An Overview of the Results and Methods of State RPS Cost-Benefit Projections

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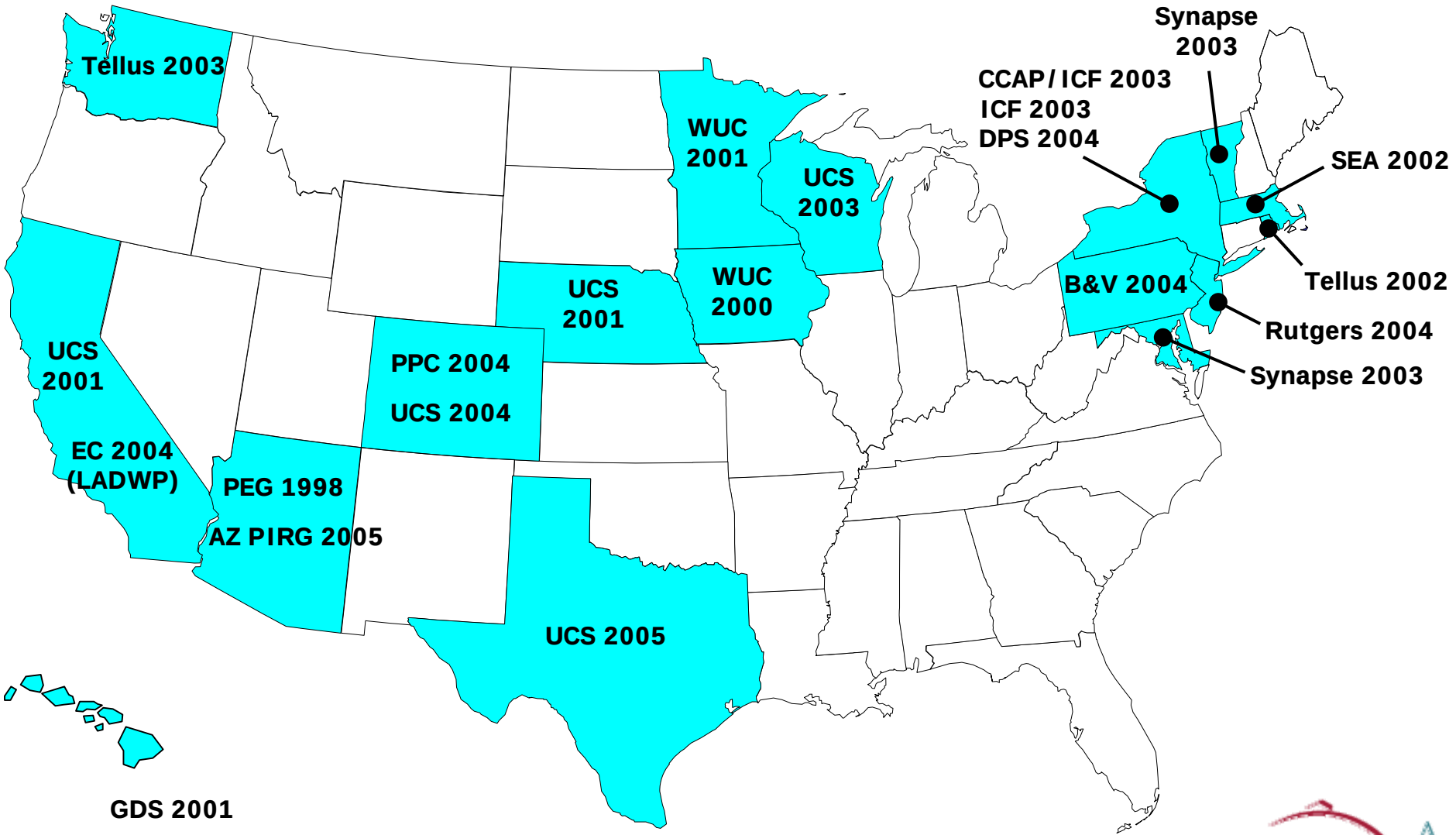
EPA RPS Collaborative Conference Call

June 7, 2005

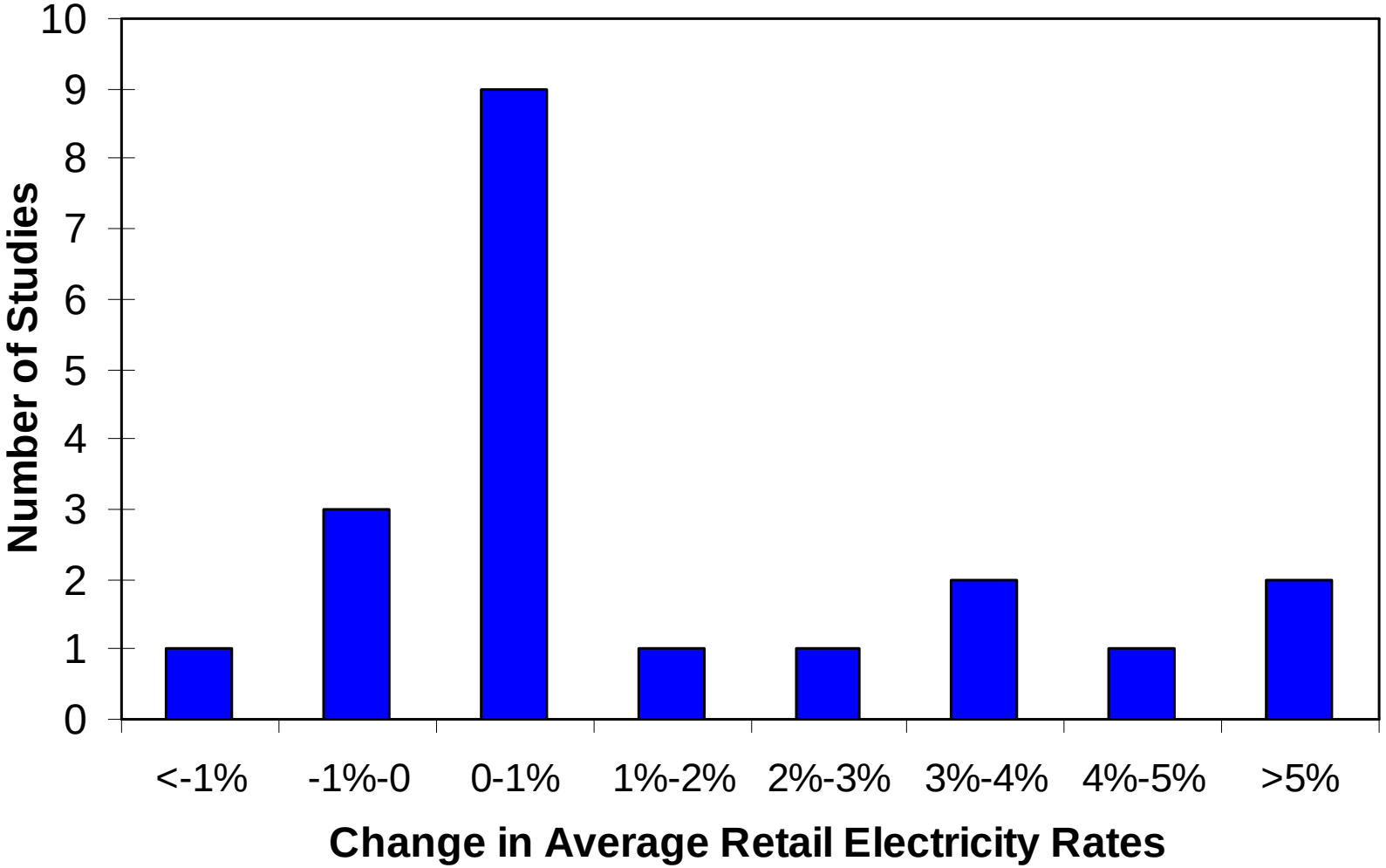
Project Overview

- **Project scope**
  - Survey of 22 RPS cost impact analyses
  - Sample includes state or utility-level analyses completed since 1998
- **Comparison of key results**
  - Direct or inferred retail rate impacts
  - Renewable deployment by technology
  - Secondary cost impacts and benefits
  - All results presented are taken from the first year that each RPS hits its ultimate target level (e.g. 2013 for New York, 2010 for California)
- **Comparison of study methodologies**
  - General modeling approaches
  - Renewable resource characterization
  - Avoided fossil generation
  - Sensitivity scenarios
  - Other details

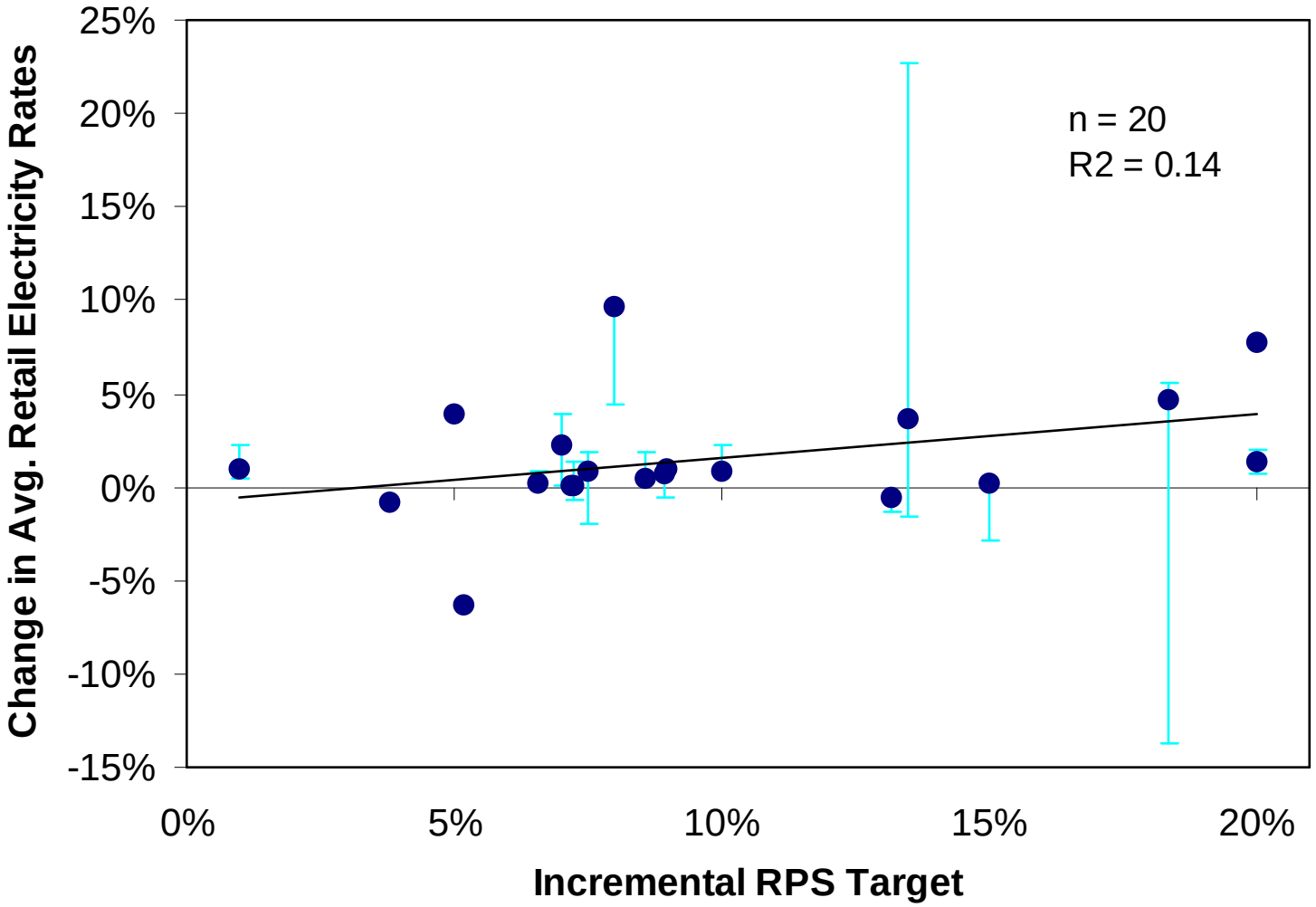
RPS Cost-Impact Study Sample: Who, When, and Where?



Distribution of Base-Case Impacts on Average Retail Electricity Rates

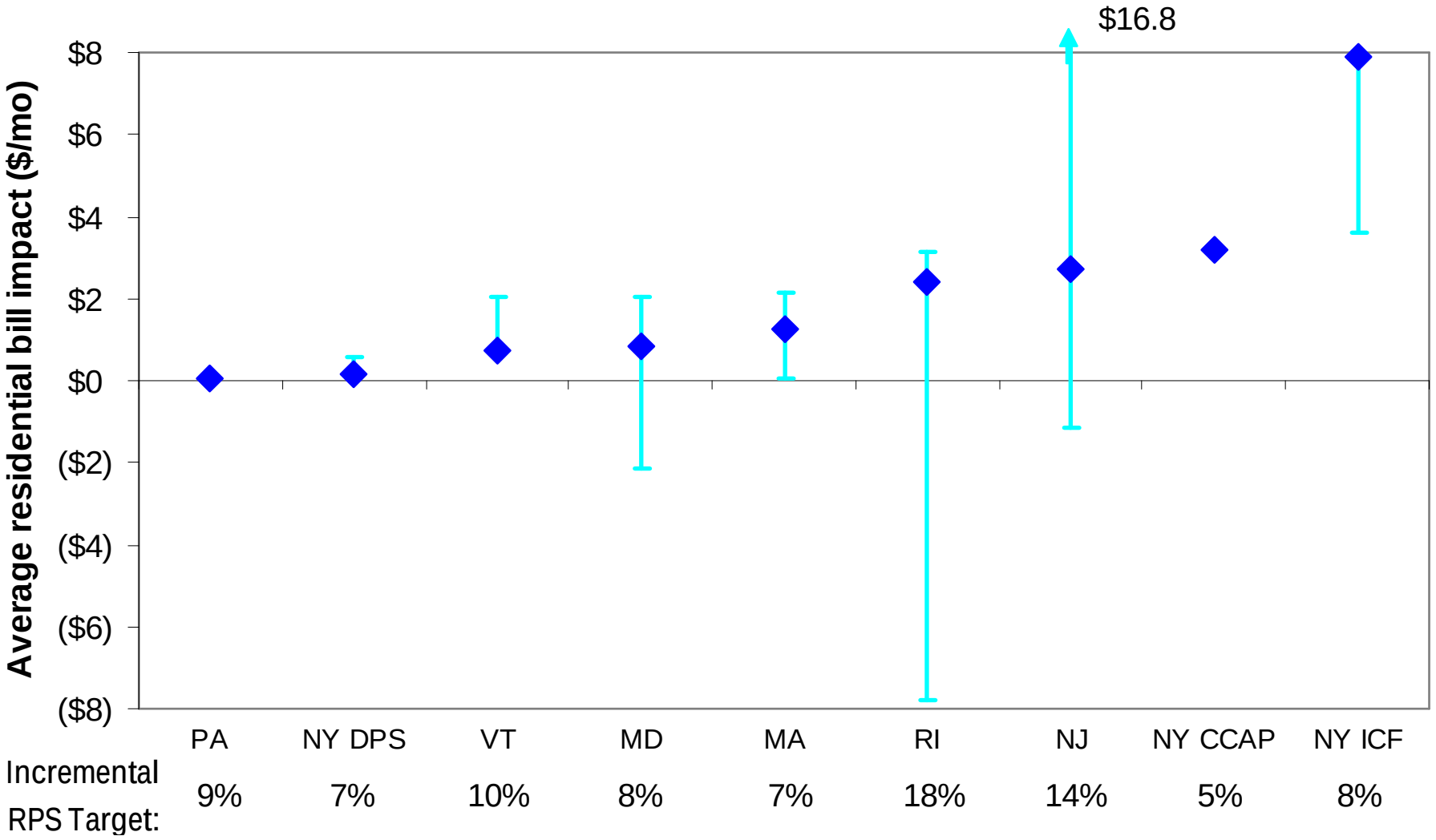


Relationship Between Incremental RPS Targets and Retail Rate Impacts

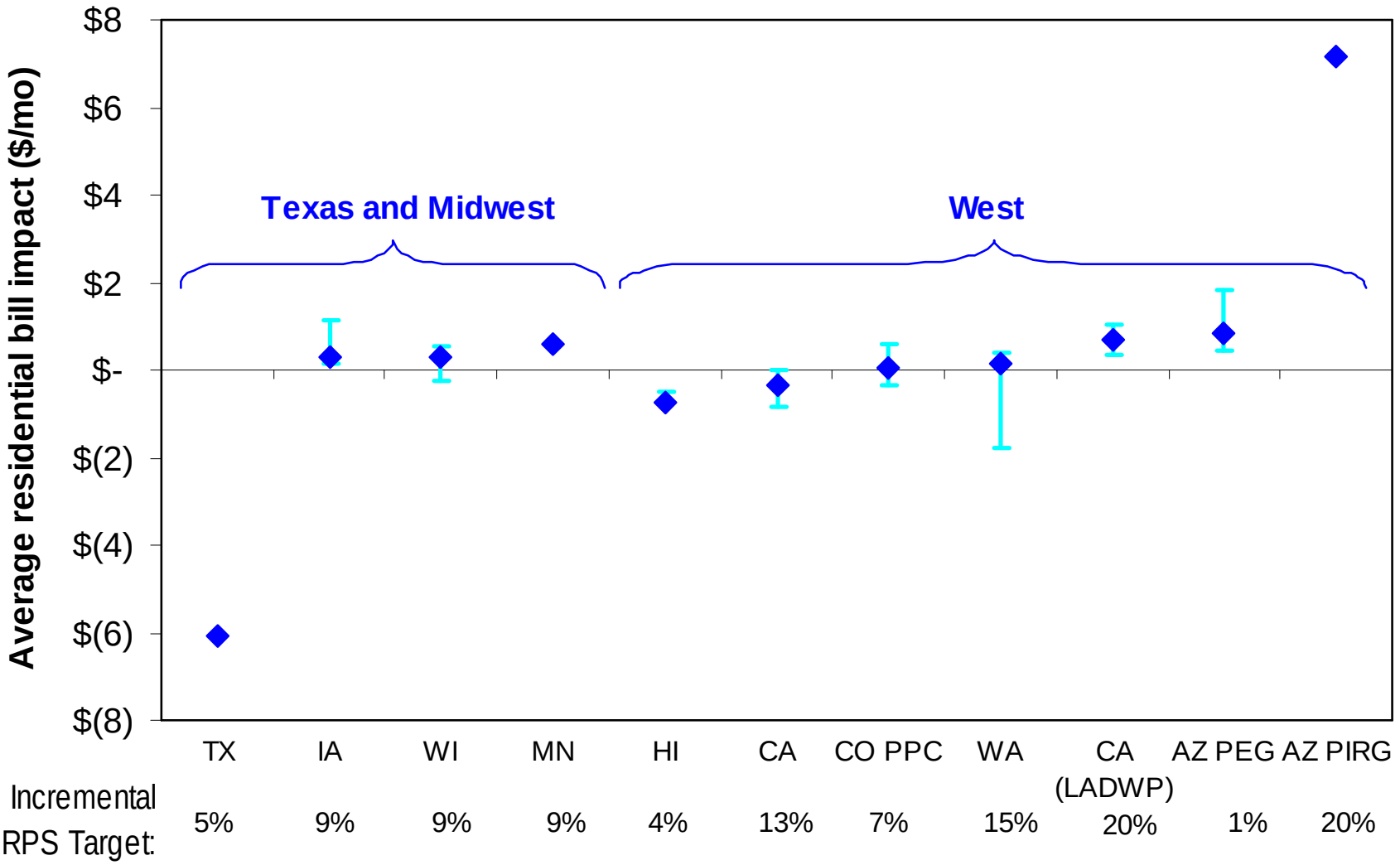


Note:
Error bars reflect alternate scenarios from the base case

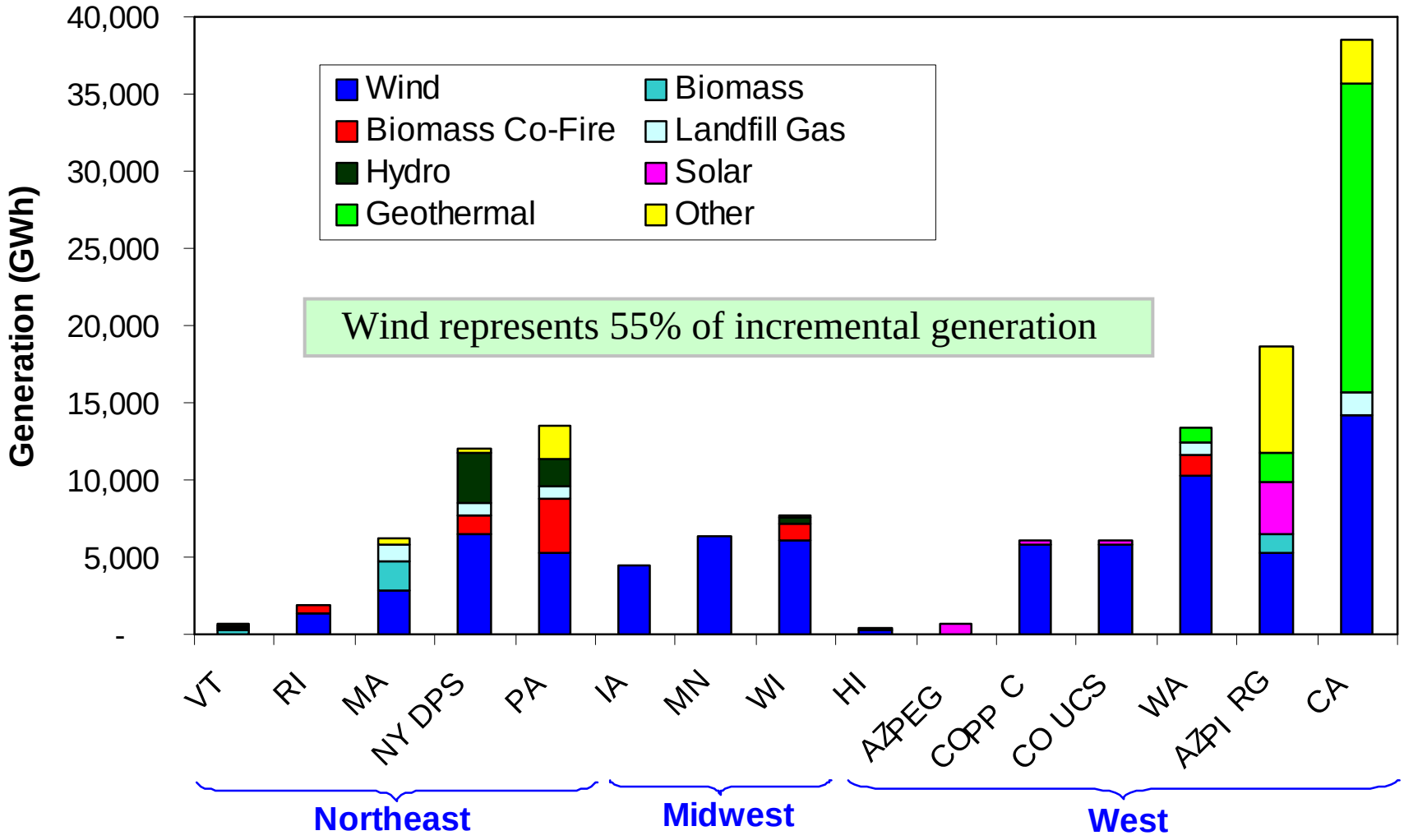
Residential Electricity Bill Impacts: Northeast



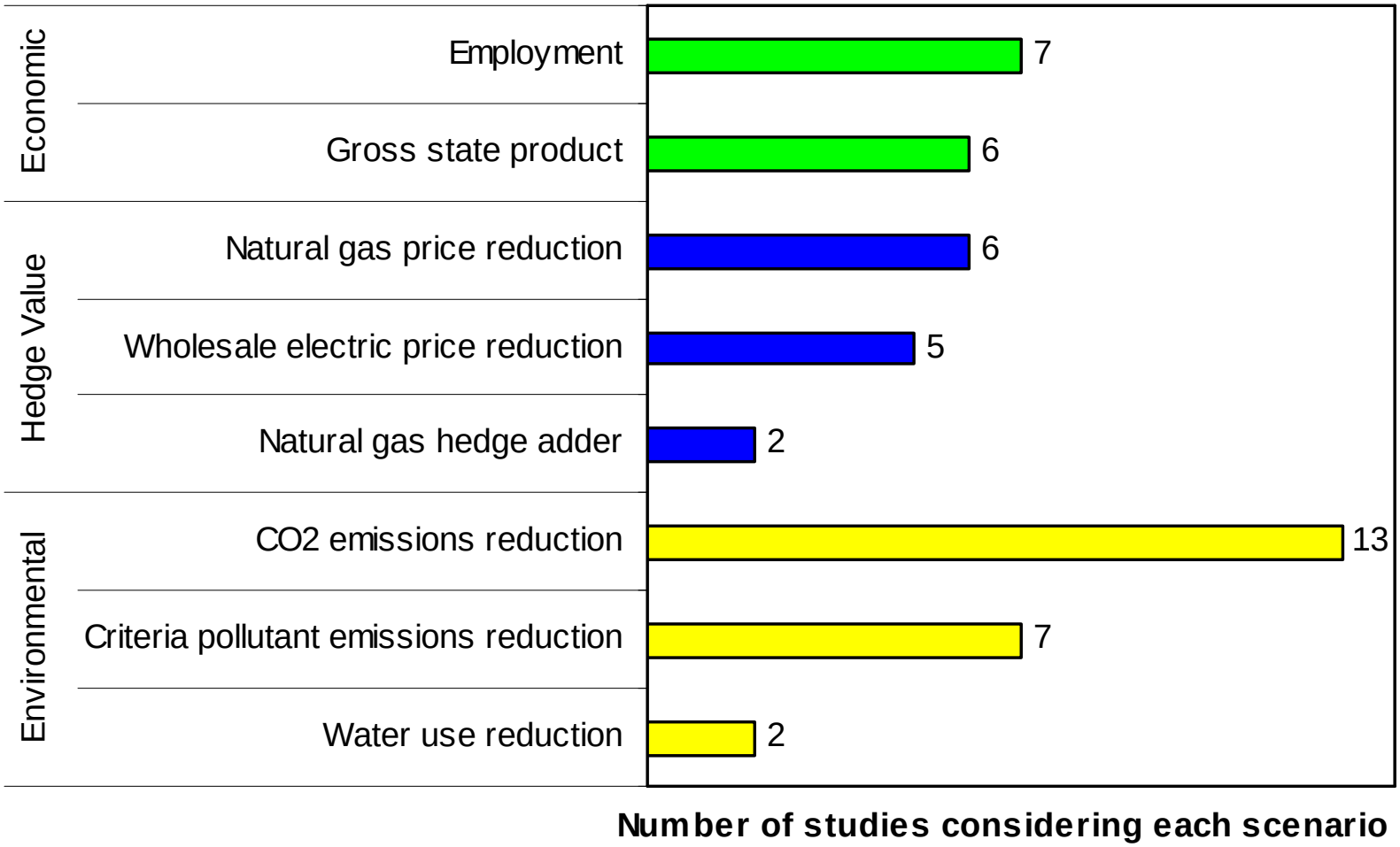
Residential Electricity Bill Impacts: Midwest, Texas, West



Incremental Renewable Deployment by Study and Technology



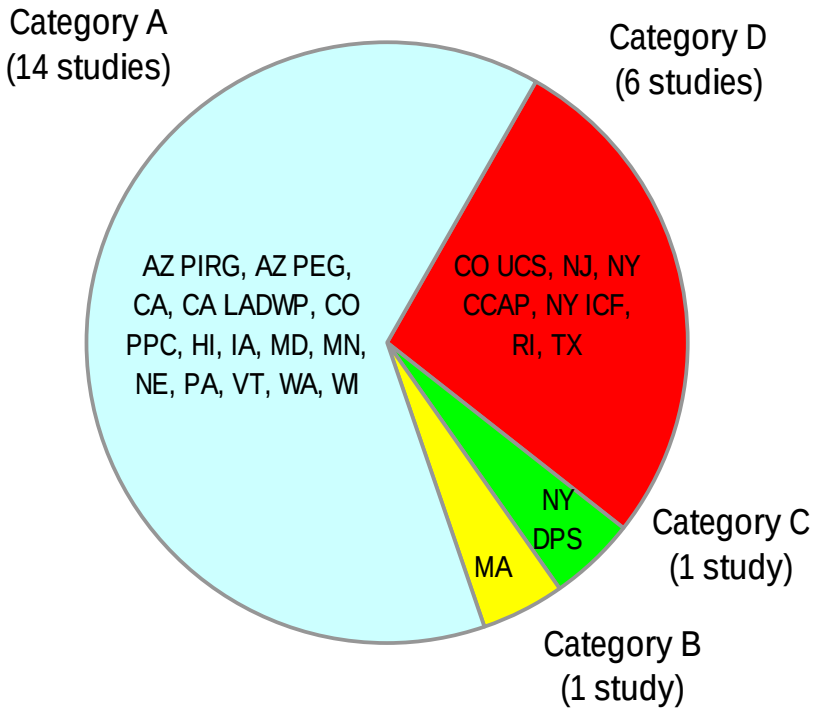
Many Studies Also Evaluate Potential Public Benefits



Four General Modeling Approaches Have Been Used

Four broad categories:

- Category A: Linear spreadsheet model of both RE + avoided utility cost
- Category B: Linear spreadsheet model of RE + generation dispatch model of avoided utility cost with base-case resource mix
- Category C: Linear spreadsheet model of RE + generation dispatch model of avoided utility cost with implied RPS mix
- Category D: Integrated energy model



Estimating the Busbar Cost of Renewable Energy

Three major components of renewable generation cost estimation:

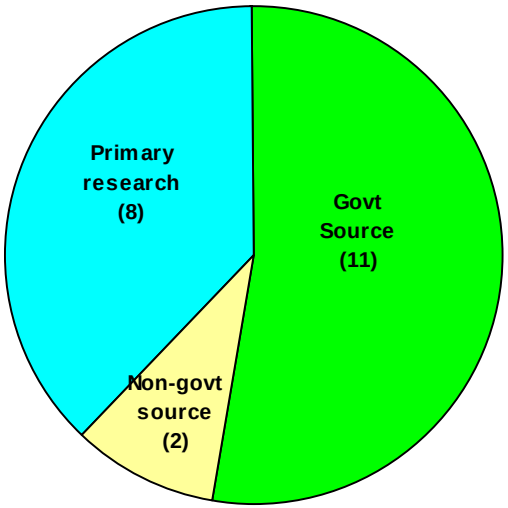
How much is available?
Renewable resource availability assessment

How much does it cost now?
Current cost and performance of renewable technologies

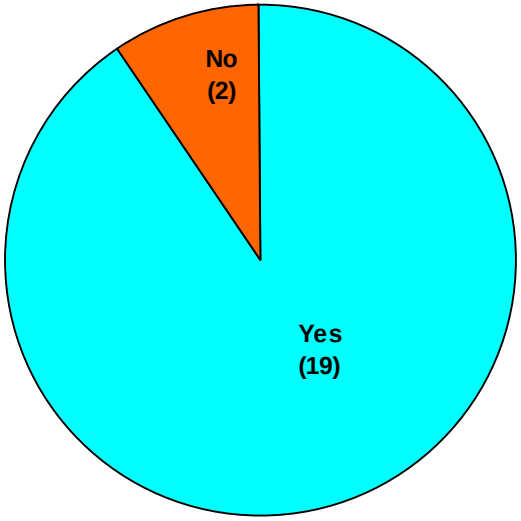
How much will it cost in the future?
Future cost and performance of renewable technologies

Sources of Resource Availability Assumptions

Sources of Busbar Cost Assumptions



Do Studies Assume Technology Learning?



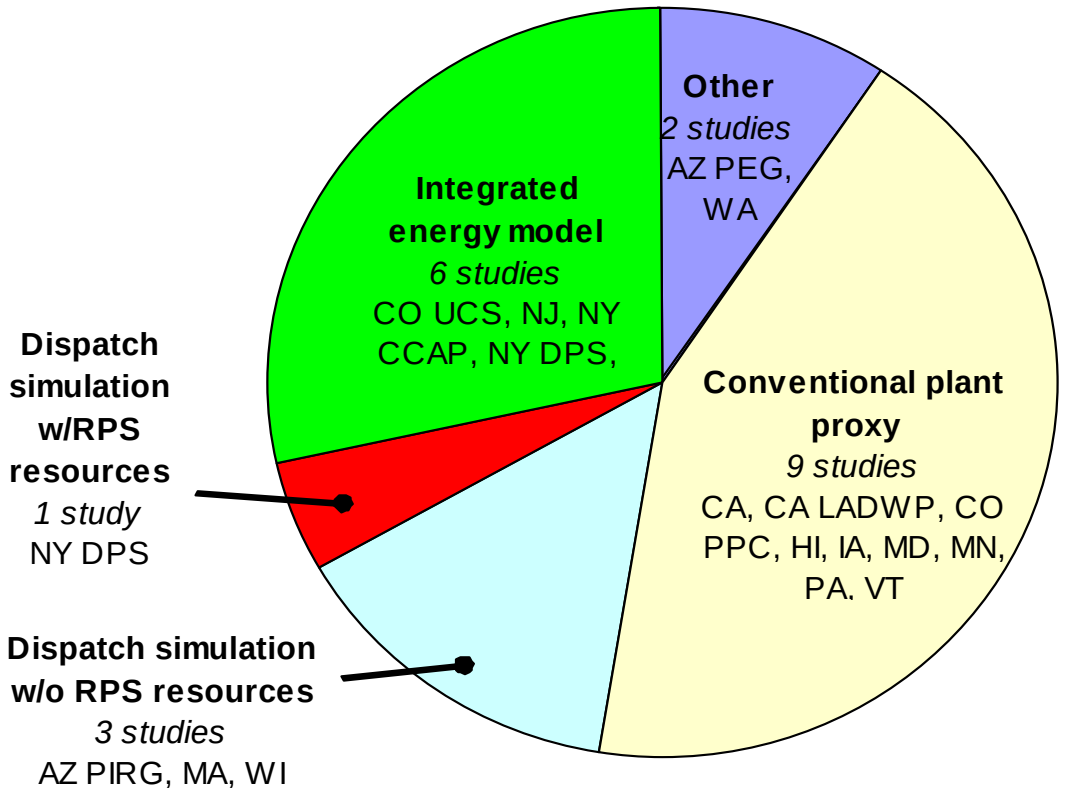
Many Studies Appropriately Consider the Secondary Costs of Renewable Generation

Cost Variable	Number of studies	Studies
Capacity value	13	AZ PEG, CO PPC, CO UCS, IA, MD, MA, MN, NY DPS, NY ICF, PA, RI, TX, WI
Time differentiation of renewable generation	10	CA, CO UCS, MA, NJ, NY CCAP, NY DPS, NY ICF, RI, TX, WI
Transmission cost	10	CA, CA LADWP, CO PPC, CO UCS, IA, MA, MN, TX, VT, WI
Integration cost	8	CO PPC, CO UCS, IA, MN, NJ, TX, WA, WI
Admin. & transaction cost	4	CA, MA, WA, WI

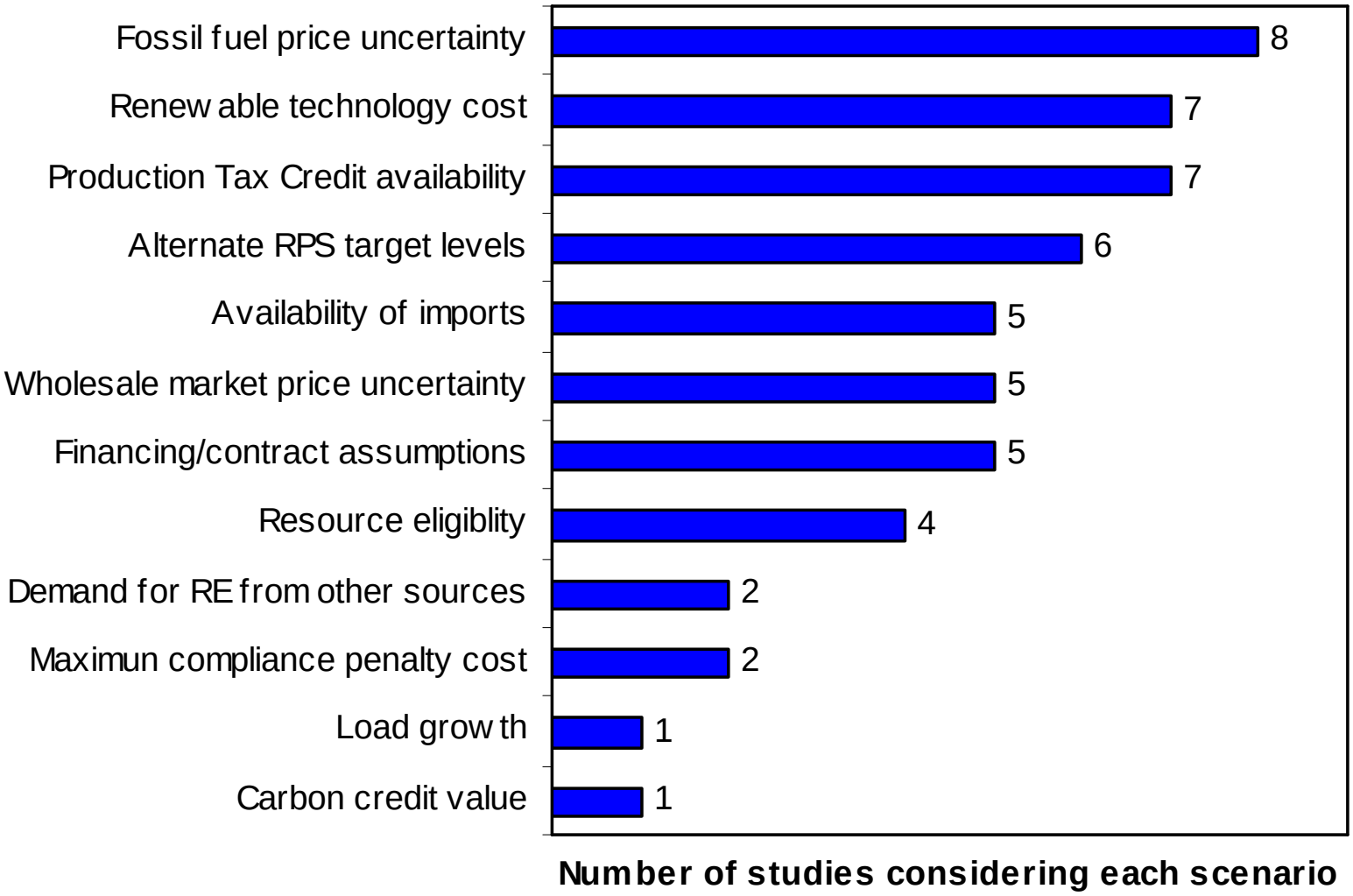
Methodologies for Estimating Avoided Costs Vary Among the Studies

Five major categories:

1. Conventional fossil fuel plant proxy
2. Dispatch simulation model w/o RPS resources
3. Dispatch simulation model w/RPS resources
4. Integrated energy model
5. Other



Scenario Analysis Is Often Used to Bound the Possible Impacts



Conclusions

- The cost of RPS policies is typically projected to be relatively modest
  - less than 5% increase in rates and less than $5/month for an avg. household, with cost savings a possibility; high end of range typically from the Northeast
- Wind power expected to serve 55% of the RPS-driven RE demand
- Recent trend toward studies that forecast not just costs and environmental benefits, but also macroeconomic and hedge benefits
- Studies use a variety of methods and data sources to calculate costs and benefits: a standard study "template" has not yet emerged
- Sophistication and detail of cost-impact analysis is largely a function of available funds and the purposes of the study
  - Not entirely clear that more sophisticated *models* necessarily improve accuracy
- Assumptions for primary and secondary costs and benefits likely to be more important than what model is used
  - natural gas price forecast, whether PTC is assumed to exist, projected transmission costs, supply curves for renewable energy

Some Possible Areas of Improvement…

- **Improved Treatment of Transmission Costs:** these costs are often poorly understood and imprecisely modeled
- **Competing RPS Requirements:** consider potential RPS policies in nearby states, and impact on RE resource supply and cost
- **Coal as the marginal price setter:** at high natural gas prices, need to consider possibility that RE will increasingly offset coal
- **Greater Use of Scenario Analysis:** natural gas and wholesale price forecasts, PTC availability
- **Consideration of Future Carbon Regulation:** consider impacts in the event that future carbon regulations are established
- **More Robust Treatment of Public Benefits:** in particular, employment, economic development, and hedge benefits

RPS Cost Studies - Northeast

State	Principal Author(s)	Year	Title
MA	Sustainable Energy Advantage & LaCapra	2002	Massachusetts RPS: 2002 Cost Analysis Update – Sensitivity Analysis
MD	Synapse	2003	The Maryland Renewable Portfolio Standard: An Assessment of Potential Cost Impacts
NJ	Rutgers CEEEP	2004	Economic Impact Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard
NY	Center for Clean Air Policy/ICF	2003	Recommendations to Governor Pataki for Reducing New York State Greenhouse Gas Emissions
NY	ICF	2003	Report of Initial Analysis of Proposed New York RPS
NY	NY DPS	2004	Renewables Portfolio Standard Order Cost Analysis
PA	Black & Veatch	2004	Economic Impact of Renewable Energy in Pennsylvania
RI	Tellus	2002	Rhode Island RPS Modeling
VT	Synapse	2003	Potential Cost Impacts of a Vermont Renewable Energy Portfolio Standard

RPS Cost Studies – Rest of U.S.

State	Principal Author(s)	Year	Title
AZ	AZ PIRG Education Fund	2005	Renewing Arizona's Economy: The Clean Path to Jobs and Economic Growth
AZ	Pacific Energy Group	1998	Solar Portfolio Standard Analysis
CA	UCS	2001	Powering Ahead: A New Standard for Clean Energy and Stable Prices in California
CA (LADWP)	Environment California	2004	Clean and Affordable Power: Updated Cost Analysis for Meeting a 20% Renewables Portfolio Standard by 2017 at LADWP
CO	Public Policy Consulting	2004	The Impact of the Renewable Energy Standard in Amendment 37 on Electric Rates in Colorado
CO	UCS	2004	The Colorado Renewable Energy Standard Ballot Initiative: Impact on Jobs and the Economy
HI	GDS Associates	2001	Analysis of Renewable Portfolio Standard Options for Hawaii
IA	Wind Utility Consulting	2000	Projected Impact of a Renewable Portfolio Standard on Iowa's Electricity Prices
MN	Wind Utility Consulting	2001	Projected Impact of a Renewable Portfolio Standard on Minnesota's Electricity Prices
NE	UCS	2001	Strong Winds: Opportunities for Rural Economic Development Blow Across Nebraska
TX	UCS	2005	Increasing the Texas Renewable Energy Standard: Economic and Employment Benefits
WA	Tellus	2003	Economics of a Washington Energy Portfolio Standard: Effects on Ratepayers
WI	UCS	2003	A Study to Evaluate the Impacts of Increasing Wisconsin's RPS