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Economic Analysis of Waxman-Markey Climate Bill (ACES)

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Environmental Markets Association Webinar

June 4, 2009

How Markets Work℠

Agenda

- Waxman-Markey design elements affecting economic impacts
- Modeling results for Waxman-Markey (one scenario)
  - CO_2 price trajectories and fuel price effects
  - Electricity sector effects
  - Regional diversity
- Implications and emerging economic issues

About NERA

NERA Economic Consulting is an international firm of economists who provide expert advice in legal, regulatory and business settings

- NERA economists evaluate economic issues related to highly complex business and legal issues arising from:
  - Antitrust, IP, energy, environment, communications, securities, labor, others
- NERA experts have assisted companies, trade associations and governments in virtually all major emissions trading programs
  - Acid rain trading, RECLAIM, NO_x Budget/NO_x SIP Call
  - Climate change programs/proposals in US, Europe, Japan and Australia
- Involvement in climate change and modeling cap-and-trade programs
  - Studies/assistance to European Commission and UK government on EU ETS
  - Reviews/studies/assistance of Regional Greenhouse Gas Initiative (RGGI), California AB32 programs, Midwestern Greenhouse Gas Reduction Accord (MGGRA)
  - Numerous projects using NERA Carbon Financial Impacts Model to assess the financial effects of alternative climate change policies for electricity, cement, pulp and paper, refining, oil and gas and other sectors

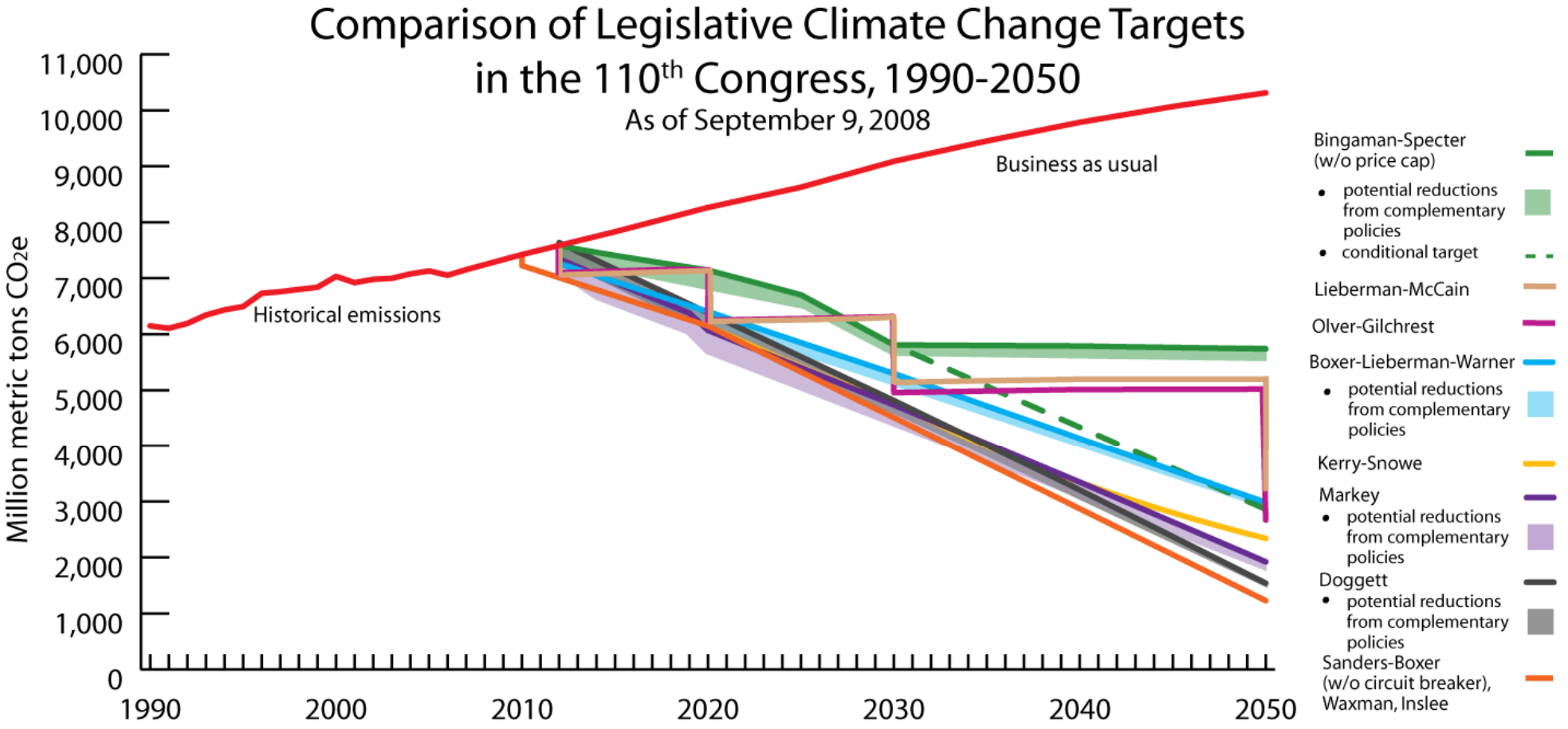
NERA's Global Presence

24 Offices Worldwide: Over 500 Economists, Over 600 Total Staff

Waxman-Markey in Perspective

- Builds upon history of similar programs.
  - Early US non-GHG programs, EU ETS, US regional GHG programs/proposals and prior Congressional GH[G] proposals
- All share the same basic approach
  - Cap-and-trade "market-based" approach
  - Cap overall emissions and *potential* for cost savings relative to "command-and-control" approach
- Differences matter
  - *Actual* cost savings depend on program design
  - Financial *impacts* on sectors/firms depend on program design

Prior U.S. Proposals to Cap GHG Emissions Using Cap-and-Trade



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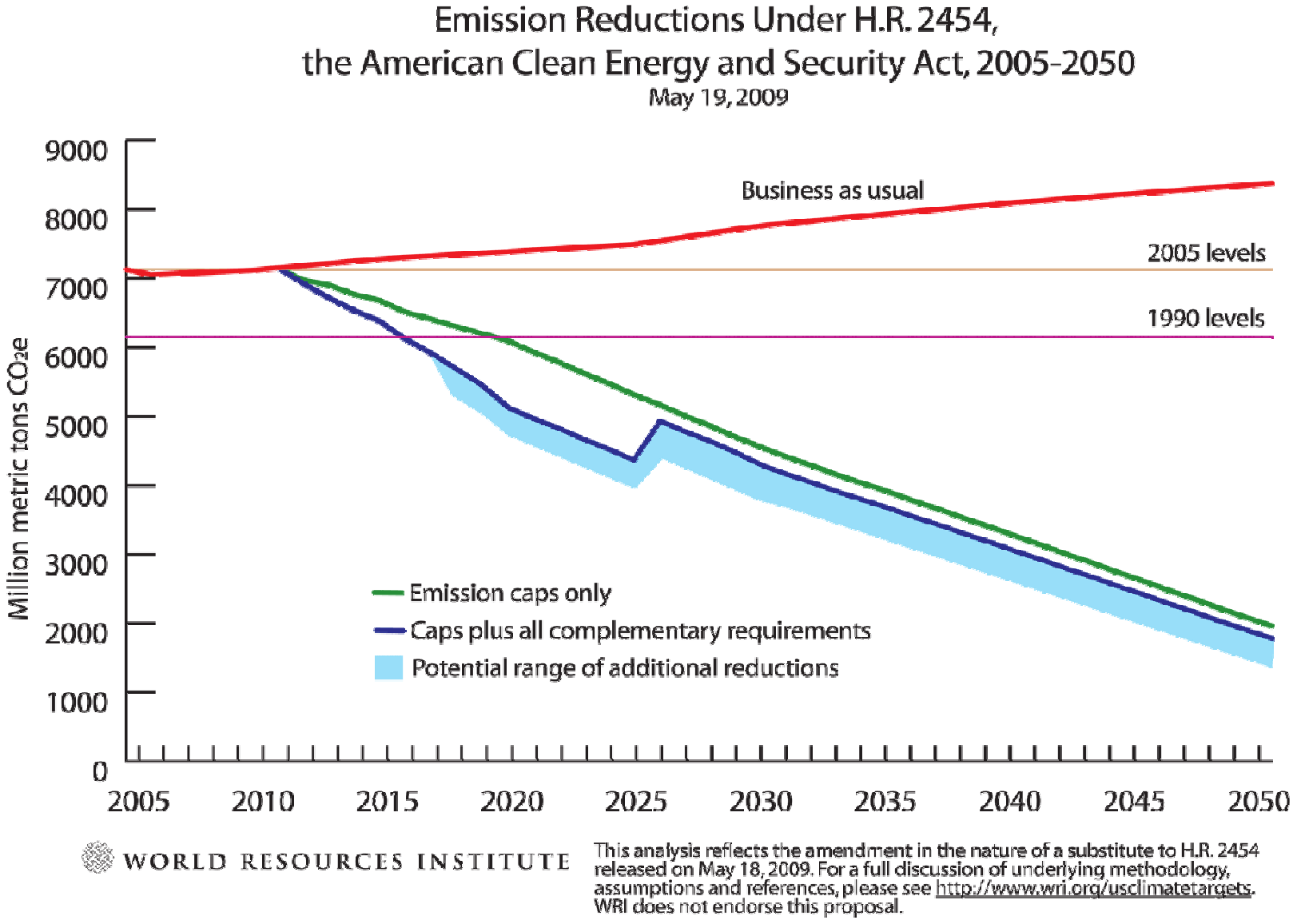
For a full discussion of underlying methodology, assumptions and references, please see http://www.wri.org/usclimatetargets. WRI does not endorse any of these bills. This analysis is intended to fairly and accurately compare explicit carbon caps in Congressional climate proposals and uses underlying data that may differ from other analyses. Price caps, circuit breakers and other cost-containment mechanisms contained in some bills may allow emissions to deviate from the pathways depicted in this analysis.

Waxman-Markey Proposal and Reduced "Business as Usual" Emissions



Some "Obvious" Design Elements That Affect Financial Impacts

- Stringency of cap
- Coverage (sectors, sources)
- "Safety valve" and "price floor" to constrain price
- Ability to use "credits/offsets" as substitute for allowances
- Allocation elements (auction vs. free, sectors, metric, years)
- "Banking" (and "borrowing") provisions

Some "Less obvious" Elements That Affect Financial impacts

- "Business as usual" emissions
- Interactions with other programs
  - RPS and energy efficiency
- Linking of programs
  - Linking "imports" features of other program (e.g., "safety valve")
- Electricity regulatory treatment
  - Affects electricity price effects (and can affect overall cost-savings)
- Details of auctioned/allocated elements
  - Allocations to LDCs/trajectories over time/"recycling" of revenues
  - "Updating" features (can affect price-cost pass-through and distributional impacts, as well as cost-saving potential)

Waxman-Markey Modeling with NERA Carbon Financial Impacts Model

- Modeling results depend upon many factors
  - Results presented here based upon one set of assumptions
  - NERA modeling includes numerous sensitivity cases (provisions, baseline conditions)
- Key provisions in following modeling results
  - Caps with sector coverage phased in from 2012 to 2016
    - Electric power/liquid fuels in 2012, industrial sources in 2014 and residential and commercial natural gas in 2016
  - Use of overall limit of 2 billion “allowance equivalents” for offsets
    - Exchange rate of 5 international offsets per 4 allowances after 2017
    - Default split of 1 billion domestic and 1 billion international can be adjusted to increase international offsets
  - Implementation of combined Renewable Energy and Energy Efficiency Standard
    - Default requirement of 15% renewable energy and 5% efficiency by 2020
    - Excludes “existing” hydro, new nuclear and CCS from the denominator
    - LDCs with sales less than 4 TWh are excluded from the requirement

NERA Carbon Financial Impacts Model

haracteristics of Company Facilities

- Product demand
- Future investment plans
- Fuel purchases
- CO_2 and other emissions

O_2 cap-and-trade scenarios

- Point of regulation
- Stringency of cap
- Free allowance allocation
- Energy market modeling assumptions

larket Impacts of Carbon Scenario (NEMS)

- CO_2 allowance prices
- Fuel prices
- Production factor prices/market impacts
- Non-CO_2 emissions allowance prices

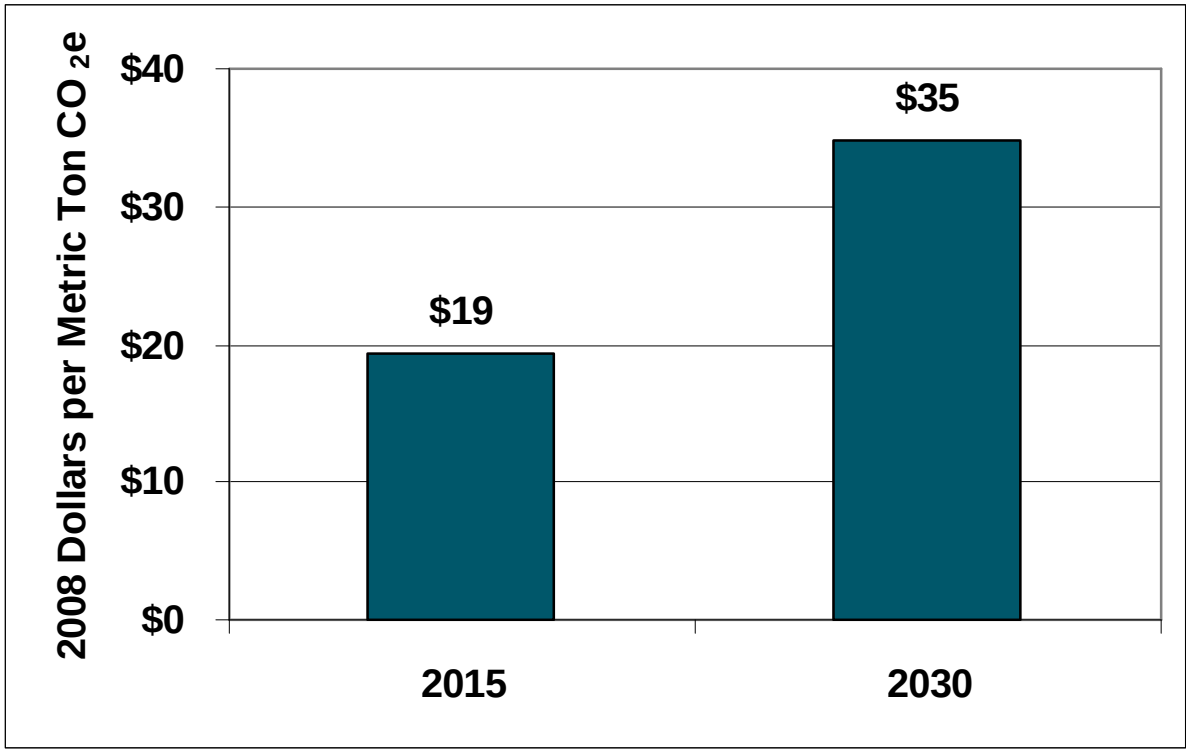
larket Impacts of Carbon Scenario

- Probability distributions for CO_2 prices and other major factors (fuel prices, etc.)
- Correlations among factors
- Timing of key events (e.g. CO_2 program)
- Evolution of uncertainty over time

NERA Carbon Financial Impacts Model

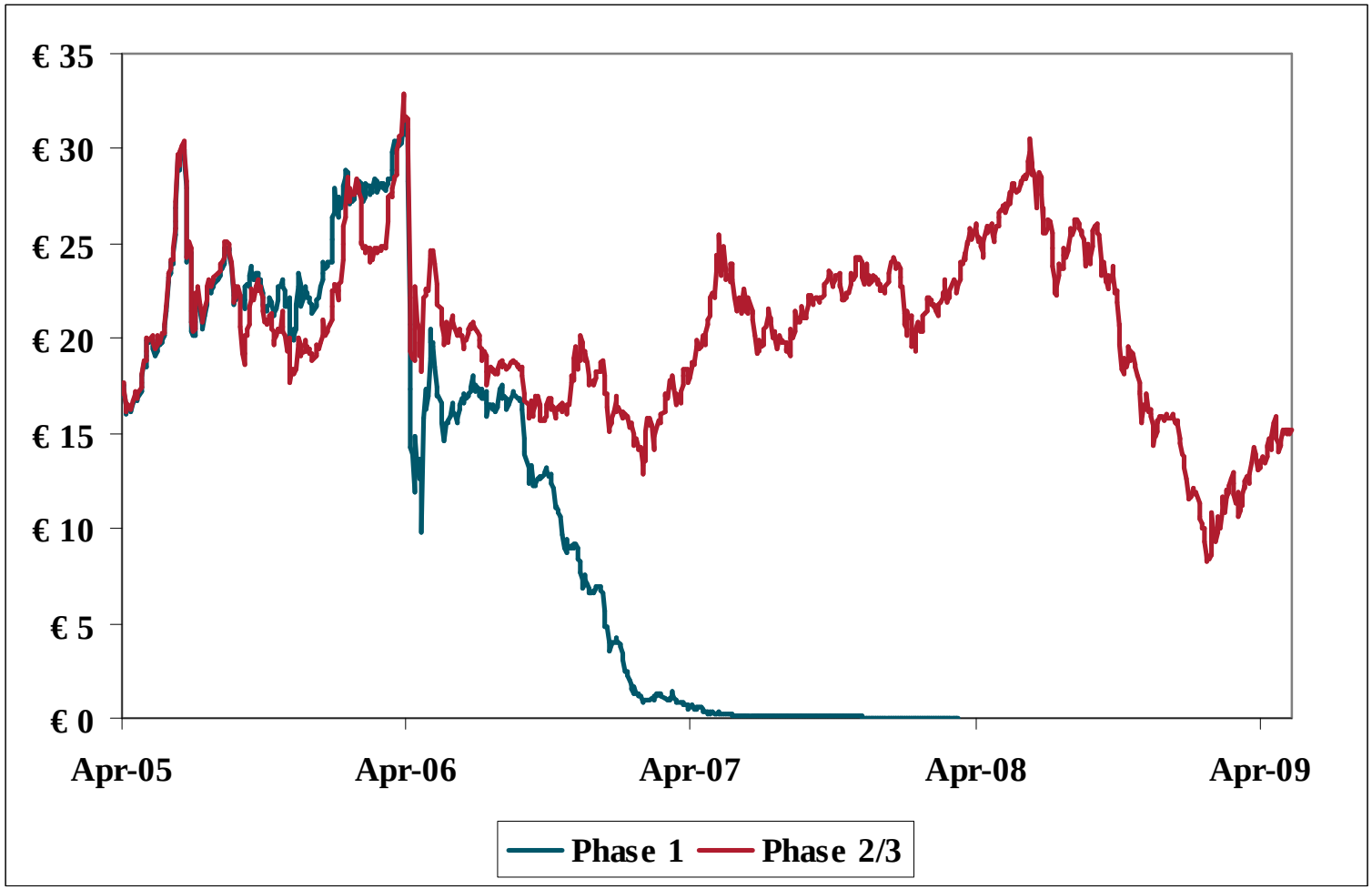
- **Changes in company costs**
  - CO_2 costs
  - Energy costs
- **Changes in company revenues**
  - Product Revenues
  - CO_2 allowance allocation
- **Changes in company net revenues (revenues – costs)**
- **Investment decision tools**
  - "Most likely" comparisons
  - Sensitivity/Monte Carlo uncertainty/risk results
  - "Decision tree" analysis
- **Periodically updated analysis**

Waxman-Markey Modeling: CO_2 Allowance Prices



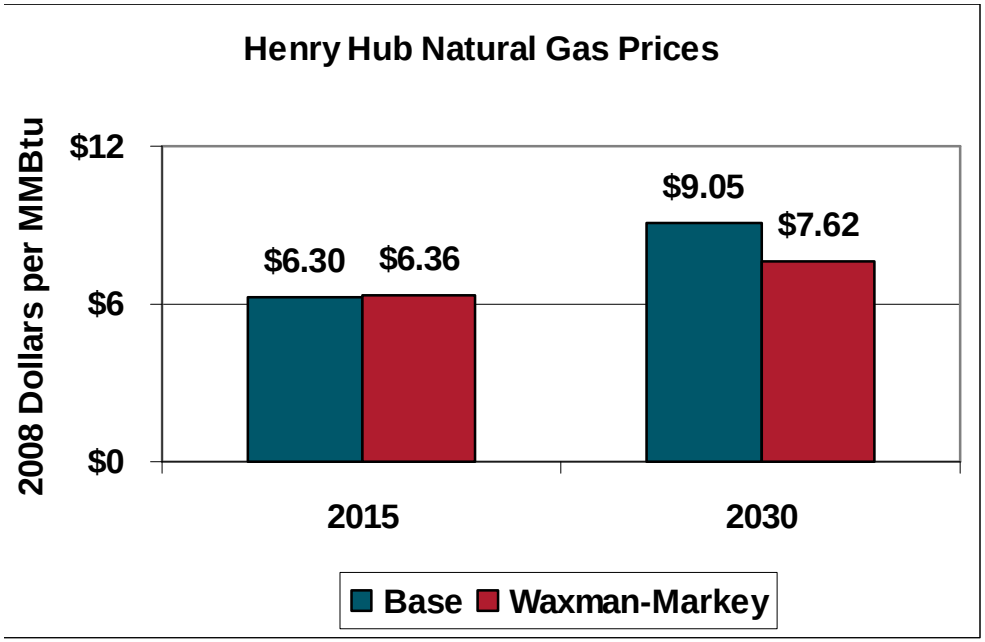
CO_2 allowance prices increase from $19 in 2015 to $35 in 2030 (real 2008 dollars)

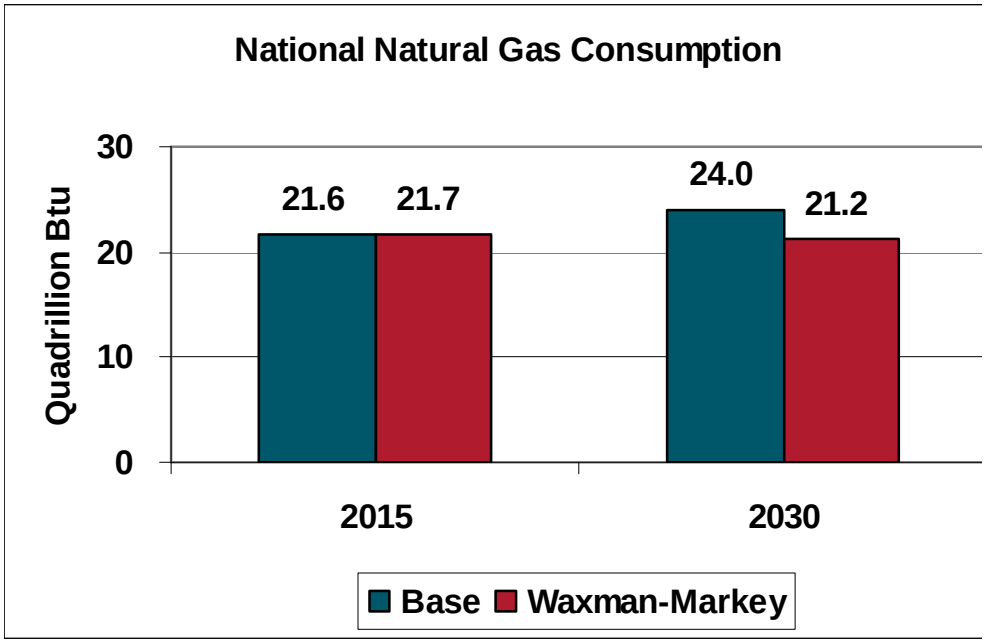
As in the EU ETS, CO_2 Allowance Price Volatility is Likely



EU ETS prices have been both higher and lower than many expected, and very volatile

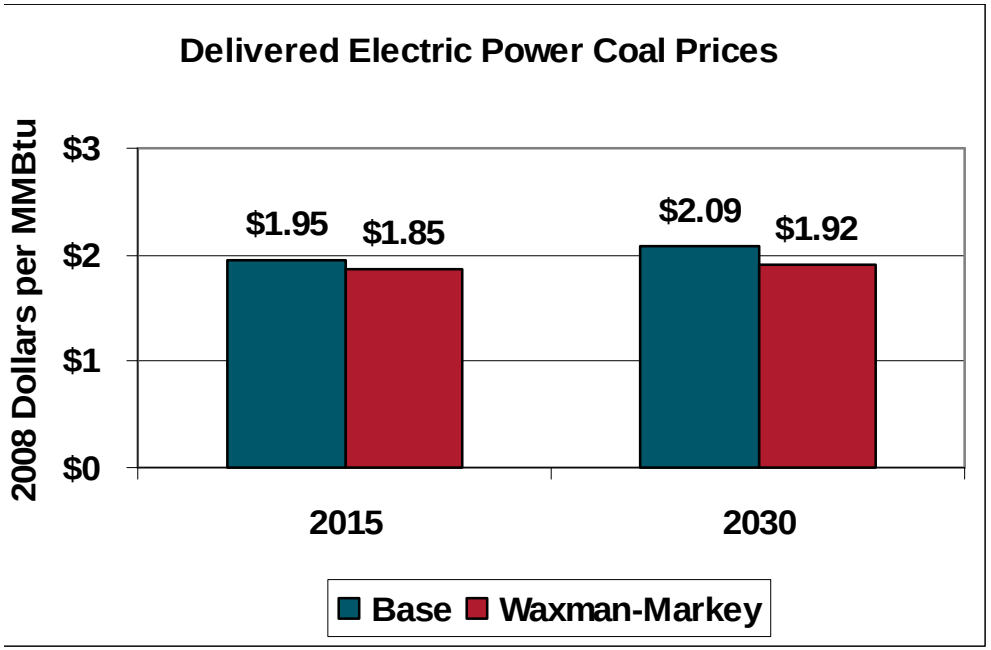
Waxman-Markey Modeling: Natural Gas Prices and Consumption

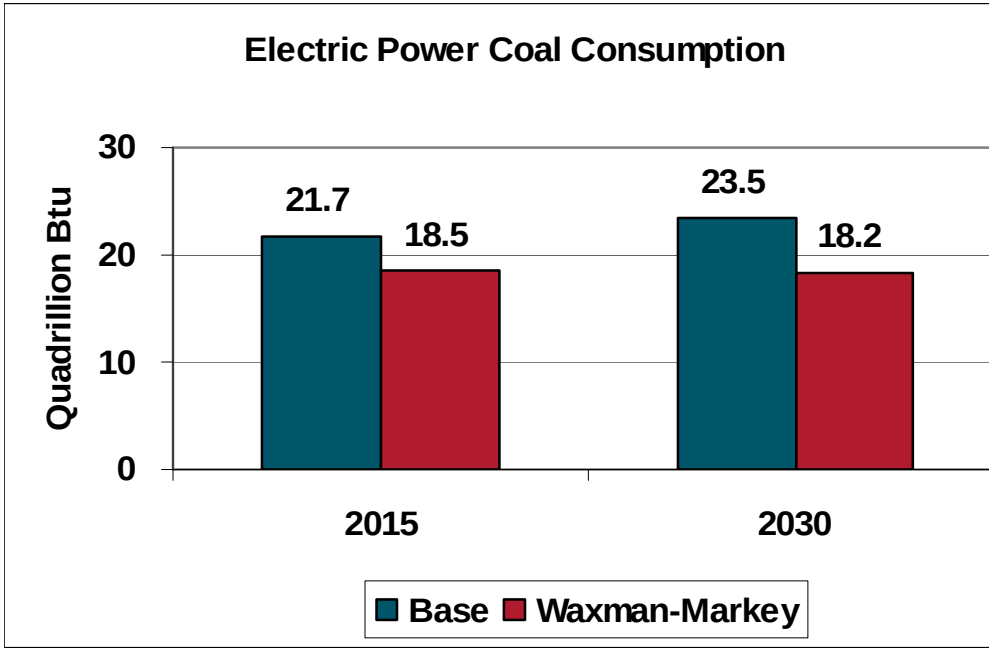




W-M leads to increases in natural gas consumption and prices (net of allowance costs) in early years and decreases in later years

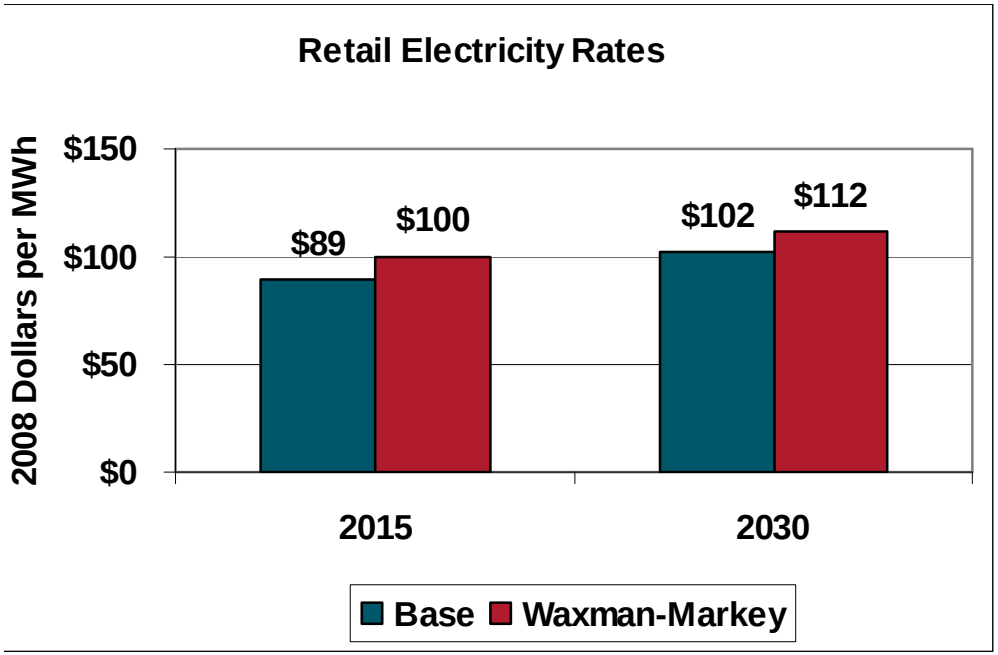
Waxman-Markey Modeling: Coal Prices and Consumption

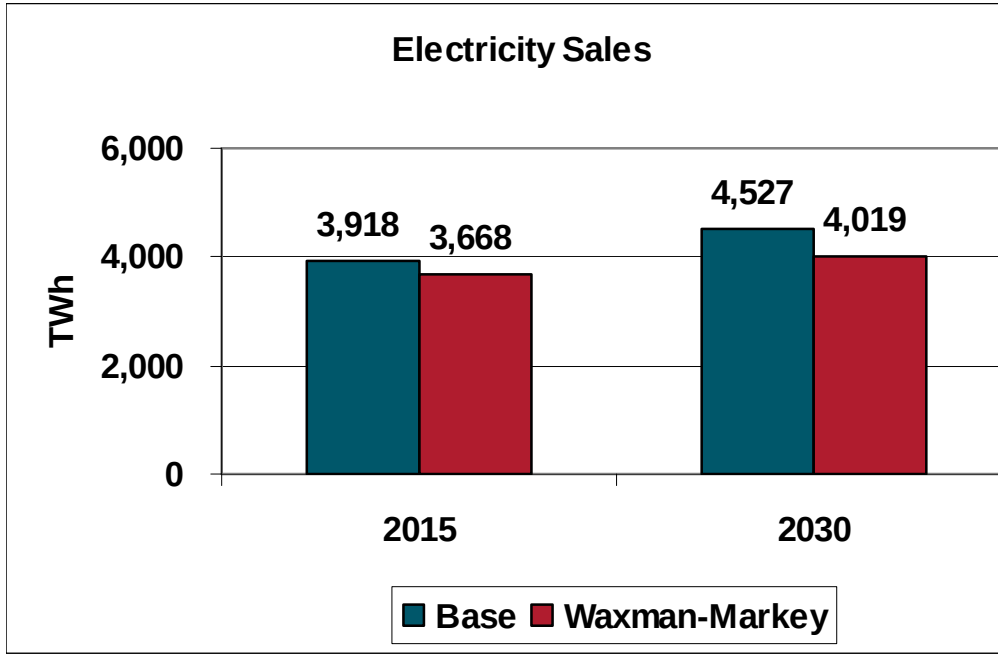




W-M leads to substantial decreases in coal consumption and prices (net of allowance costs), resulting in coal prices that are 22% below base case by 2030

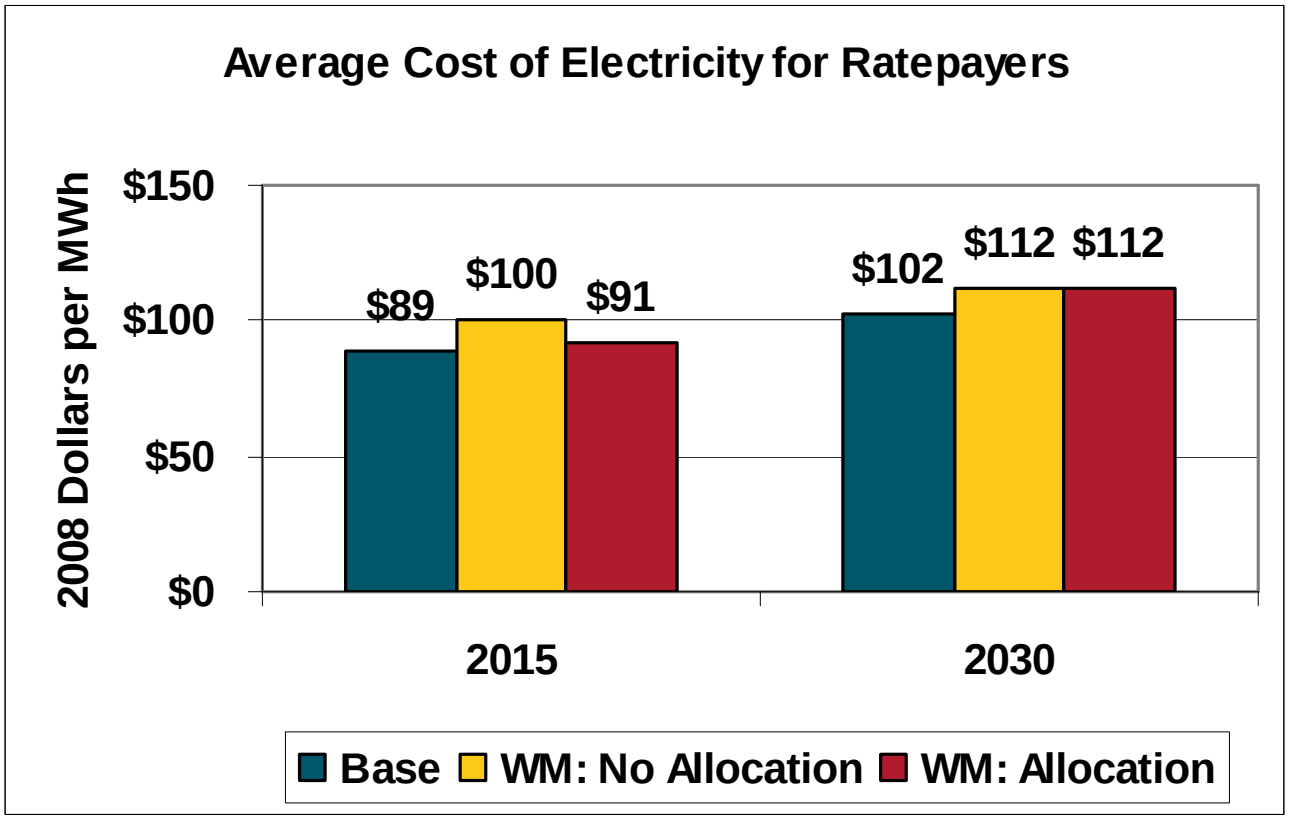
Waxman-Markey Modeling: National Electricity Sales and Prices





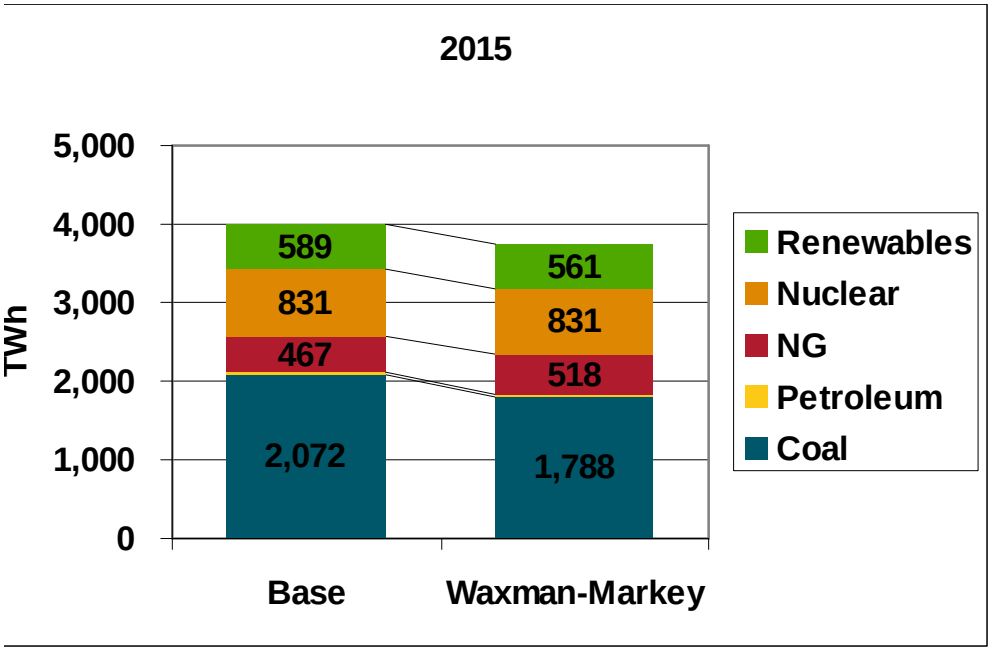
W-M results in substantial decreases in electricity sales (including energy efficiency effects) and substantial increases in national electricity prices, with retail prices about 10% above baseline

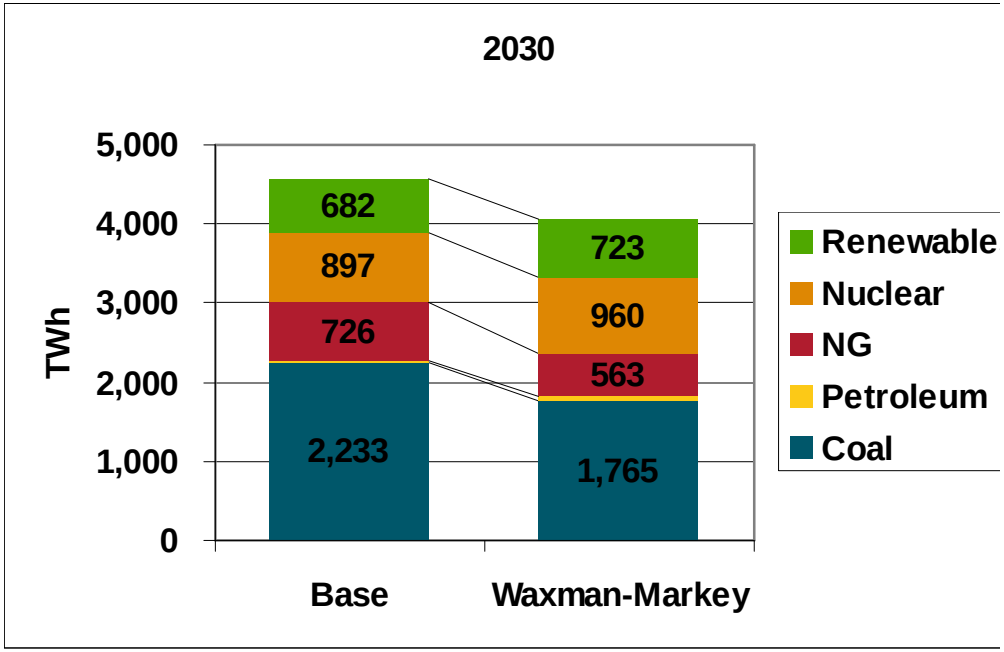
Waxman-Markey Modeling : LDC Allocation and Average Electricity Costs



Allocation to LDCs significantly dampens the increase in average electricity costs to consumers until allocation phases out in the late 2020s

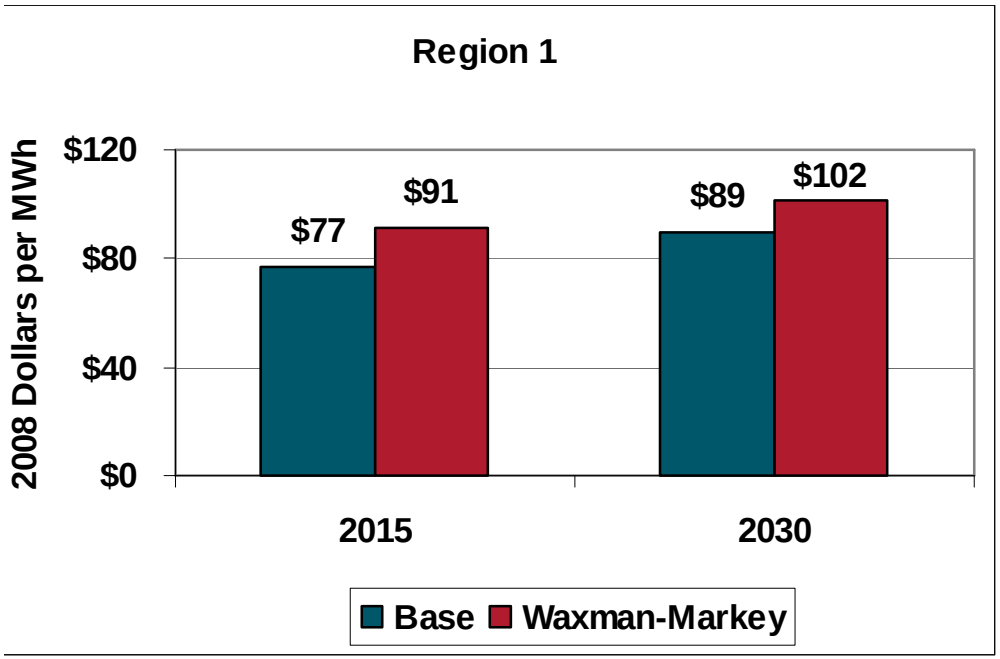
Waxman-Markey Modeling: National Electricity Generation by Fuel

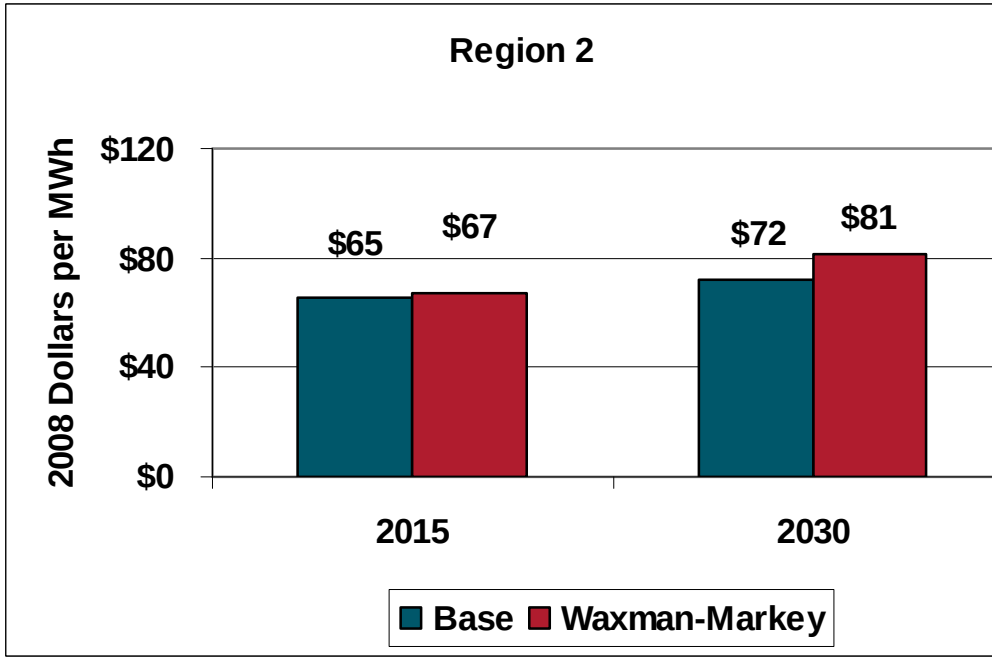




W-M leads to increases in renewable and nuclear generation and decreases in natural gas and (particularly) coal generation

Waxman-Markey Modeling: Regional Diversity in Electricity Price Impacts





W-M has very different impacts on electricity prices in different regions, due to regional differences in generation mix, delivered fuel prices, demand growth and regulation

Implications and Emerging Economic Issues

- **Waxman-Markey in tradition of "basic" GHG cap-and-trade**
  - But, energy efficiency and renewables targets
- **Many features (beyond cap) affect economic impacts**
  - Offsets, capital cost assumptions, CCS credits, biomass supply
- **Substantial regional/company diversity in economic impacts**
  - Fuel profile, regulation/deregulation, demand growth
- **Emerging/future economic issues**
  - Allocation and implications for electricity prices/consumer impacts
  - Cost containment (how to deal with "price spikes")
  - Competitiveness impacts (rebates, border tax adjustments)

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