RAP® Energy solutions for a changing world

Meeting 30% of Energy Needs with Efficiency within 10 Years:

The Next Quantum Leap in Electric Energy Efficiency

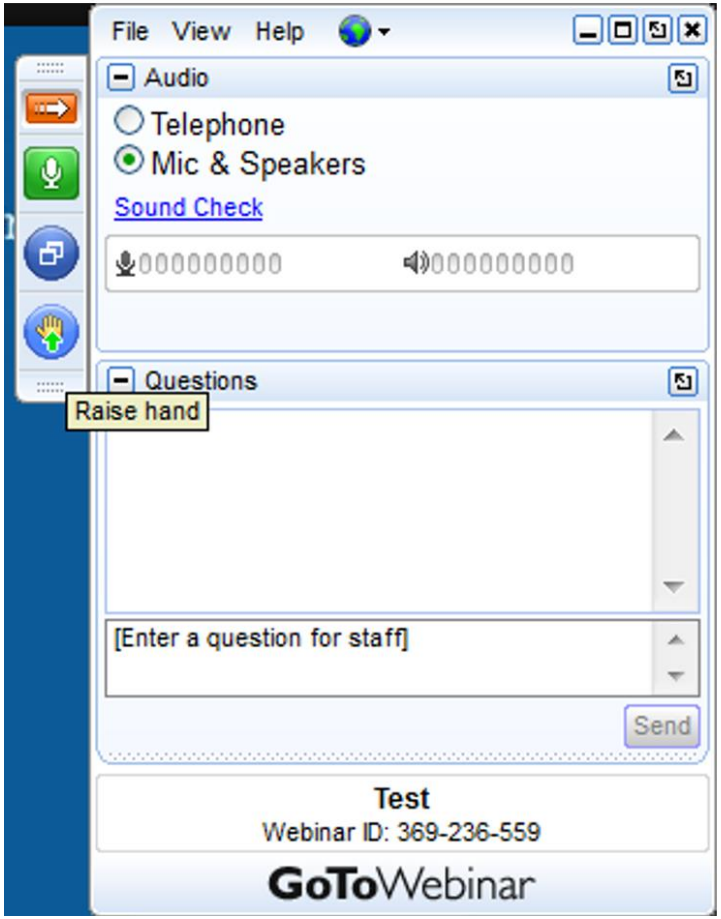
Chris Neme, Energy Futures Group

January 21, 2016

The Regulatory Assistance Project (RAP)®

Process

Please send questions through the Questions pane.



Our Experts

Chris Neme,
Energy Futures Group

David Farnsworth,
Regulatory Assistance Project

Presentation Outline

1. Project Objective and Approach
2. Current Best Practice
3. Opportunities for Increasing Savings
4. Policies Needed to Maximize Efficiency

1. Project Objective and Approach

30% Electric Savings in 10 Years

- Just end-use savings in homes & businesses
- Just efficiency/conservation
- Savings still persisting in 10 years
- Relative to business as usual baseline (net savings)
- Societally cost-effective
- All policy options “on the table”

50 – 100%

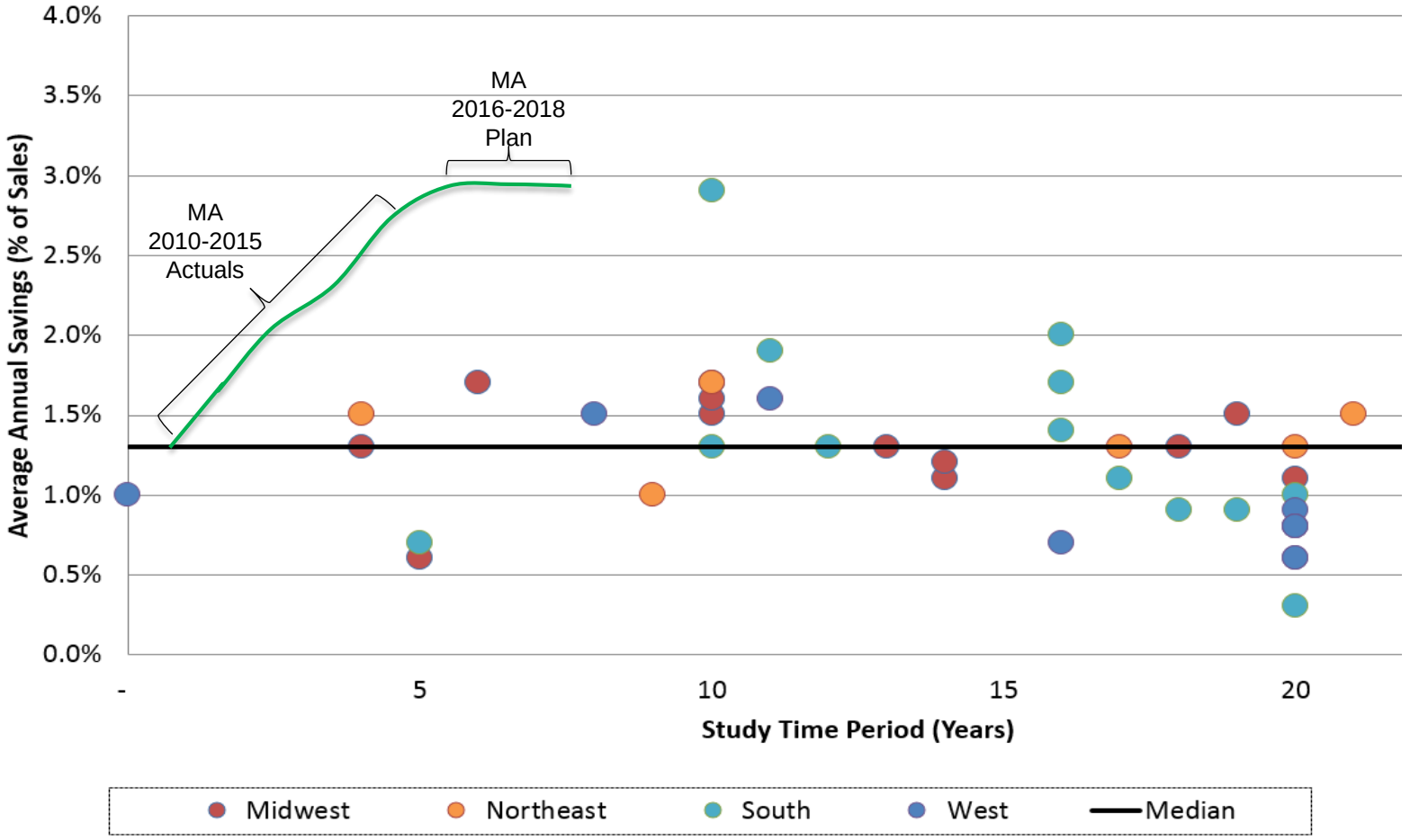
more saving than leading states are currently achieving

Project Approach

- Top-down macro-level analysis
- Initial list of technical, program, and policy ideas for increasing savings
- Interviews with 9 national "thought leaders"
- Additional research/analysis of selected ideas

This is not a traditional potential study. Such studies are inherently poor tools for assessing the limits of what is possible.

Potential Study Estimates of "Max Achievable" Much Lower than Leading States' Actual Achievements!



Graph courtesy of Phil Mosenthal, Optimal Energy (see his ACEEE 2015 Efficiency as a Resource conference presentation)

2. Current Best Practice

We've Been Getting Better at This

(1st Year Savings as % of Annual Sales)

2006

1.2%: CT, RI

≥1.0%: 3 states

≥ 0.5%: 12 states

2014

≥2.5%: MA, RI

≥1.5%: 6 states

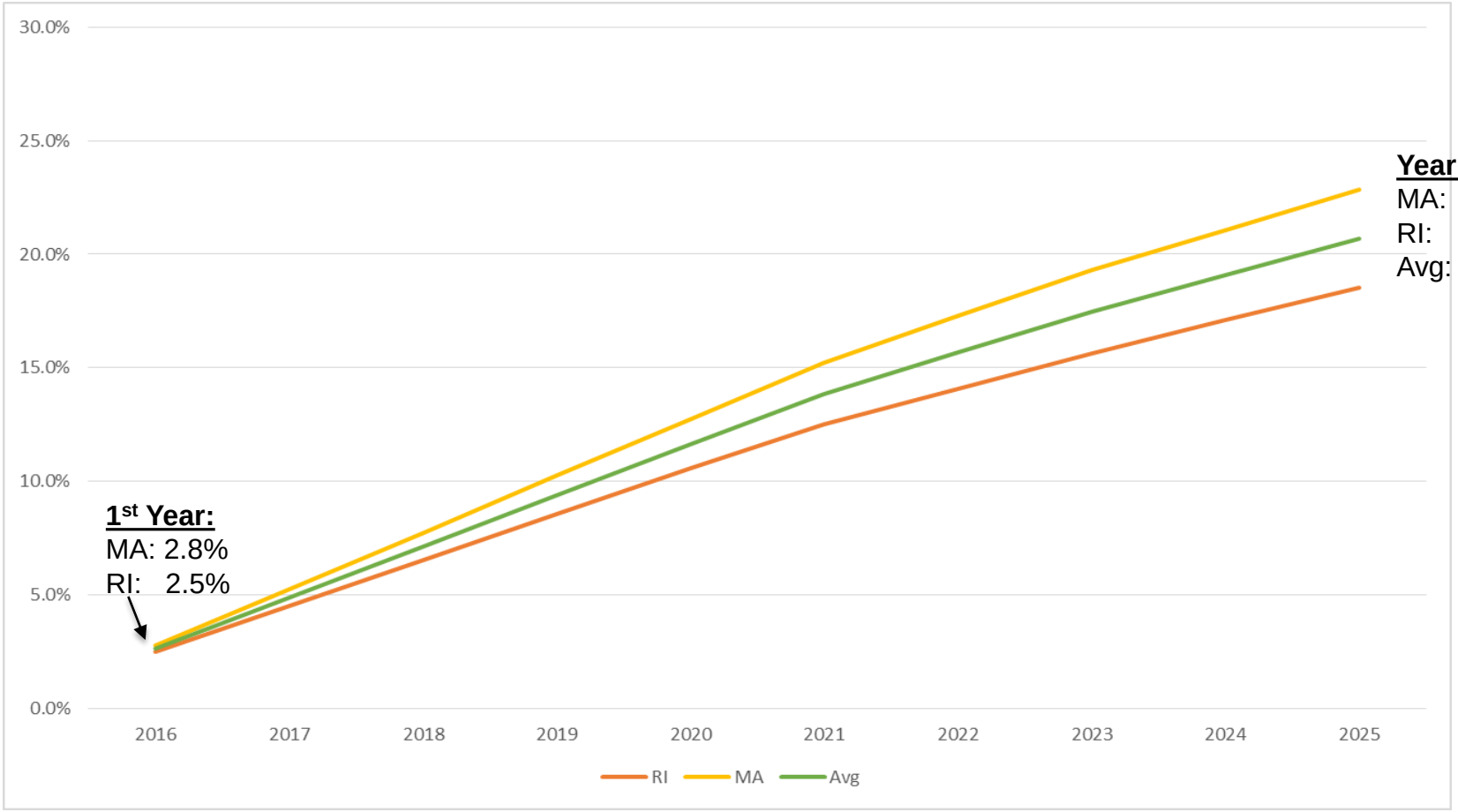
≥1.0%: 16 states

≥0.5%: 33 states

7 states (MA, RI, VT, CA, MD, AZ, CT) currently have EERS which will lead to at least 2.0% annual savings in the future.

Source: ACEEE 2008 and 2015 State Energy Efficiency Scorecards; author analysis of 2015 CA legislation.

MA and RI 2014 Results Extrapolated to Next 10 Years



Note: Results exclude impacts of CHP (addressed later)

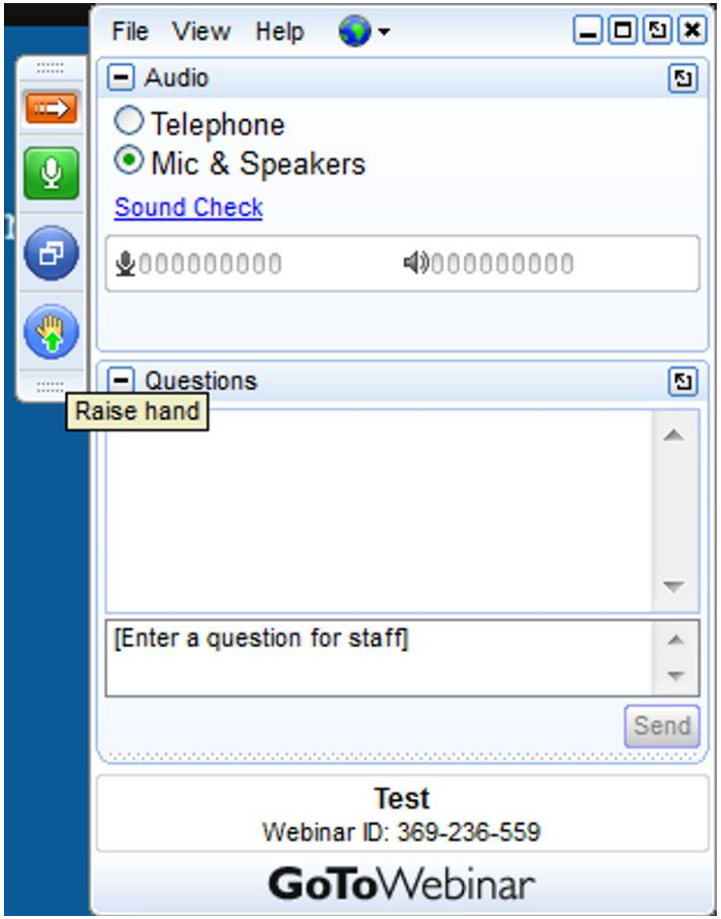
Transferability of MA/RI Results

- Higher than average electricity costs
- Higher than average avoided costs
- Colder than average climate
- Longer than average history of EE programs

We expect the net impact of these factors to be small.

Pause for Clarifying Questions

Please send questions through the Questions pane.



3. Opportunities for Increasing Savings

Expanding the Definition of Efficiency

- Combined Heat and Power (CHP)
  - "Efficiency" from multi-fuel perspective
  - "Effective electric savings" potential of ~2%
    - Net of "savings penalty" for increased on-site gas use
- Conservation Voltage Reduction (CVR)
  - Utility measure, but savings on customer side of meter
  - 2.3% savings from application where most cost-effective

New Technology Opportunities

- **Currently known**:
  - At least 18-19% savings over 15 years*
- **Currently unknown**:
  - Definitely not zero!
  - ½ of NPCC 7th Power Plan savings from measures not in 6th Plan
- **Other**:
  - Known measures whose costs decline to point where cost-effective
  - New end uses – e.g. electric vehicles
  - Changing usage patterns – e.g. electrification of heating

** ACEEE 2015 "New Horizons" Report (savings just from "big" opportunities, in addition to CVR, CHP)*

Low Hanging Fruit Grows Back!

LED Alternatives to Linear Fluorescent Light Fixtures

(3-lamp, 4-foot fixtures savings & /costs relative to 2014 fed std)

Already 2x to 3x savings of most common C&I lighting measure

	Savings		Societal Cost/kWh	
	Watts	%	Natural Replacement	Early Retirement
2015				
High Performance T8	18	21%	$0.02	$0.11
LED	38	45%	$0.06	$0.11
LED w/Integrated Controls	56	66%	$0.07	$0.10
2025				
High Performance T8	18	21%	$0.02	$0.11
LED	51	60%	$0.01	$0.05
LED w/Integrated Controls	64	76%	$0.02	$0.05

Already cost-effective and competitive w/HPT8 in some applications

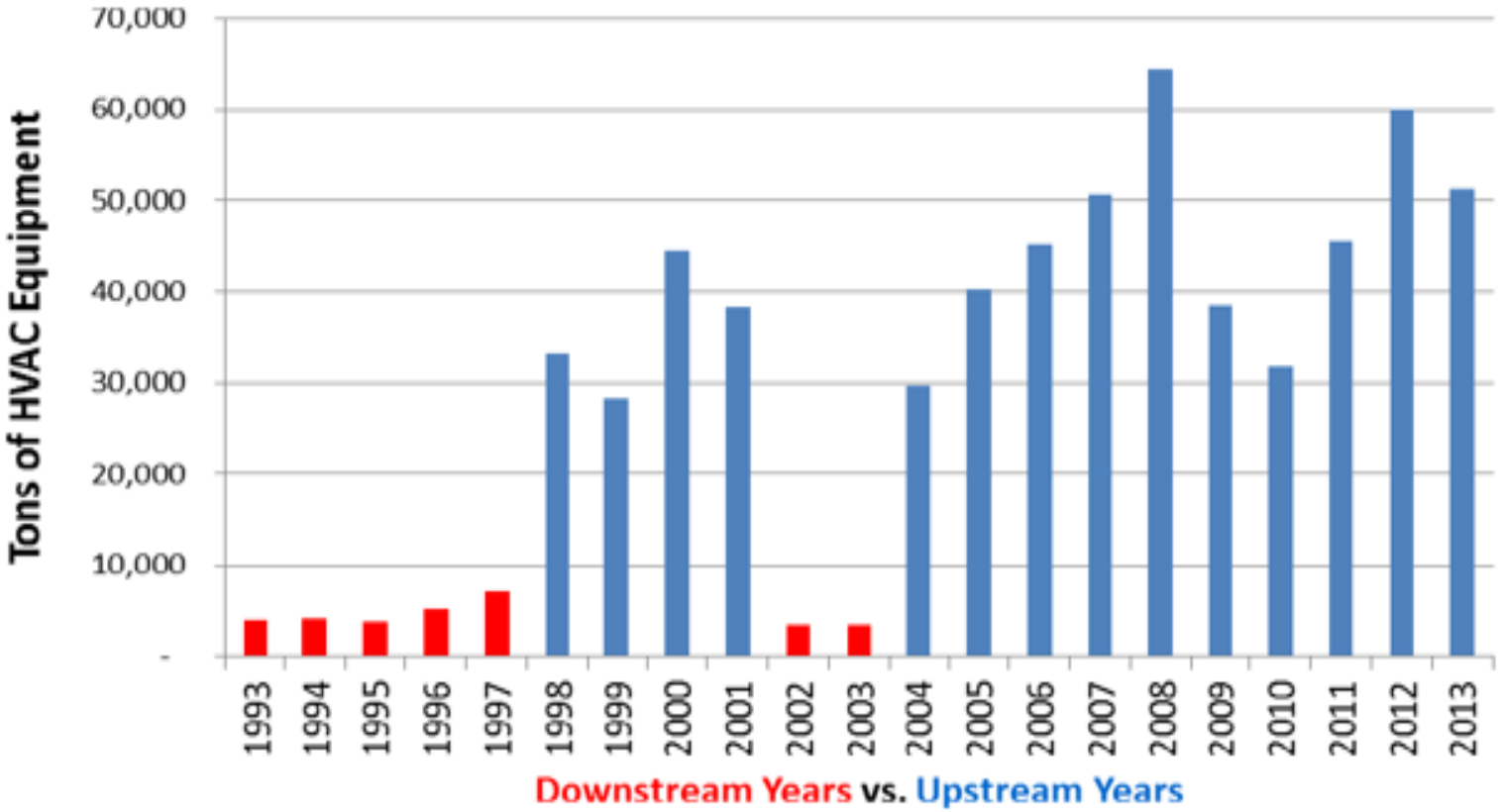
Improvements by 2025 = 3x to 4x savings at or less than current HPT8 costs/kWh saved

Analysis by Dan Mellinger, Vermont Energy Investment Corporation (VEIC) Lighting Strategy Manager

Emerging Program Approaches

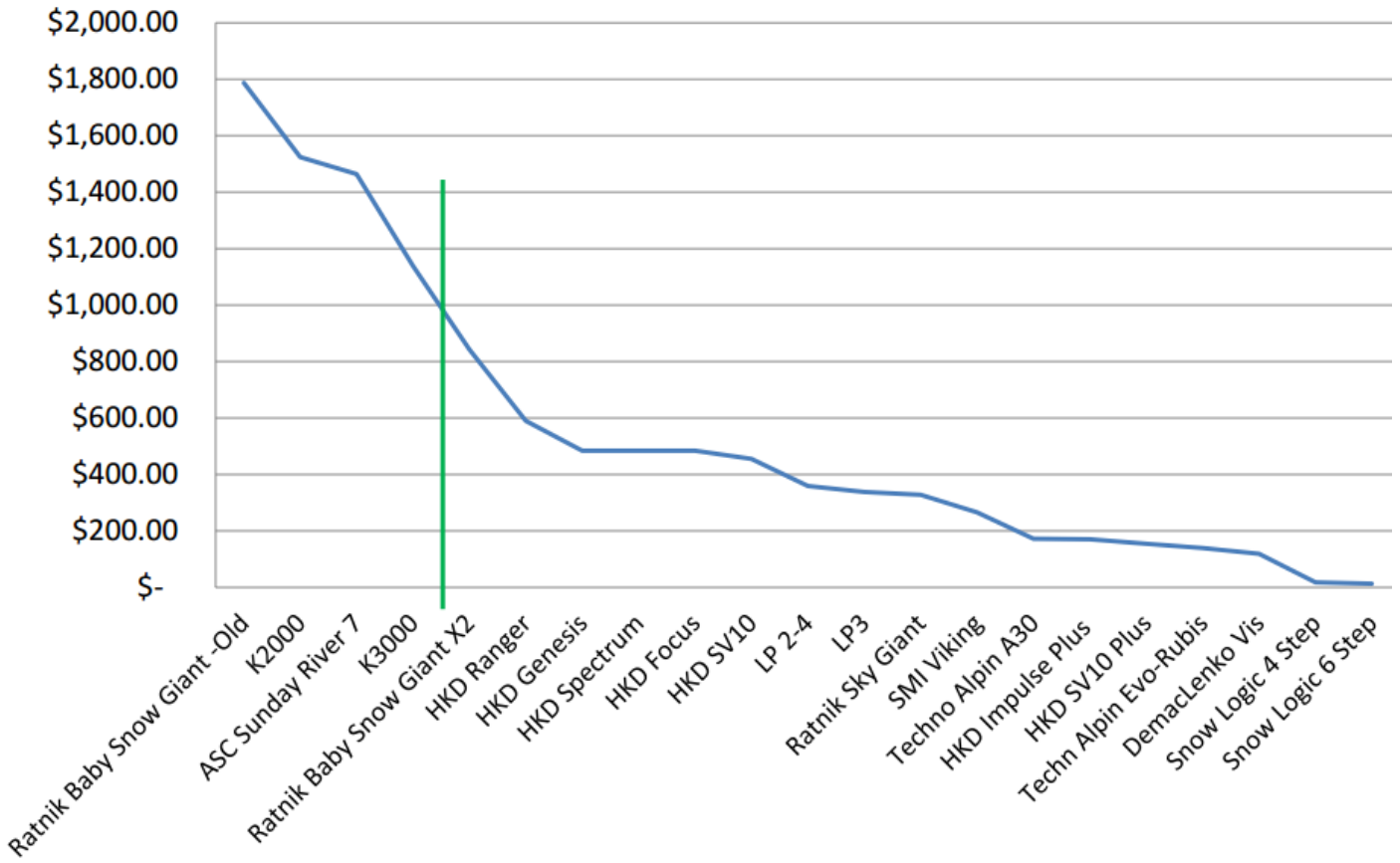
- Upstream/Midstream incentives
- Strategic Energy Management (SEM)
- Market-specific “deeper dives”
- Others…

Upstream Incentives Experiment: PG&E Commercial HVAC Program



Graphic from Phil Mosenthal's 2015 ACEEE "EE as a Resource" presentation (original source: Jim Hanna, Energy Solutions)

Industry Deep Dive Example:
Efficiency Vermont's Efficient Snow Gun Promotions



McMurry, John and George Lawrence, Efficiency Vermont, "Snow Gun Performance, Efficiency and Operating Costs," presented at the Ski Areas Best Practices Exchange, 5/15/2014

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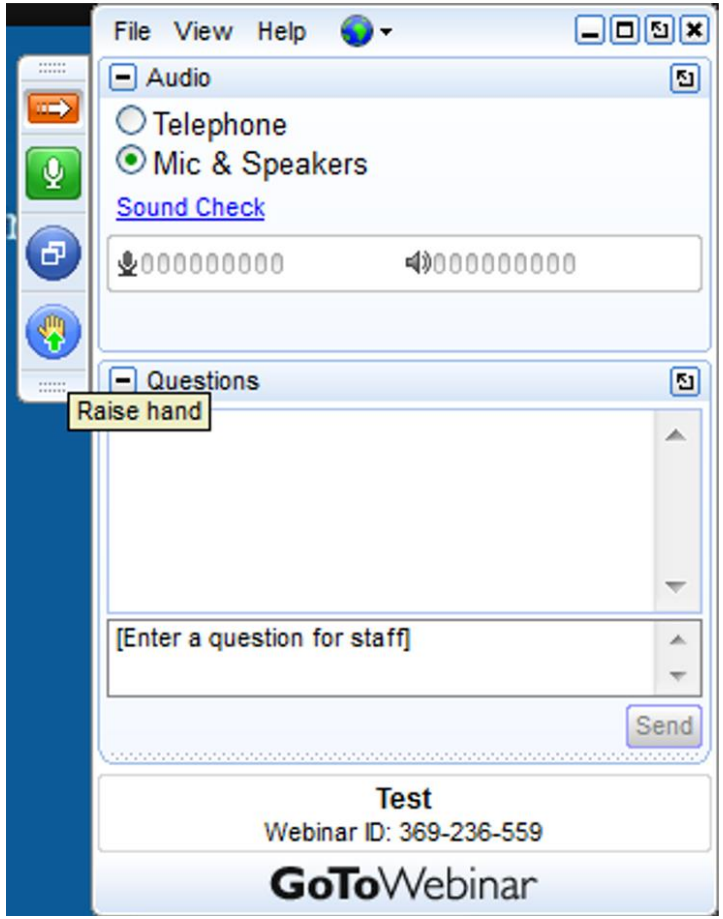


4. Policy Needs and Considerations

Increase Ratepayer Funding of EE

- If efficiency is cheaper than supply, buy it
  - MA/RI spending ~7% of revenues on EE, but will meet ~20% of load
- Rate impact concerns often inadequately informed
  - Bills matter more than rates
  - Rate reducing impacts of EE often greater than spending impacts
  - EE also reduces consumer risk
  - Expanding EE to serve more customers mitigates concerns
  - Analysis of potential economic trade-offs rarely conducted

Make EE Profitable for Utilities

- Shareholder incentives
- Decoupling

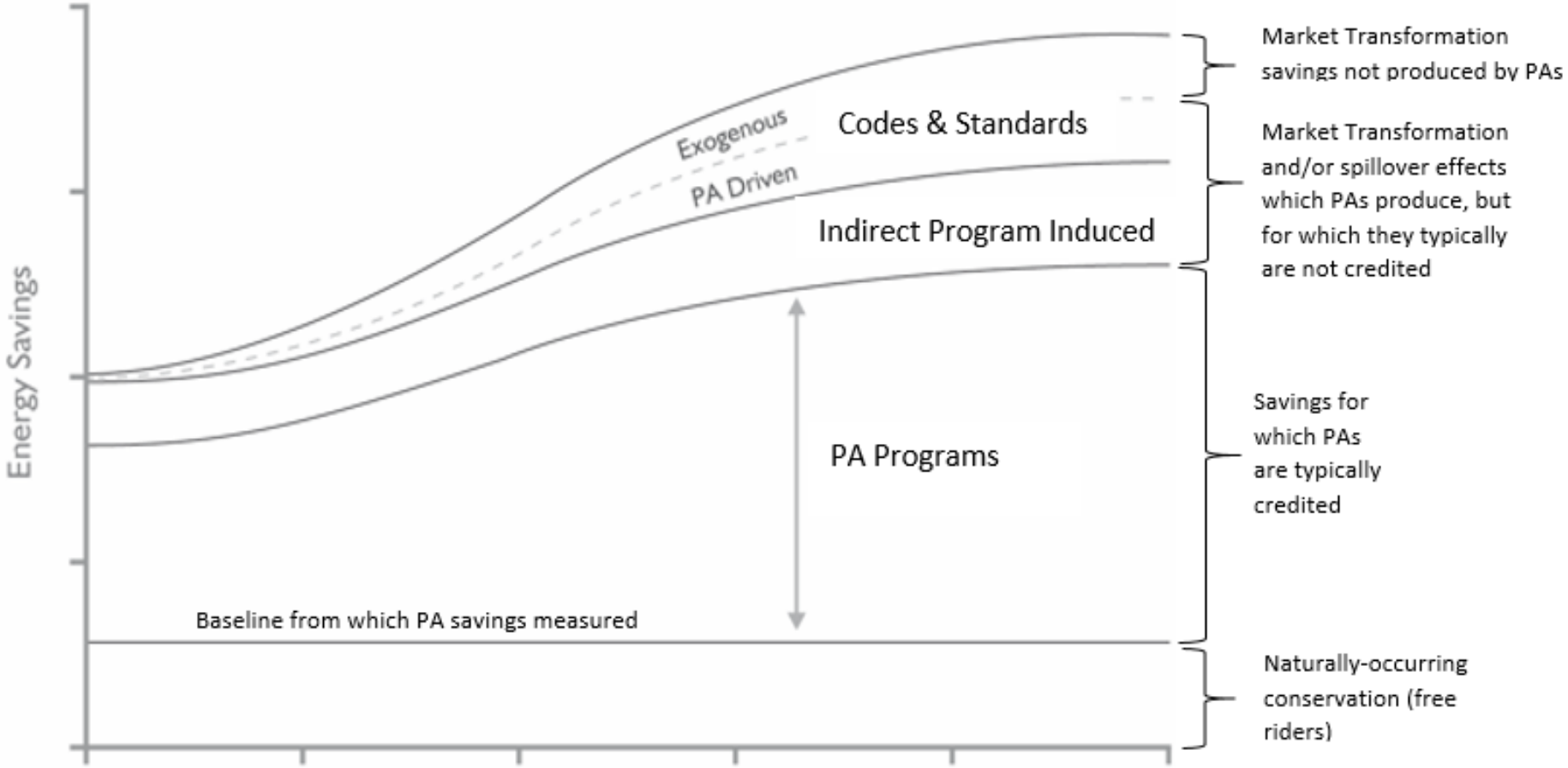
Align Efficiency Goals w/Long-Term Objectives

- Lifetime savings (rather than 1st year savings)
- Multi-year performance periods
- Possible switch to measuring absolute sales or intensity
  - With appropriate adjustments (weather, electrification, etc.)

Fix Cost-Effectiveness Screening

- All electric benefits in cost-effectiveness screening
  - including avoided T&D, environmental compliance costs, price suppression effects, reduced risk, marginal line losses, etc.
- Inclusion of non-energy impacts under TRC/SCT
  - Otherwise asymmetry/bias from inclusion of customer costs
- Societal discount rate

Recognize/Reward Market Transformation



Adapted from graphic in April 2011 RAP webinar presentation "Supporting Energy Efficiency Codes and Standards through DSM/EE Programs" by Allen Lee and Richard Faesy

More Regulatory Focus on "Forest," Less on "Trees"

- Typical bias to ensure savings aren't "over-counted"
  - Under-valuing (or no value for) market transformation (MT)
  - Quantify free riders, but under-counting (or not counting) spillover
  - Discounting or ignoring operational efficiency improvements
- Unintended/Undesirable consequences:
  - No incentive to produce MT, spillover, op improvements, etc.
  - EE cost savings likely offset by much higher added supply costs!

Consider New Models for Acquiring EE

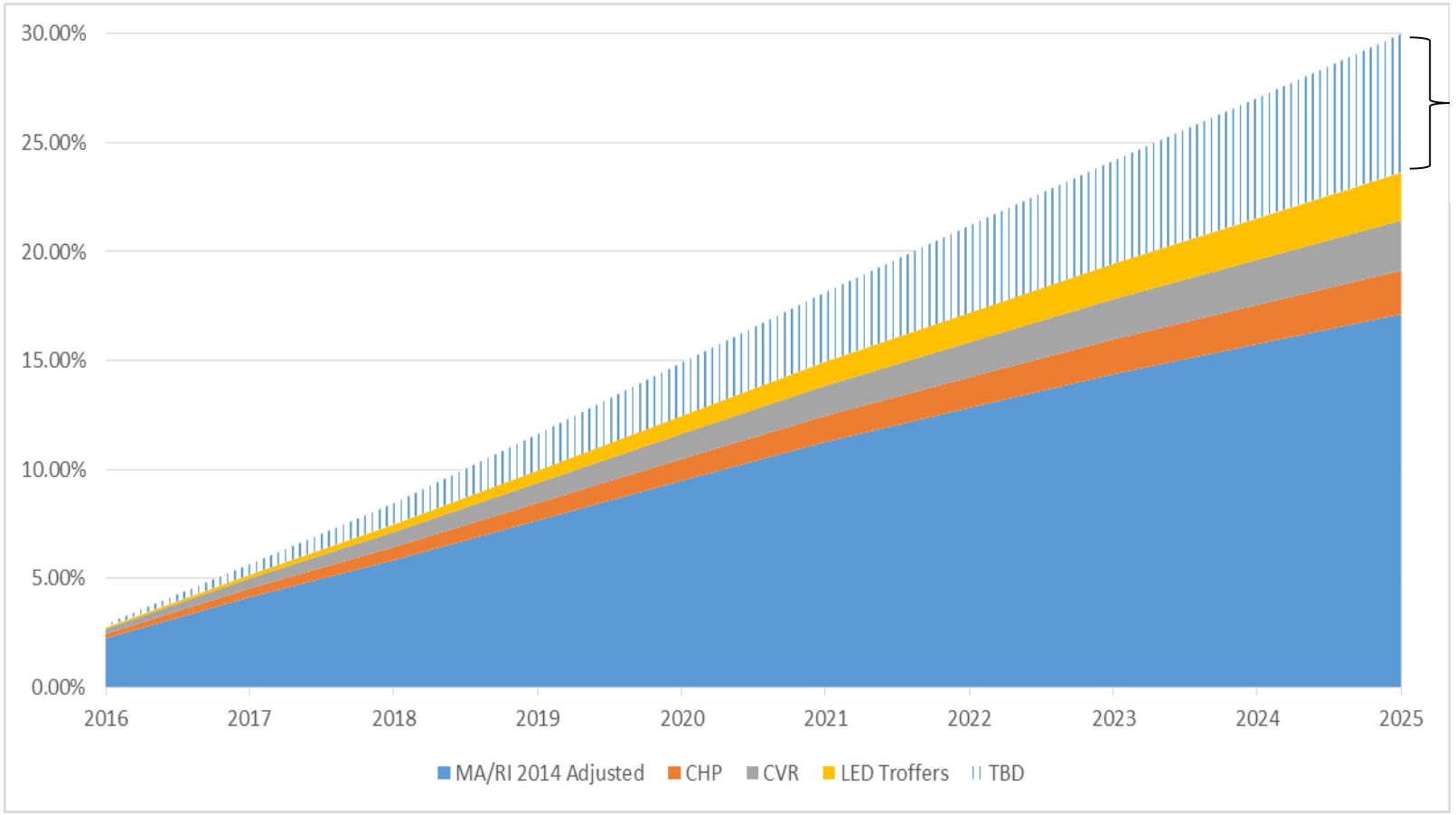
- Competitive procurement
  - Structure carefully to truly produce innovation
  - Start with targeted “pilot” initiatives
- New utility regulatory paradigms
  - Explicit performance metrics around customer efficiency
  - Strong tie between metric performance and utility profits
  - Backstop with minimum EE requirements until concept tested
- Counting fossil fuel savings towards electric targets
  - Many end-uses may ultimately need to be electrified anyway
  - May necessitate adjustment to goals

More Stringent Codes and Standards

Particularly for existing buildings:

- Building efficiency labeling and disclosure requirements
- Rental energy ordinances
- SAVE Act

30% Savings in 10 Years is Possible…
…but Requires Major Policy Changes



Gap to be addressed by unquantified or unknown technologies and strategies

Questions

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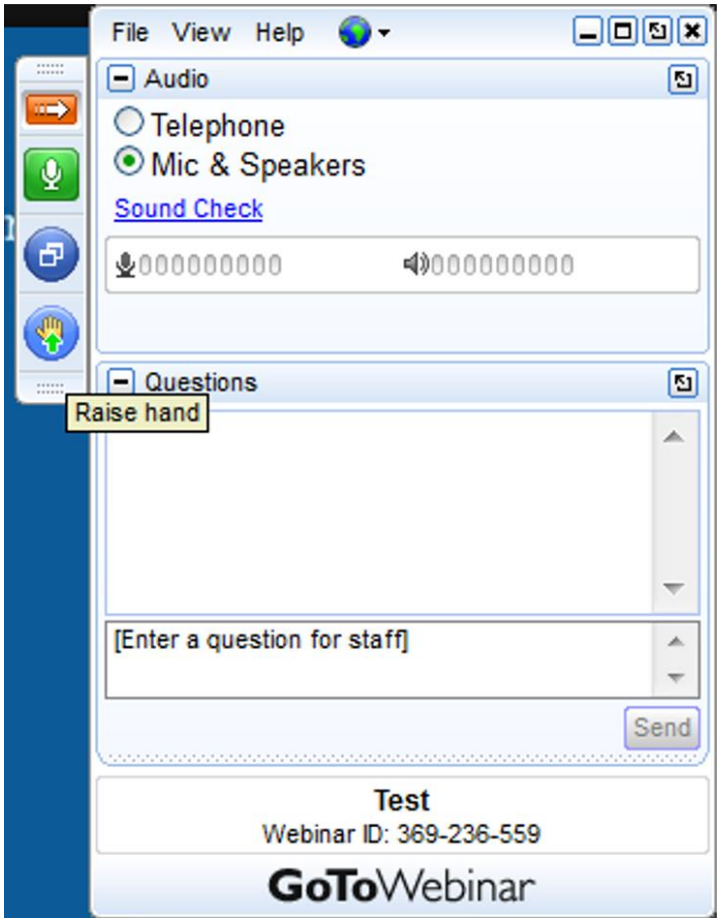

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ENERGY FUTURES GROUP

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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