The Value of Demand Reduction Induced Price Effects (DRIPE)

Presented by
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Housekeeping

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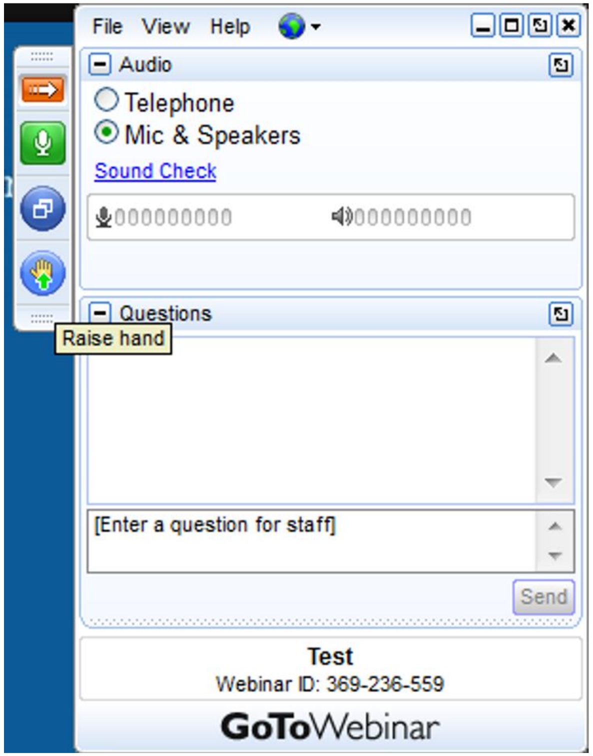

Our DRIPE Experts

Chris Neme
Energy Futures Group

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Resource Insight

Presentation Overview

1. Context for the Study
2. Study Methodology and Results
3. Summary

Context for Study

IL Electric Efficiency Programs

- Began in 2007
- Statutory Energy Efficiency Resource Standards
  - Year 1: 0.2%
  - Year 2: 0.4%
  - Year 3: 0.6%
  - Year 4: 0.8%
  - Year 5: 1.0%
  - Year 6: 1.4%
  - Year 7: 1.8%
  - Years 8+: 2.0%

  - Subject to spending cap of ~2% of revenues
  - If spending cap hit, savings targets adjusted
  - Spending cap had effect of limiting savings to between 0.6% and 1.0%
- Illinois Power Agency (IPA) required to procure of all cost-effective residential & small business EE beginning in 2013
  - Over and above what utility EERS programs are capturing
  - Effectively eliminated spending cap for those customers
  - Makes cost-effectiveness screening very important

IL Cost-Effectiveness Screening

- Statute references TRC test
- Statutory definition specifics on benefits:
  - "…sum of avoided utility costs, representing benefits that accrue to the system and the participant…"
  - Calculation of avoided costs must include value of avoided costs of complying with likely future regulation of greenhouse gases
  - "other quantifiable societal benefits" should also be included
- NRDC interested in whether price suppression effects could be quantified and included in test

Questions?

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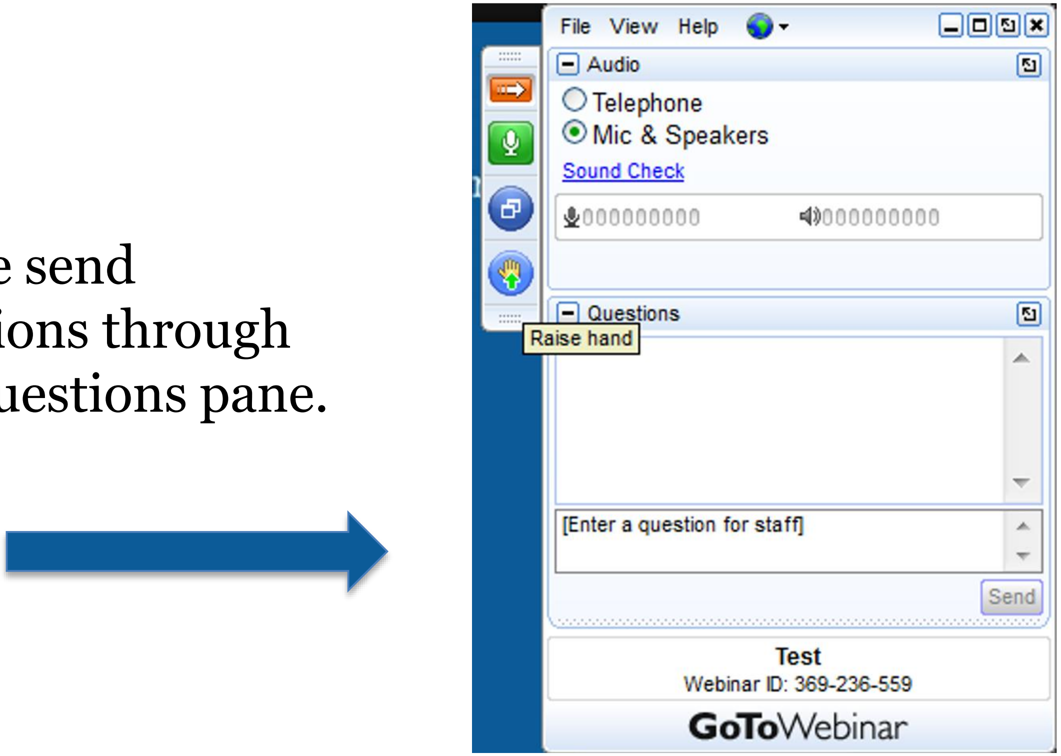
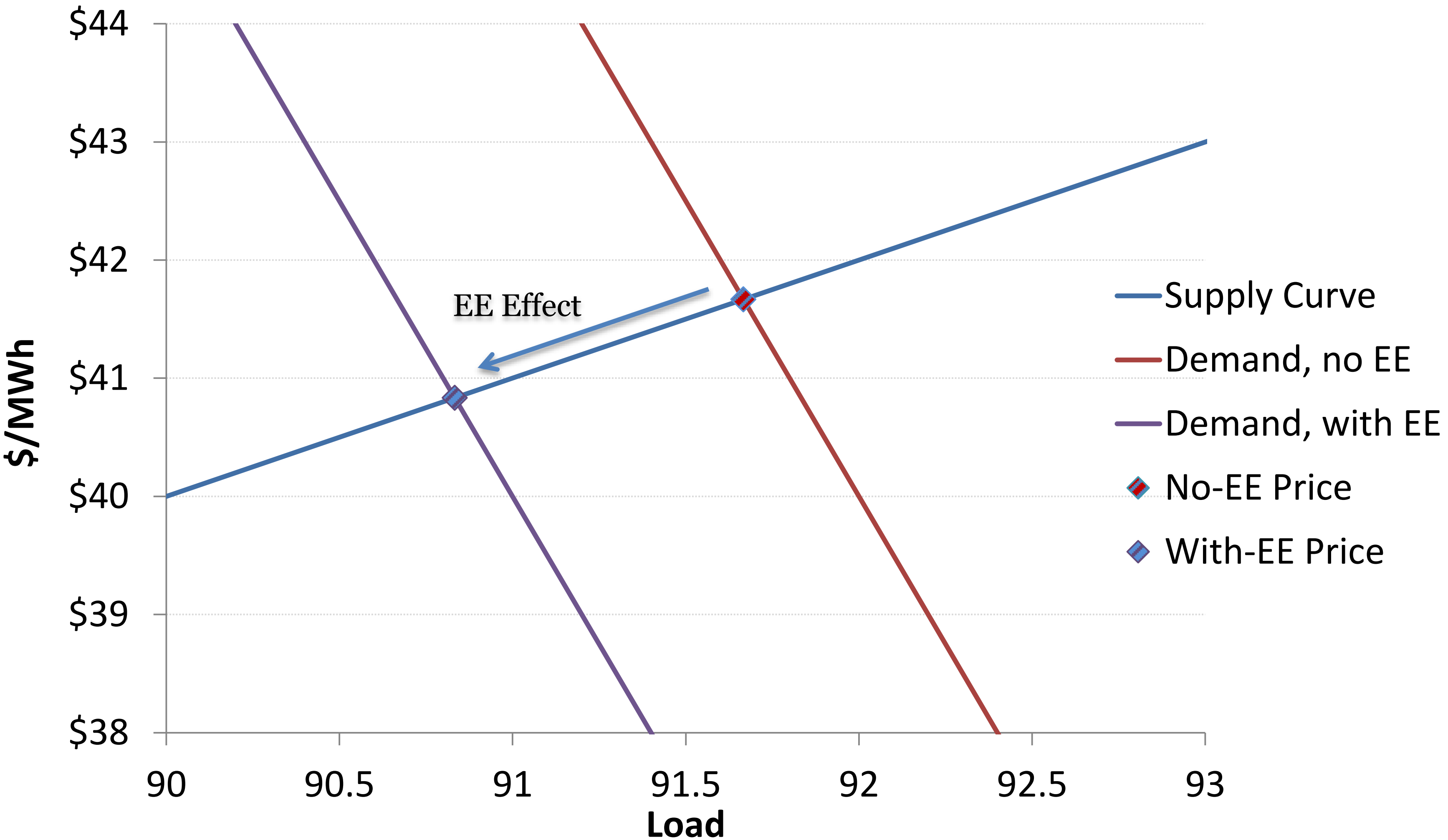


Study Methodology and Results

Summary

- **In competitive markets, lower demand means lower prices**
  - Price suppression has been estimated for electric energy & capacity, natural gas supply & basis
- **This presentation describes my estimates for Illinois electric energy DRIPE**
  - Lower price is a benefit to all restructured electricity consumers in Illinois and some beyond
- **Including DRIPE in TRC screening is consistent with treatment of other costs**

Lower Load Means Lower Price

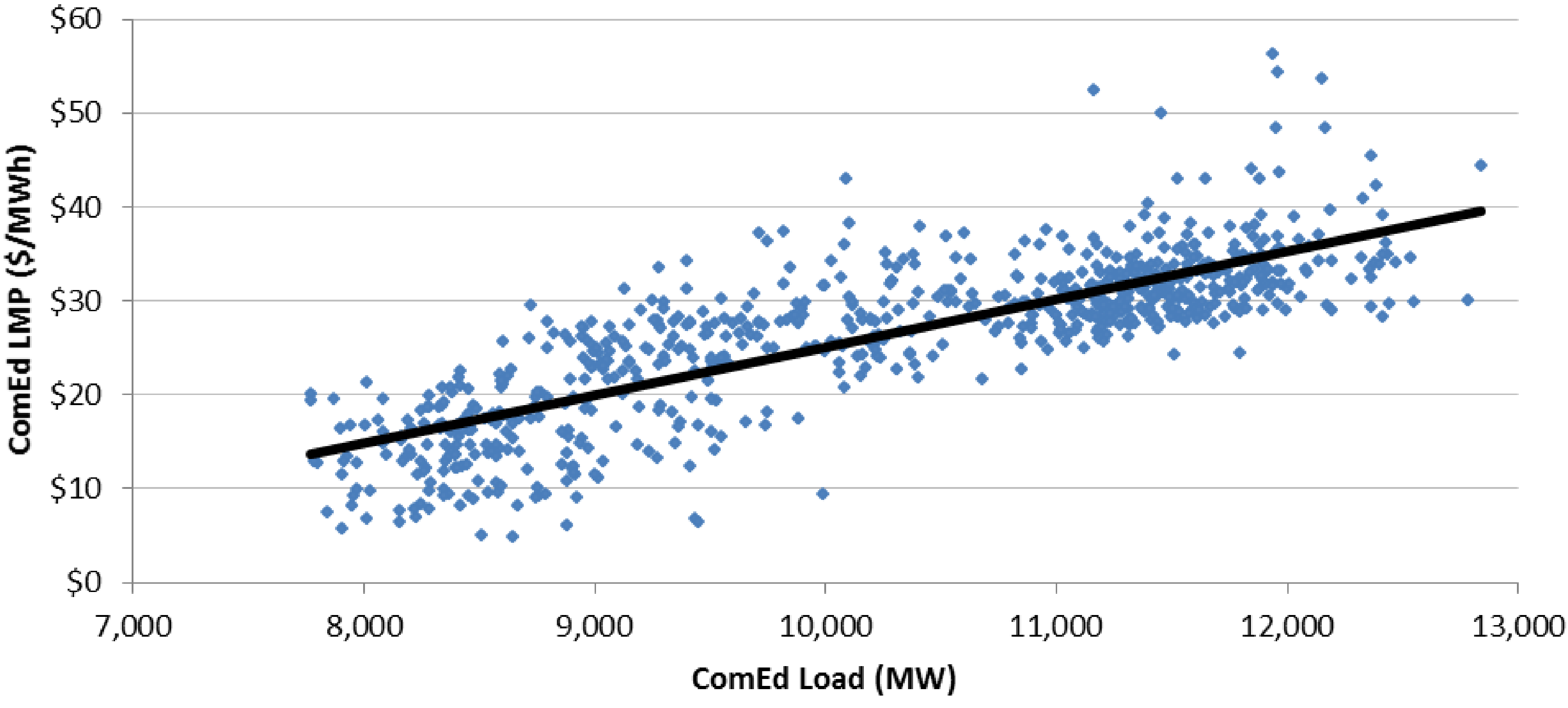


Estimating Market Electric-Energy DRIPE: Approaches

- **Use production-cost model; change load and observe change in model-estimated price**
  - Results tend to be unstable
  - Production cost models make many quasi-random decisions: scheduling maintenance, timing of unplanned outages
    - *Small changes in output (or even the order in which plants are listed) can result in large changes in dispatch*
- **Regress historical hourly prices as function of loads**
  - For Illinois, I used data 7/2009–12/2012, for peak and off-peak
  - I expressed hourly load and price as % of monthly average. Normalizes away inter-month variation in gas prices, capacity, maintenance

Example

ComEd LMP as Function of ComEd Load (October 2012)



Regression Results

- **1% load reduction causes 2% price reduction**
- **How large is the area causing this effect?**
  - Not clear
  - More than Illinois
  - Less than MISO + PJM
  - Illinois represents about 25%–50% of load driving Illinois price
- **1% Illinois load reduction causes 0.5%–1% *price** * reduction in Illinois**

*correction made for accuracy

Price Reduction as an Avoided Cost

If market energy price is $50/MWh, a 1% Illinois load reduction would:

- Reduce Illinois price about 25¢/MWh–50¢/MWh
- Each MWh of savings reduces prices for 99 MWh of remaining load
- Each MWh of savings produces price benefits for Illinois of
  99 MWh × 25¢/MWh ≅ $25/MWh, or
  99 MWh × 50¢/MWh ≅ $50/MWh
- Additional benefits to consumers in rest of PJM?

Illinois Results are in Typical Range

- **2013* IPA Annual Report: Clean Power Research on solar**
  - Average levelized price effect = $59/MWh
  - Range of estimates = $30/MWh–$82/MWh
- **2013 Regional Analysis for New England utilities**
  - 1% load reduction causes
    ~2.2% price reduction on-peak
    ~1.2% price reduction off-peak
- **2009 NYSERDA renewables assessment**
  - Adding 1% load in renewable energy causes ~1.1% price reduction
- **2009 PJM Analysis**
  - 1% load reduction causes 1%–3.3% price reduction*

*corrections made for clarification/accuracy

Reducing DRIPE for share of retail load affected by market price

- **Only customers of restructured utilities**
- **Short-term hedging by existing contracts**
  - Utility default/basic/standard-offer service
  - Retail suppliers
  - Municipal aggregators
- **Long-term contracts (none in IL)**
  - Legacy contracts
  - Utility-owned resources (e.g., ConEd steam cogen)
  - Reliability contracts (e.g., Connecticut)
  - Renewable projects (e.g., Massachusetts)

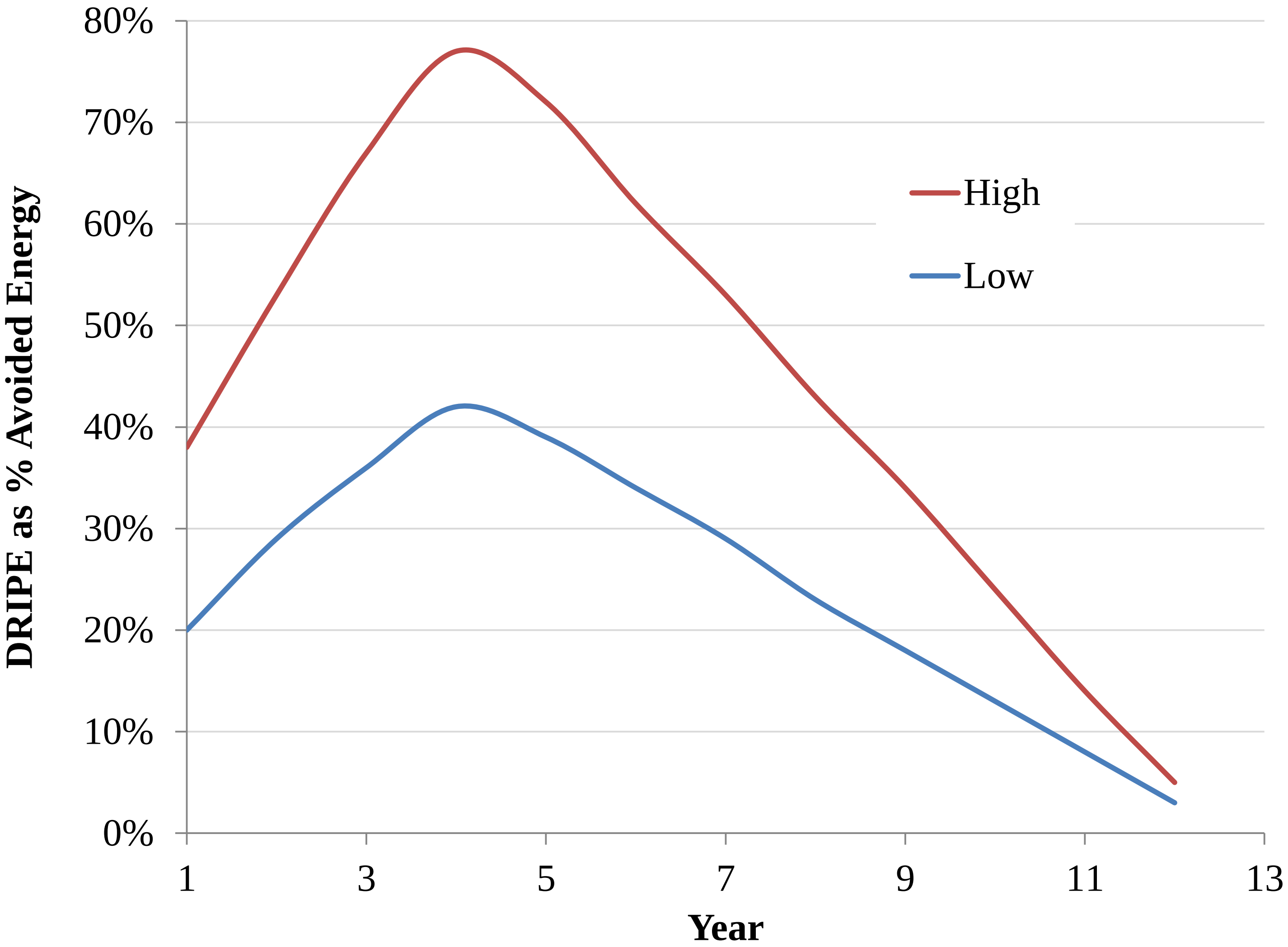
IL Short-Term Hedges

- **IPA 2014 Procurement Plan hedging:**
  - 75% of energy in current year (varies over course of year)
  - 50% for year 2
  - 25% for year 3
- **Difficult to assess hedging by competitive retailers**
  - Residentials offered fixed rates for 1 to 24 months
  - Businesses offered both fixed-price & indexed products
    - *Little info available on distribution of contracts by duration*
    - *When contract ends, no hedging*
- **Study assumed**
  - 60% hedged 1st year
  - 40% headed 2nd year
  - 20% hedged 3rd year
  - 2% hedged subsequent years

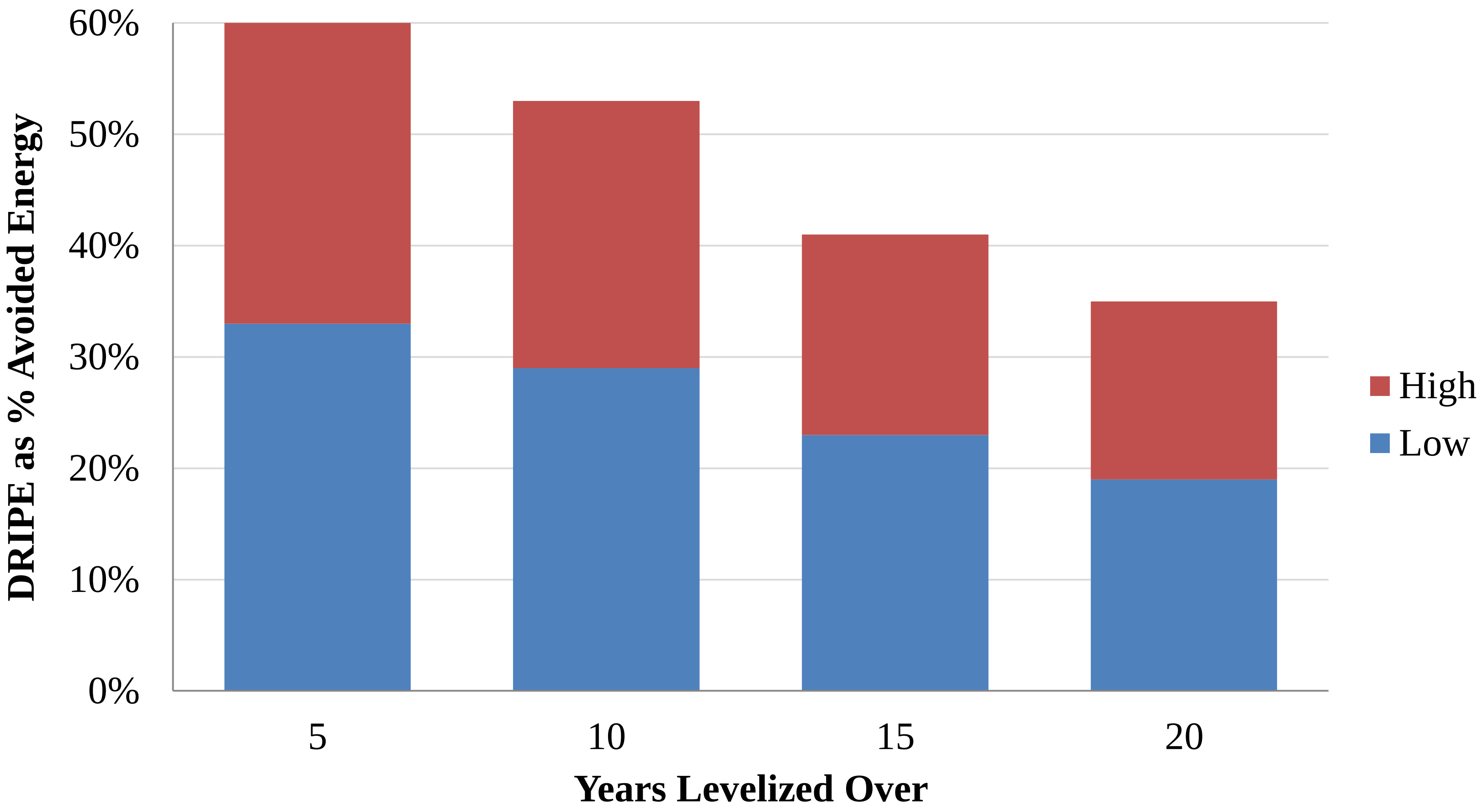
Adjusting for Long-Term Erosion of Price Suppression Effects

- **Price elasticity of demand**
  - Retail price is about twice wholesale price, so % retail price change is ~½ of wholesale price change
  - Demand response depends on estimates of short- and long-term elasticities.
  - Using PJM load forecast, demand offsets ~2% of benefit in short run, ~3% long term
- **Pressures on power plant fleet:**
  - Accelerated plant retirements
  - Delayed capacity additions
  - Deferred upgrades
  - Shift in new capacity to peakers higher energy prices

Estimate of Illinois Net DRIPE by Year



DRIPE as % Avoided Energy, Levelized



- Does not reflect changing market prices over time

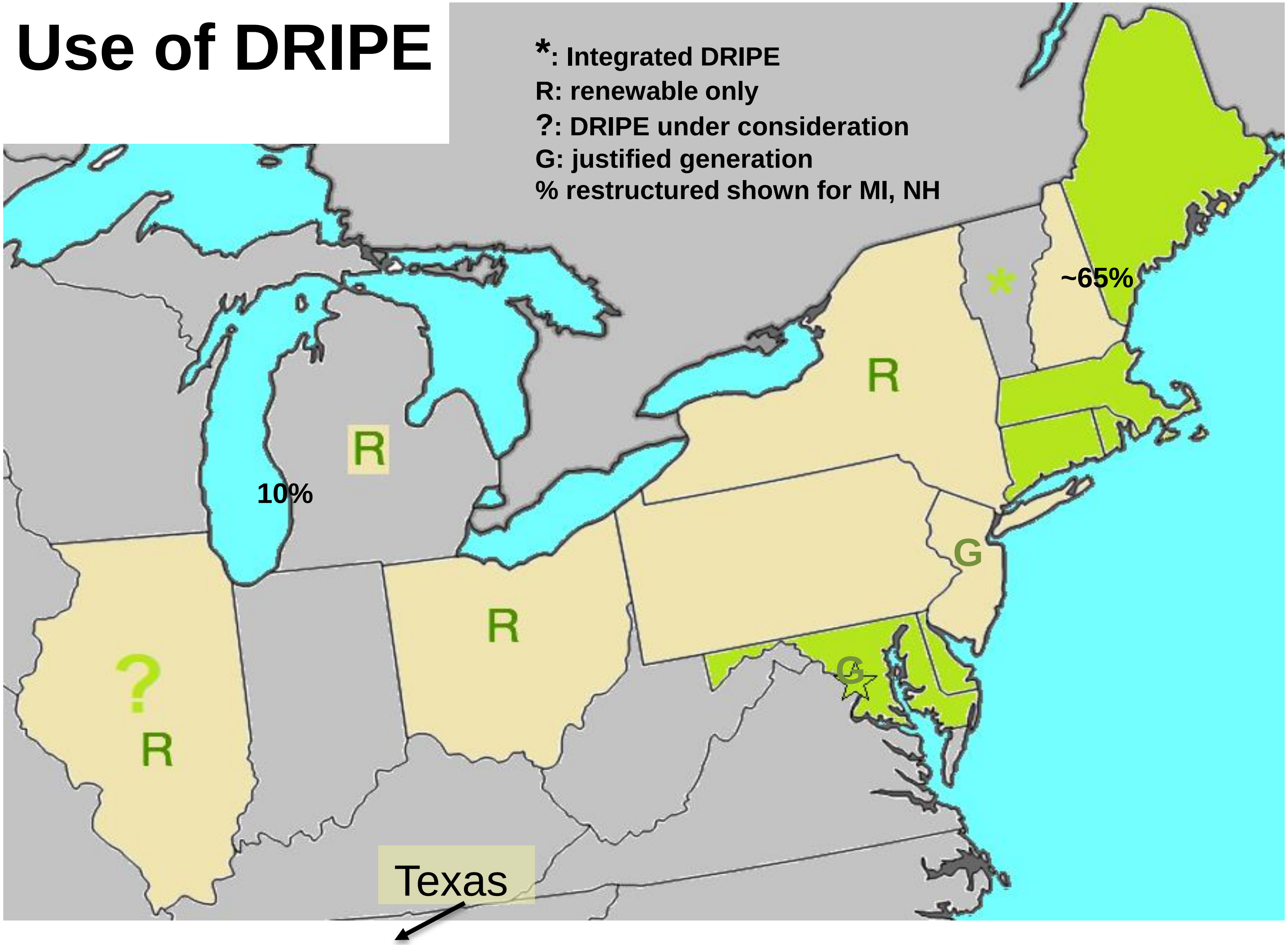
DRIPE looks like a TRC Benefit

- **Illinois (and some other) legislation mentions price reduction as goal of DSM**
- **Consistent with measurement of energy-efficiency costs**
  - Payments to contractors and suppliers, including their profits, are treated as costs
  - Reducing prices paid to supply chain through better program design is an improvement
  - Lost profit to energy-efficiency supply chain is a TRC benefit
- **Consistent with power procurement goals**
  - Lower prices are preferred for energy and RECs
  - Supplier profits are treated as costs

DRIPE is widely accepted in restructured states

- **Included in EE screening in 7 of 12 restructured jurisdictions:**
  - Entire RTO effect: CT and RI
  - State effects only: MA and MD
  - Scope unclear: DC, DE, ME
- **DRIPE used in evaluating renewables in many of above, plus NY, OH, IL and (10% restructured) MI**
- **DRIPE justified generation contracts in MD and NJ**
- **I have not found DRIPE used in PA, TX, or (mostly restructured) NH**
- **VT: Vertically integrated, includes 50% of RTO DRIPE**

Use of DRIPE


*: Integrated DRIPE
R: renewable only
?: DRIPE under consideration
G: justified generation
% restructured shown for MI, NH
*
~65%
R
R
10%
G
R
G
?
R
Texas

Other categories of DRIPE

- **Electric capacity DRIPE**
  - Estimated for ISO-NE and PJM
  - Driven by slope of supply curve and administrative demand curves
- **Natural gas supply DRIPE**
  - From electric and gas energy efficiency
  - Uniform effect for all of North America
- **Natural gas transportation basis**
  - From electric and gas energy efficiency
  - Varies widely by region
- **Effect of gas price on electric price**

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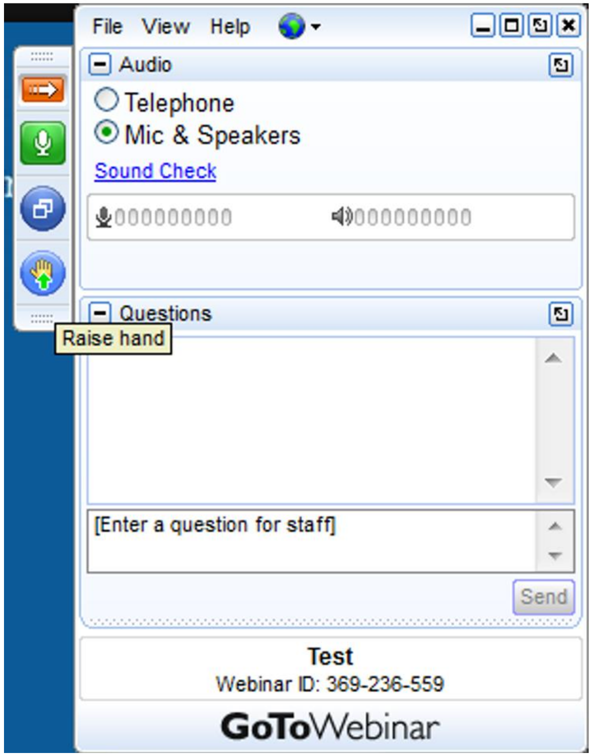

Summary

Benefit or Transfer of Wealth?

- Depends on whose impacts policy-makers care about
  - If just utility and its customers, then it is a benefit
  - If all of society – including generators – then a transfer
- Suggests DRIPE is a benefit under UCT
- Suggests DRIPE is a benefit under TRC
- Suggests DRIPE may not be benefit under SCT
  - Under expansive view of "society" that requires similarly expansive consideration of societal benefits (and societal discount rate)*
- Regardless of whether accepted as a "benefit" for cost-effectiveness screening, it is a factor that puts downward pressure on rates (at least partially offsetting factors putting upward pressure on rates - e.g. program spending)*

Note: This is our summary. Not speaking for other parties in IL.

** Clarifying points that were not in original webinar presentation*

Implications of 5 Principal Cost-Eff. Tests

Test	Key Question Answered	Summary Approach	Implications
Societal Cost	Will total costs to society decrease?	Includes the costs and benefits experienced by all members of society	Most comprehensive comparison
Total Resource Cost	Will utility costs and program participants' costs decrease?	Includes the costs and benefits experienced by all utility customers, including energy efficiency program participants and non-participants	Includes the full incremental costs and benefits of the efficiency measure, including participant and utility costs and benefits
Program Administrator Cost	Will utility costs decrease?	Includes the costs and benefits experienced by the energy efficiency program administrator	Limited to impacts on utility revenue requirements; indicates net impact on utility costs and utility bills
Participant	Will program participants' costs decrease?	Includes the costs and benefits experienced by the customer who participates in the efficiency program	Provides distributional information; useful in program design to improve participation; of limited use for cost-effectiveness screening
Rate Impact Measure	Will utility rates decrease?	Includes the costs and benefits that will affect utility rates, including program administrator costs and benefits as well as lost revenues	Provides distributional information; useful in program design to find opportunities for broadening programs; should not be used for cost-effectiveness screening

Woolf, Tim et al., *Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for "Other Program Impacts" and Environmental Compliance Costs*, published by the Regulatory Assistance Project, November 2012.

Discussions of Study in IL

- Argument for including DRIPE presented in last IPA procurement case
  - Other cost-effectiveness screening issues also raised
- Commission ordered discussion in stakeholder workshops
- January workshop focused on just this issue
- Workshop disagreement mostly on two issues:
  - Whether effect is a “benefit” or “transfer” of wealth
  - Duration of the effect
- Workshop process not yet complete

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power sector. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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Calculating DRIPE: Citations and Links (1)

Electric DRIPE

- Exeter Associates. 2014. *Avoided Energy Costs in Maryland: Assessment of the Costs Avoided through Energy Efficiency and Conservation Measures in Maryland, Final Report* for Power Plant Research Program Maryland Department of Natural Resources, pp. 32–43.
- *EmPOWER 2015-2017 Cost Effectiveness Framework*, Maryland Energy Administration, August 18, 2014.
- *Annual Report: The Costs and Benefits of Renewable Resource Procurement in Illinois under the Illinois Power Agency and Illinois Public Utilities Acts*. Illinois Power Agency, 3/29/2013, Figure 12.
- Stern, Frank, Nicole Wobus, Jane Pater, and Greg Clendenning. 2009. *New York Renewable Portfolio Standard Market Conditions Assessment, Final Report*. New York State Energy Research and Development Authority.
- *Potential Effects of Proposed Climate Change Policies on PJM's Energy Market PJM*, 1/23/2009.
- Blossman, Brandon, Becca Followill, and Jessica Chipman. 2009. *Texas Wind Generation*. Tudor, Pickering and Holt presentation.

Calculating DRIPE: Citations and Links (2)

Electric DRIPE (con't)

- Perez, Richard, Benjamin L. Norris, and Thomas E. Hoff. 2012. *The Value of Distributed Solar Electric Generation to New Jersey and Pennsylvania*. Mid-Atlantic Solar Energy Industries Association.

Natural Gas DRIPE

- Eliot, R. Neil., Anna Shipley, Steven Nadel, and Elizabeth Brown. 2003. *Natural Gas Price Effects of Energy Efficiency and Renewable Energy Practices and Policies*. ACEEE Report Number E032. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Neubauer, Max, Ben Foster, R. Neal Elliott, David White, and Rick Hornby. 2013. *Ohio's Energy Efficiency Resource Standard: Impacts on the Ohio Wholesale Electricity Market and Benefits to the State*. ACEEE Report Number E138. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Wiser, R., Bolinger, M. and M. St. Clair. 2005. *Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency*. LBNL-56756. Berkeley, Calif.: Lawrence Berkeley National Laboratory.

Calculating DRIPE: Citations and Links (3)

Natural Gas DRIPE (con't)

- Carnall, Michael, Larry Dale, and Alex Lekov. 2011. *Effect of Energy Efficiency Standards on Natural Gas Prices*. LBNL-4994E. Berkeley, Calif.: Lawrence Berkeley National Laboratory.
- Hoffman, Ian, Mark Zimring, and Steven R. Schiller. 2013. *Assessing Natural Gas Energy Efficiency Programs in a Low-Price Environment*. LBNL-6105E Appendix A. Berkeley, Calif.: Lawrence Berkeley National Laboratory. Philip Mosenthal, R. Neal Elliott, Dan York, Chris Neme, Paul Chernick, Kevin Petak. 2006. *Natural Gas Energy Efficiency Resource Development Potential in New York* Final Report. Bristol, Vt.: Optimal Energy.

Both Gas and Electric

- Hornby, Rick, Paul Chernick, David White, John Rosenkranz, Ron Denhardt, Elizabeth Stanton, Jason Gifford, Bob Grace, Max Chang, Patrick Luckow, Thomas Vitolo, Patrick Knight, Ben Griffiths, and Bruce Biewald. 2013. *Avoided Energy Supply Costs in New England: 2013 Report*. Northborough, Mass.: Avoided-Energy-Supply-Component Study Group, c/o National Grid Company (updating versions from 2005, 2007, 2009, and 2011).