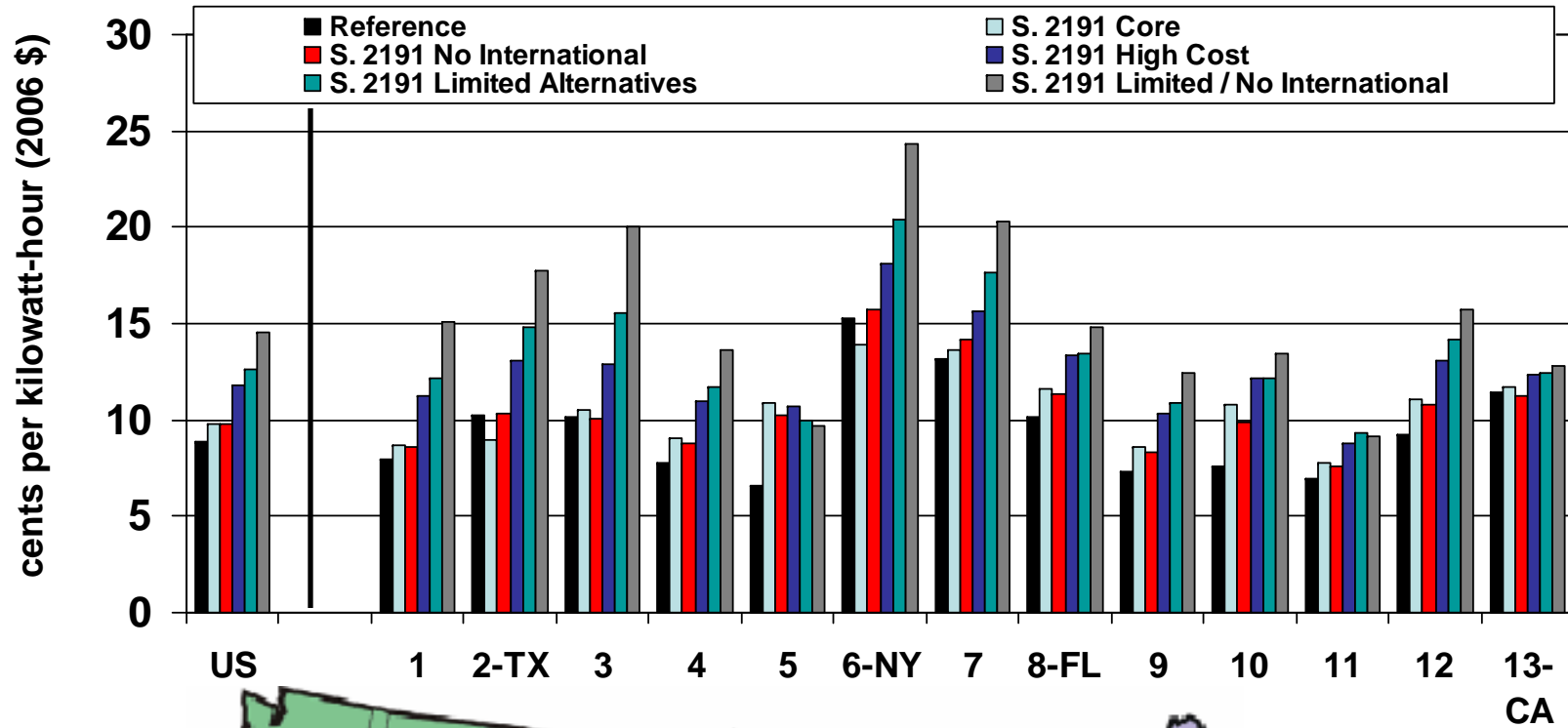


2030 Delivered Natural Gas Prices (2006\$ per million Btu)

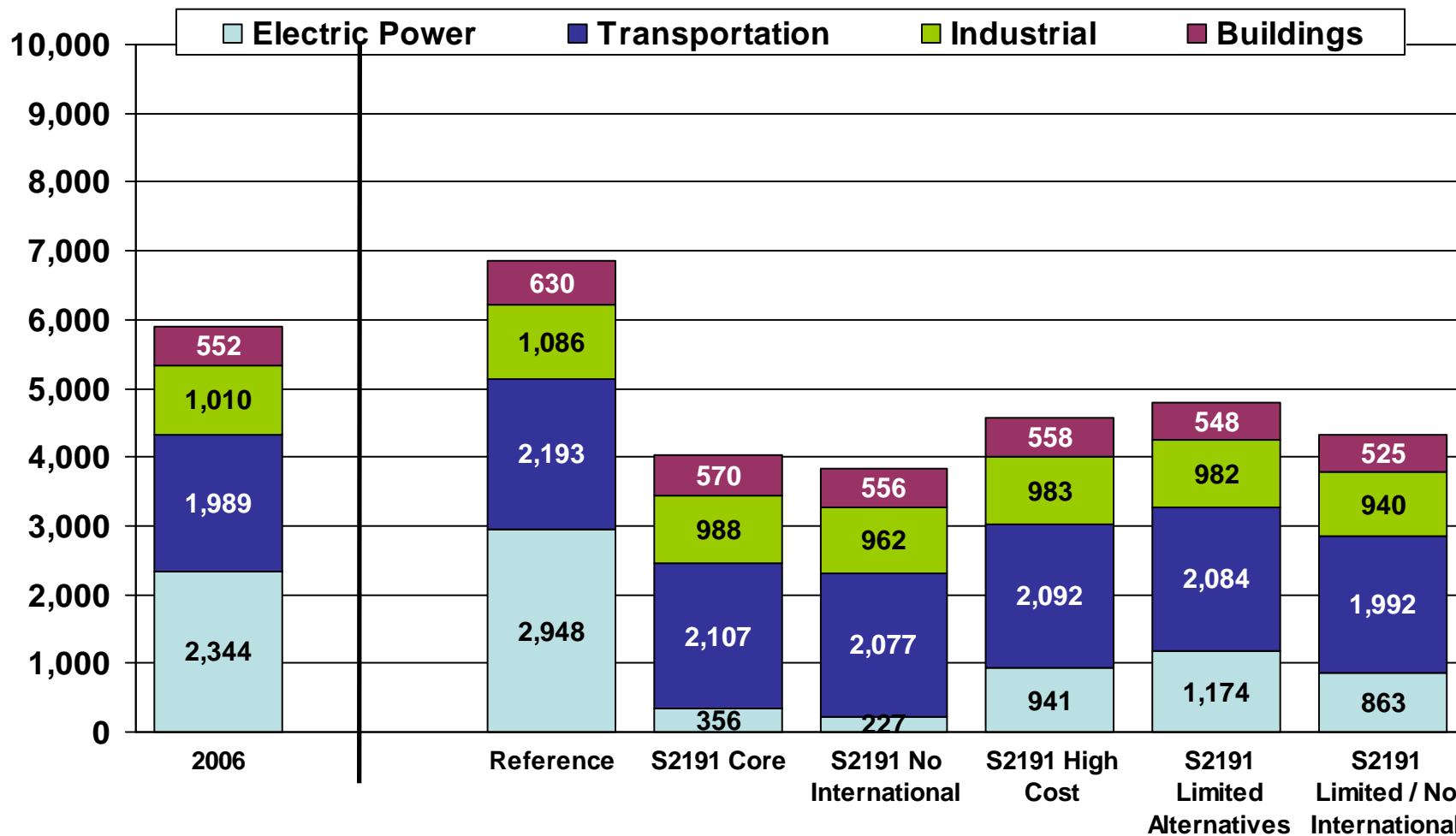


- Among the S. 2191 cases, the delivered price of coal in 2030 in 2006 dollars, including allowances, increases dramatically, with increase ranging from 405 percent to 804 percent.
- The delivered price of natural gas in 2030 in 2006 dollars, including allowances, also increases, with increase ranging 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).

# 2030 National and Regional Electricity Price Impacts



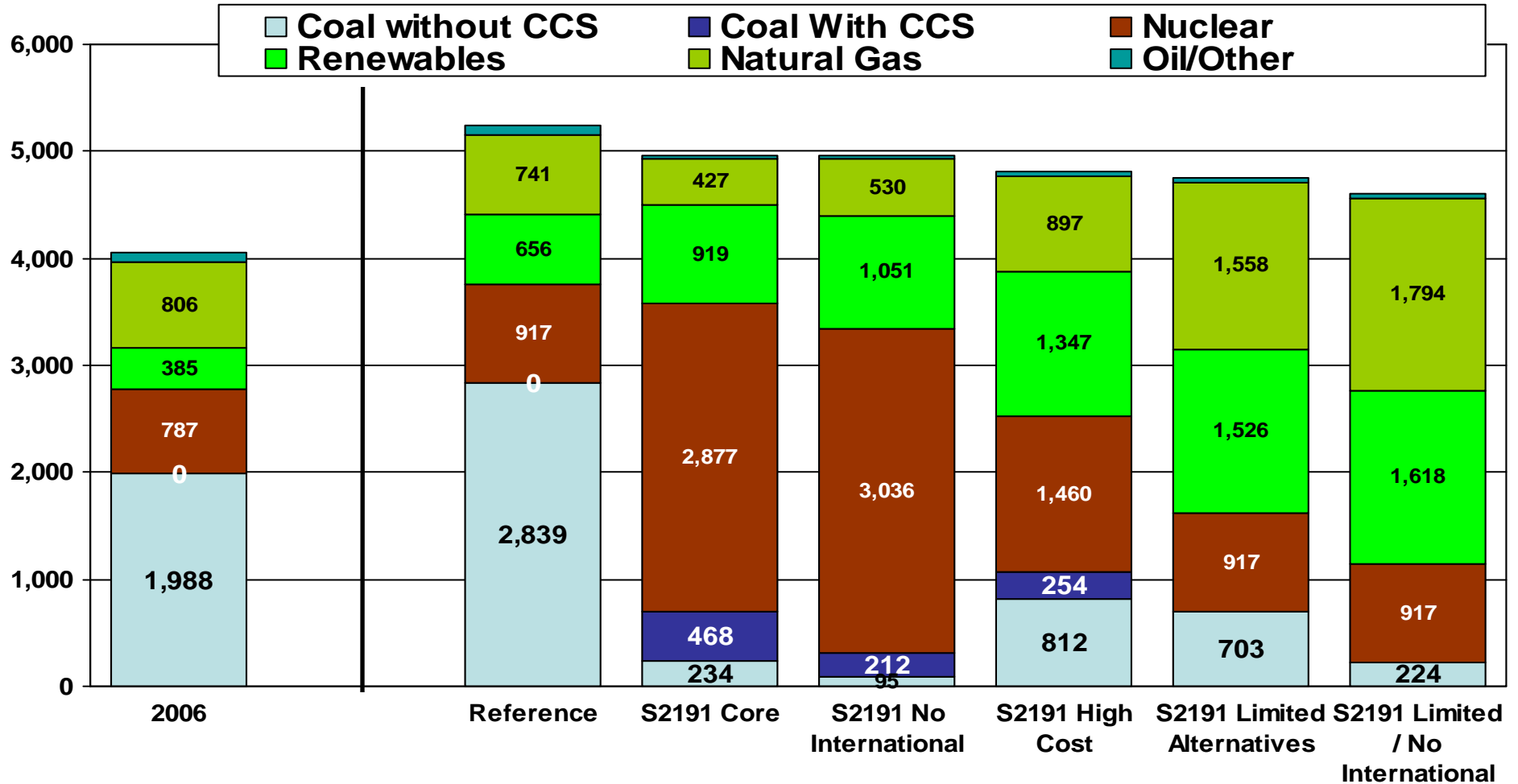
# 2030 Energy-Related CO<sub>2</sub> Emissions (million metric tons)



- The electric power sector dominates energy-related CO<sub>2</sub> emission reductions in all S.2191 cases.
- Other sectors play a relatively small role, except in cases with the highest allowance prices.

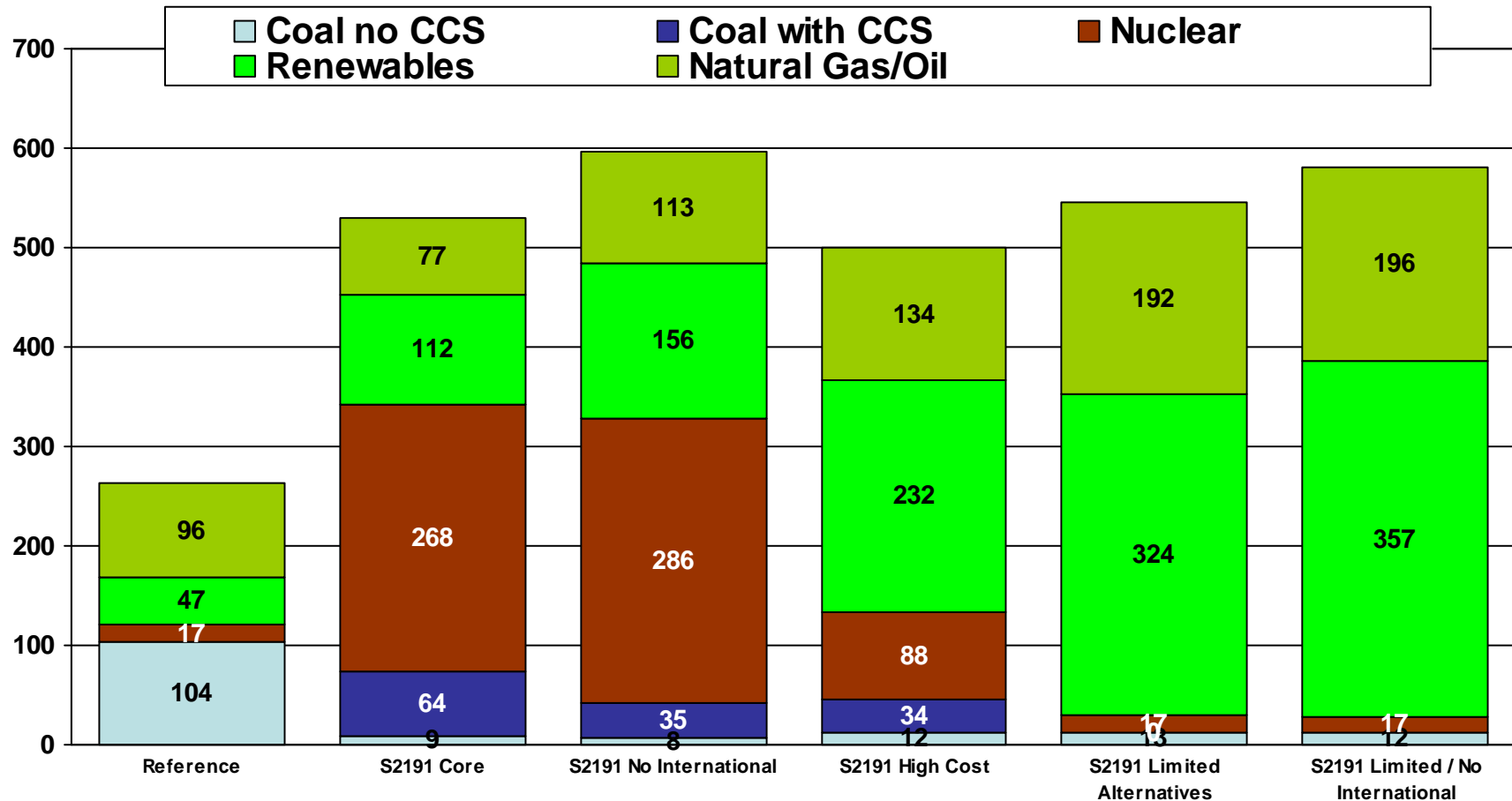
# 2030 Electricity Generation by Fuel

(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.

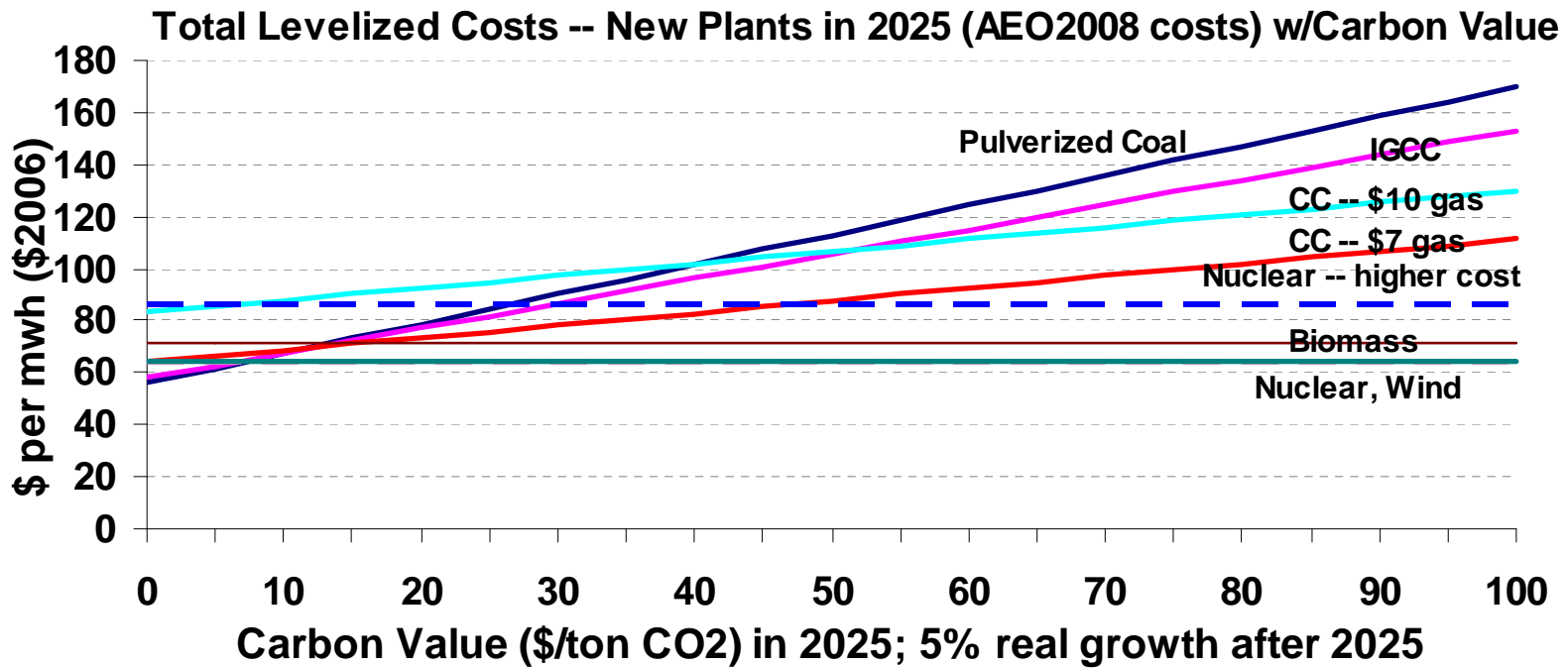
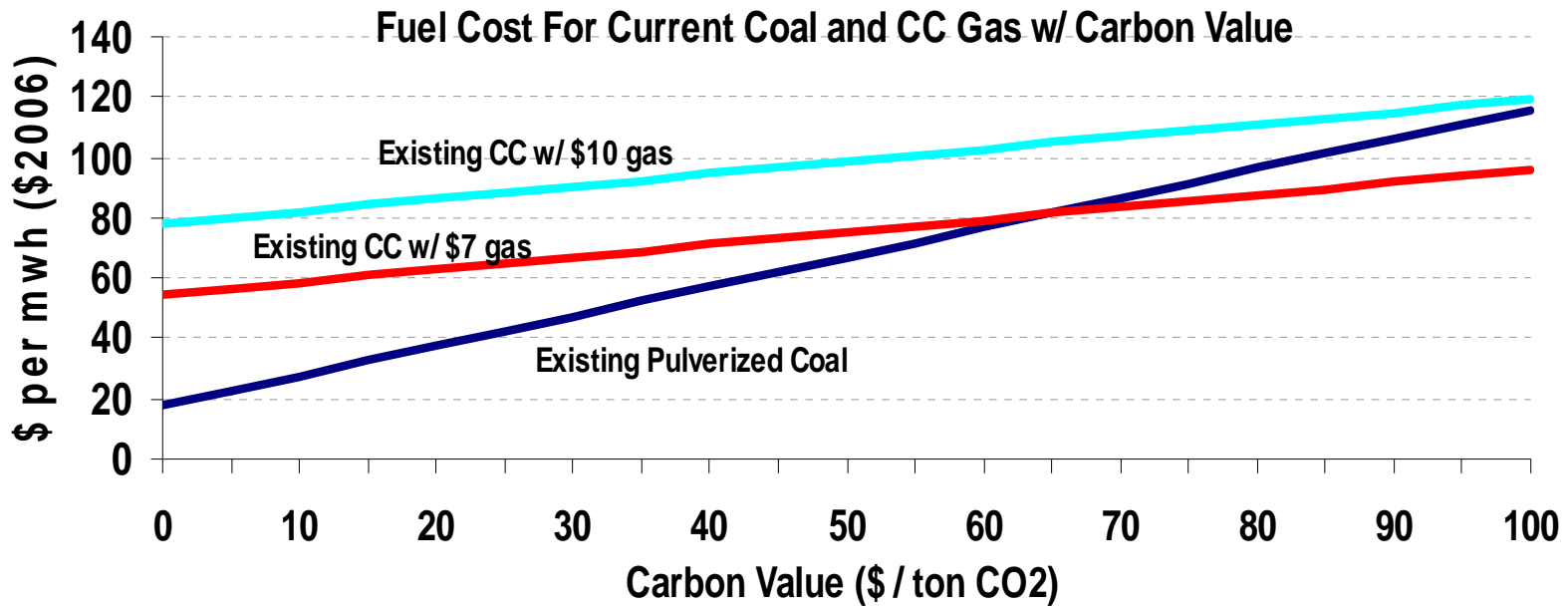
# Cumulative Electric Capacity Additions, 2007-2030 (gigawatts)



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

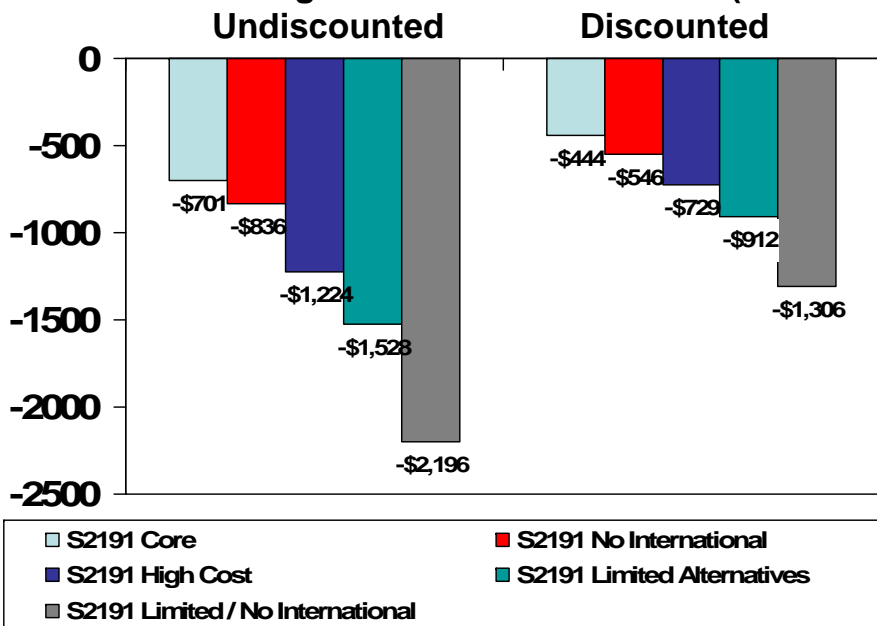
When nuclear, renewables and coal with CCS are all available at an economical cost, these technologies are used for new capacity and to replace existing conventional coal plants.

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

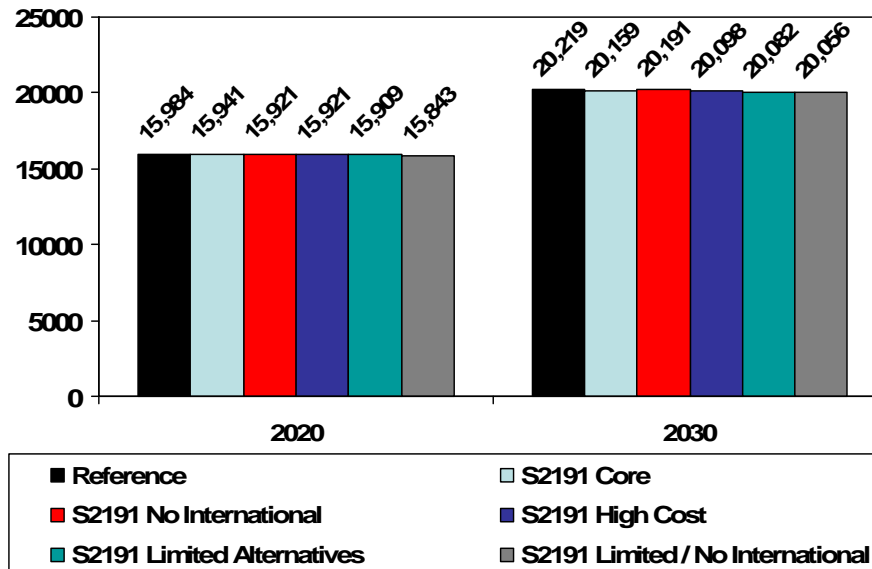


# Real GDP And Consumption

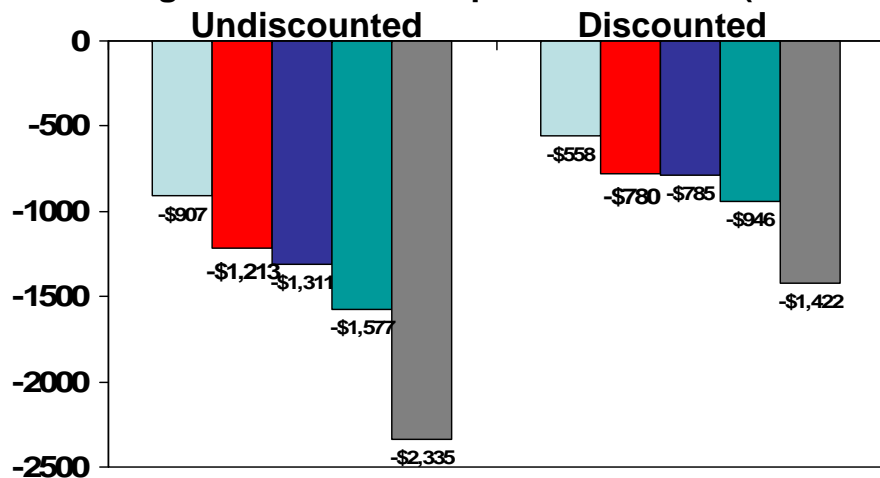
Cumulative Change in Real GDP 2009-2030 (billion 2000 \$)



Real GDP (billion 2000 \$)



Cum. Change in Real Consumption 2009-2030 (billion 2000 \$)



Real Consumption (billion 2000 \$)

