Modeling the Economic Impacts of State Climate Policies

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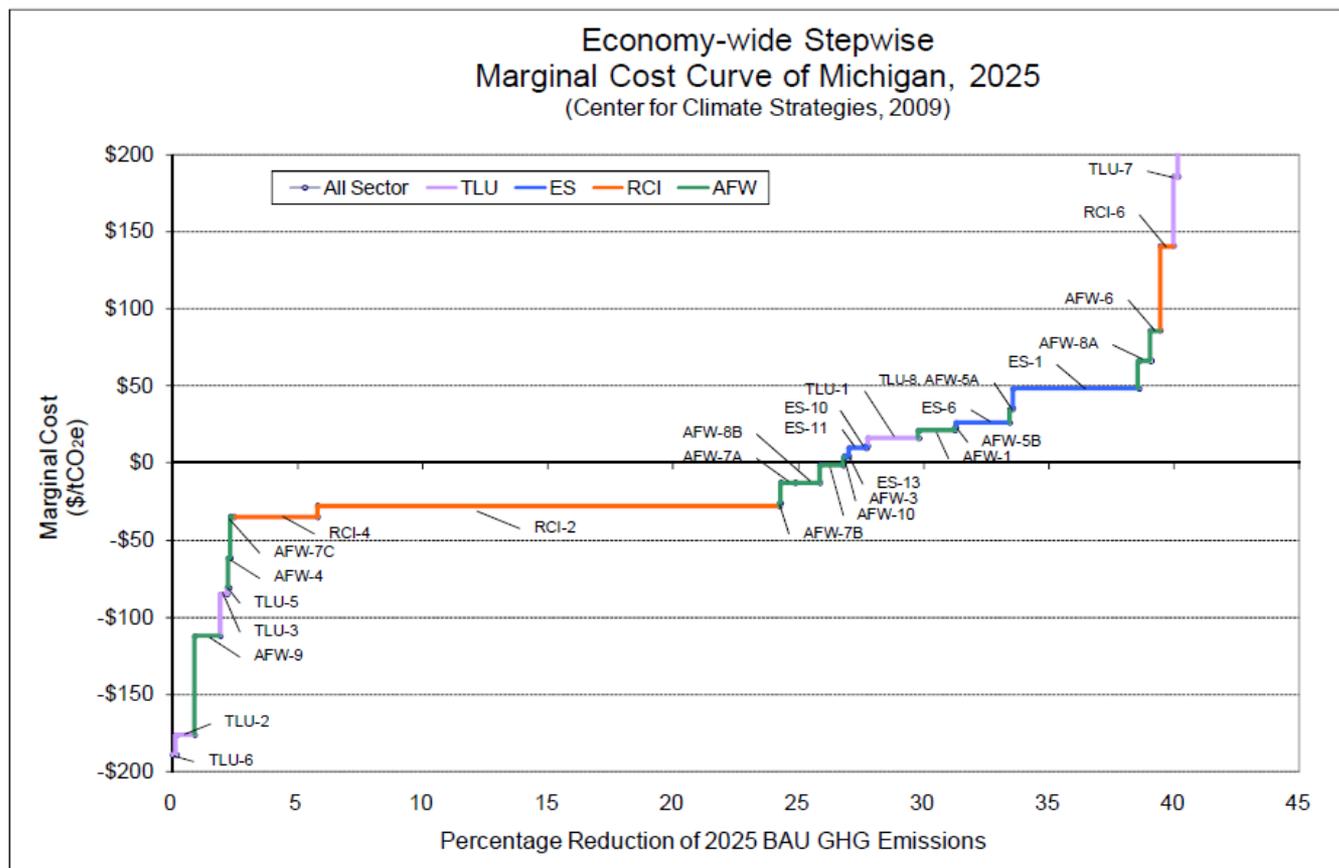# California is the Front-Runner, But Not Alone

- Center for Climate Strategies (CCS) has facilitated the development of climate action plans through a fact-finding and consensus building process for over 16 US states
    - Stakeholders include utility representatives, regulators, environmental reps, legislators, consumer protection advocates, manufacturing and agricultural lobbyists
- Policy recommendations represent negotiated, consensual policies of what is <u>desirable and achievable</u>

CCS Macroeconomic Modeling

- Macro-economic analyses in four diverse states: Florida, Michigan, Pennsylvania and Wisconsin
  - Research team includes Adam Rose and Dan Wei from USC, Steve Miller from Michigan State (WI and MI reports)
- Economy-wide climate action plans modeled (except WI)
  - Transportation and Land Use
  - Agriculture, Forestry and Waste
  - Energy Supply
  - Residential, Commercial, Industrial (typically demand side management)
- Local stakeholder knowledge on program design and implementation
  - Data is mix of policies, price mechanisms, and codes and standards

Example: Climate Action Plan for Michigan

- **Estimate approximately 27% of business as usual emissions can be mitigated at negative cost**

Economy-wide Stepwise Marginal Cost Curve of Michigan, 2025 (Center for Climate Strategies, 2009)

http://www.miclimatechange.us/ewebeditpro/items/O46F21183.pdf

Mapping Microeconomic Data onto REMI Model

- **Desktop energy and climate results inputted into Regional Economic Models, Inc (REMI) model**
  - Structural economic forecasting and policy analysis model:
    - integrates input-output (I-O),CGE, econometric & economic geography methods
    - dynamic, with forecasts & simulations generated on annual basis
    - behavioral responses to wage, price, and other economic factors
  - Five major blocks:
    - 1) Output and Demand
    - 2) Labor and Capital Demand
    - 3) Population and Labor Supply
    - 4) Wages, Prices and Costs
    - 5) Market Shares
  - 169 sectors

State Results

State	Date of Report	Target Year	% MTCO2e Reduction	GDP Impact % of BAU	Employment Impact % of BAU
MI	Jan-10	2020	44% below 2025 BAU	2.3	2.7
FL	May-09	2025	33% below 1990	0.87	1.13
PA	Dec-09	2020	39% below 2000	0.48	0.71
WI	Feb-10	2025	22% below 2005	0.62	0.56
CA	Mar-10	2020	15% below 2020 BAU	-0.2	0.1

- Compared to other state estimates, ARB results seem conservative

- CCS modeling indicates that climate policies are likely to lead to <u>improved</u> economic outcomes, rather than slightly negative results

California Modeling Methodology

- Energy modeling results linked to CGE model
  - Similar to CCS' approach
- Strengths
  - Better representative of real world
    - Rich sectoral detail to simulate California labor and investment components
      - Target spending changes in specific industries
  - Moves beyond market failure debate
    - Jurisdictions deploying demand side management on a massive scale
      - In many cases greatly reducing or eliminating new demand growth
    - DSM should be considered "core" policy rather than complementary policy

California Approach con't

- Concerns about methodology
  - Model / assumptions might be overstating compliance costs in sensitivity cases
  - Forces Energy 2020 to find GHG reductions endogenously to compensate for sensitivity cases (2-5) limitations on GHG mitigation supplies
    - Energy 2020 model is complex and assumes prices have to rise considerably to induce behavioral change
    - Assumes no new GHG reductions from renewables in power sector aside from 33% RPS
      - "Sticky" coal-gas fuel switching might require artificially high CO_2 price
    - So, model forces CO_2 reductions from end user efficiency and fuel switching at high cost
    - But, model's built environment shows limited to no device efficiency improvements through 2020 (Appendix G)

Specific questions / comments about California approach

- CCS models increase in private sector credit intermediation from new clean energy capital investments
  - ARB table 27 (p. 57) indicates limited involvement of finance and insurance sectors
- Readers would benefit from data on disaggregated sectoral impacts
  - Including industries and government

Summary

- ARB model selection and methodology best captures the complexities of reality
- ARB estimates of the costs reducing GHGs in California are potentially overstated
  - Modeling in other states indicates net economic gains for similar or greater relative GHG reductions
  - Energy 2020 model design and assumptions might be interacting to increase CO_2 prices and compliance costs

Thank you

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