

Emerging Issues in the Evaluation of Energy Programs: The US Experience

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AESP Webinar

December 2, 2010

Topics

□ Key EM&V Issues:

- Technical
- Policy
- Infrastructure

I. EM&V Technical Issues

- Net energy savings calculation
- Market transformation evaluation
- Carbon emissions calculation

Net Energy Savings Calculation (1)

- What were the true effects produced by a program, separated out from what would have otherwise occurred absent the program?
- Definitions vary by state
 - Net savings = gross savings – free riders
 - Net savings = gross savings – free riders + participant spillover + market effects
 - Definitions can result in large and significant differences in reported energy savings and carbon reductions!!

Net Energy Savings Calculation (2)

□ Technical measurement

- Measure changes in decision behavior => how has the program changed end users' decision behavior?
- Self reports [surveys/interviews]
- Econometric modeling
- Market share [market sales]
- Quasi-experimental research design

Net Energy Savings Calculation (3)

- Should we care about net energy savings?
 - Past context: precise quantification of energy savings and demonstration of cost-effectiveness (burden of proof scrutiny)
 - Current context:
 - ♦ EE has proven itself as a cost-effective resource & is a least-cost utility system resource
 - ♦ Climate change is overriding policy objective: reduce GHG emissions!
 - ♦ Impossible to source out the net effects of a program due to mosaic of public and private programs

Net Energy Savings Calculation (4)

□ Should we care about net energy savings?

YES!!!

- EM&V is important for improving the effectiveness of programs
- For targeting non-free riders
- Where financial incentives are tied to energy savings

□ States will decide: gross savings or net savings

□ National level: is a dual approach viable?

Market Transformation (MT) Evaluation

- MT programs: education, info, training, incentives, working with manufacturers, etc.
- Market characterization: describing specific market or market segments
- Market assessment: examining changes in market structure and functioning and in the behavior or market participants
 - Market theory, program theory (logic models and market indicators)
- Sustainability
 - How does a changed market sustain market effects?

Carbon Emissions Calculation (1)

- Four approaches:
 - Average carbon multiplier effect (carbon emissions factor)
 - ◆ Uses average fuel source(s) for generating kWh
 - Hourly weighted average carbon multiplier approach
 - ◆ Uses average carbon reductions for each hour of the year
 - Hourly dispatch carbon emissions calculation approach
 - ◆ Uses generator-specific dispatch data and hourly savings load shapes over the EUL of the measures
 - Fuels: Heat-rate approach (oxidation reduction equation approach)
 - ◆ Carbon emissions via combustion process or emitted to the atmosphere

Carbon Emissions Calculation (2)

- Lots of uncertainties and possible estimation errors
- Best to estimate carbon impacts using the least expensive approach for the accuracy desired
 - Carbon emissions factors: least expensive (least accurate)
 - Hourly based approaches (more expensive and more accurate)
 - ◆ Hourly load shapes – current? available?

II. EM&V Policy Issues

- Evaluation metrics
- Evaluation practice
- National EM&V protocols

Evaluation Metrics (1)

- Metrics have historically focused on efficiency, net savings and Total Resource Cost (TRC) test of cost-effectiveness
- Need to reconsider these metrics if one wants to reduce GHG emissions
 - Need to measure absolute GHG reductions
 - Need to focus on markets, not programs (too narrow) and how the market is changing over time
 - Need to revisit net savings

Evaluation Metrics (2)

- Need to revisit TRC –new metric or make significant changes to inputs:
 - Avoided cost calculation – base it on renewable energy plant?
 - Discounting – use very small discount rates? - to reflect long-term decisions and societal perspective
 - Carbon adders – use higher carbon values (\$45 instead of \$3)?
 - Measure lifetime (EUL) – higher or lower values?
 - Non-energy benefits – include in benefit-cost tests?

Evaluation Practice

- Evaluation practice depends on how the results will be used:
 - Demonstrating energy efficiency as a reliable resource
 - Using energy efficiency as a means for reducing GHG emissions
 - Determining shareholder incentives
 - Improving the quality of programs
- Critical role for process evaluation
- More research needed on:
 - Which consumers participate or do not participate in energy efficiency programs and why
 - Behavior of key stakeholders
 - Market for energy efficiency products and services

National EM&V Protocols (1)

- Renewed interest in a national EM&V protocol
 - Common evaluation terms and definitions, evaluation methods, savings values and assumptions, and reporting formats
 - To produce reliable and transparent savings estimates
 - To compare savings from one state to another or from one evaluation to another
 - To reduce evaluation estimation error risks
 - To reduce evaluation costs to states
 - To minimize confusion for and reduce barriers for the growing market of energy efficiency providers

National EM&V Protocols (2)

- Concerns in developing a national EM&V protocol
 - May be challenging in getting a consensus from a broad range of stakeholders
 - May impede innovation at the state level, or inadvertently exclude evaluation practices that are valid
 - Best achievable practices in evaluation may differ regionally, due to resource availability
 - May be viewed as too stringent or too lenient
 - May be viewed as too general and not specific
 - May increase transaction costs (state & national requirements)

National EM&V Protocols (3)

- Must be developed objectively by third parties
- Must build in room for flexibility and opportunity for updates
- Must ensure that state reporting goals and reporting needs are being addressed
- Must encourage an open and transparent process with opportunities for stakeholder input and participation
- Must provide an array of evaluation categories
 - Minimum levels of rigor for all programs
 - Encourage exceeding minimum levels, if desire and budget are available

III. EM&V Infrastructural Issues

- Developing a professional evaluation community and workforce
- Training the next generation of evaluators

Developing a Professional Evaluation Community and Workforce

- IEPEC experience: role model
 - Since 1983
 - Referred papers, poster sessions, expert panel discussions, topics, workshops, training, networking

Training the Next Generation of Evaluators

- Efficiency Valuation Organization
 - Certification course on M&V and IPMVP
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers
 - Training course on M&V
- Association of Energy Services Professionals
 - Training course on evaluation
- IEPEC – evaluation workshops
- Conferences: IEPEC, American Council for an Energy-Efficient Economy, Consortium for Energy Efficiency
- Universities and colleges
 - Directory of energy and energy-related programs (2006) at IEPEC website

IV. Other EM&V Issues Not Discussed

- Closing the gap between evaluators and implementers
- Evaluation of persistence
- Evaluation of rebound (takeback)
- Evaluation of behavior and behavior change
- Policy evaluation
- Evaluation of programs and policies using top-down indicators

Time for Questions



Evaluation in the Northeast US from a Program Administrator's Perspective

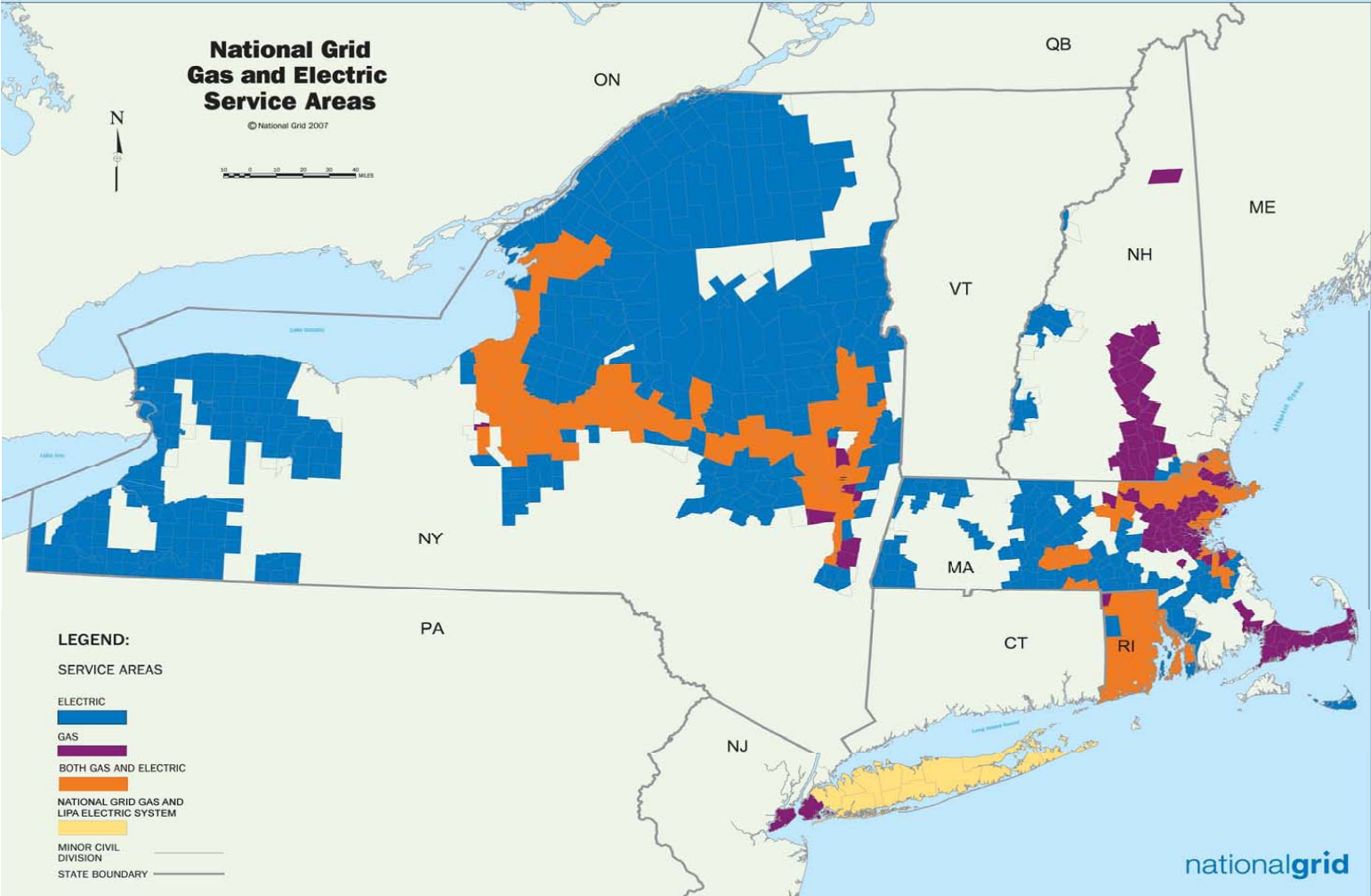
**Jeremy Newberger
National Grid
Waltham, MA**

**AESP Brown Bag
December 2, 2010**

Overview

- **The status of evaluation**
- **Measures of success that can guide us**
- **Rating the current system**
- **Recommendations**

National Grid Territories

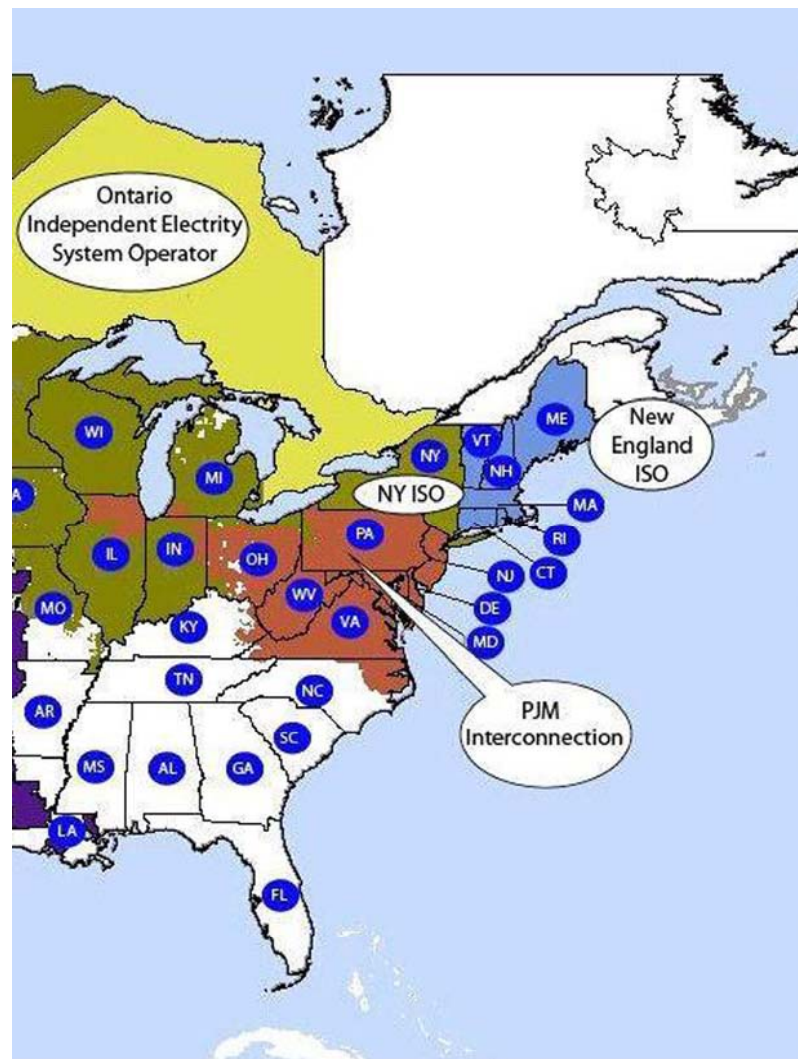


Program Administrators in Selected Northeastern States



State	Electric	Gas
Connecticut	2	2
Maine	1	1
Massachusetts	5	6
New Hampshire	4	2
New York	7	4
Rhode Island	2	1
Vermont	1	1
TOTAL 7 States	22	17

Independent System Operators



Source: FERC

Who Has Jurisdiction?

State	Who Manages Evaluation?	Who Oversees Evaluation?	Who Approves Evaluation?	Standards of Review
Connecticut	PA	Oversight Board	Oversight Board w/PA input	High level
Maine	PA	Regulator	Regulator	Varying level
Massachusetts	PA	Oversight Board	Regulator	Varying level
New Hampshire	PA	Regulator	Regulator	Reasonableness review
New York	PA	Regulator	Regulator	Too soon to tell
Rhode Island	PA	PA	PAs and Regulator	Reasonableness review
Vermont	Regulator	Regulator	Regulator and PA	Varying level

The Eiffel Tower



- One of the most recognizable structures in the world
- But what *is* it? How do we define it?
 - Size?
 - Origin and history?
 - Design?
 - Tourist statistics?
 - Place in popular culture?

Perspectives



- Another universal symbol
- But what are the impacts of energy efficiency programs that we need to measure?
 - kWh savings
 - kW savings
 - kW resource
 - Market effects
 - Carbon reduction
 - Economic redistribution
 - Economic benefits

Status summary

- **Splintered Territories**
- **Overlapping Jurisdictions**
- **Differing Perspectives**
- **Unclear Measures of Success**

All leads to ... *the “tangled web” of evaluation*

Measures of Success in Evaluation

- **Statistical** -- confidence and precision
- **Societal** -- demonstrating achievement of a certain amount of energy savings or a certain amount of CO2 emissions reduced
- **Regulatory** -- acceptance by regulators as satisfying their rules
- **Economic** – efficient use of evaluation resources
- **Political** – acceptance by oversight bodies as satisfying political considerations such as independence and objectivity
- **Professional** -- contribution to high quality studies, providing feedback to program improvement, and the regard that others have for their expertise and judgment

Rating the Emerging Web

- ↔ **Statistical** – 90/10 seems not to be affected, but yet to be reconciled with ISO 80/10 standard in results

- ? **Societal** – Too soon to tell

- ↔ **Regulatory** – Seems to be solid, unless there is concern about cost control; also, acceptance of NEEP EM&V Forum studies is unclear

- 💡 **Economic** – Lacks any focus on achieving economies in evaluation efforts

- 👍 **Political** – Satisfactory in design, but reality of resource constraints have not yet been felt on priorities and timetables

- 💡 **Professional** – More work, fewer resources, and less regard for opinions of staff who have been running evaluation studies

Recommendations

- **Untangle the web and support the continued advancement of energy efficiency through evaluation**
 - **Establish consistency on what we want to measure**
 - **Accept values that are adjusted for probability, if certainty is not possible**
 - **Strive for economies in evaluation practices**
 - **Coordinate decision making between overlapping jurisdictions**

Questions

....thank you

REVIEW AND ASSESSMENT OF KEY EVALUATION ISSUES:

***Status Quo, Gaps, and Strategies for
Traditional and Behavioral Programs***

Results of the SERA/CIEE White Paper

*AESP Brown Bag – “Evaluation Today! Challenges,
Solutions, and Gaps”, December 2, 2010*

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BACKGROUND AND CONTEXT

- CIEE White Papers
- Drivers / Purpose for the Study
- Issues / Context

SCOPE

- Problem – getting reliable results (TRUST) on effects of behavioral programs as:
 - More market chatter / overlap
 - More common, but measurement complex & need increasing
- White Paper for CIEE - Focus on gross effects & net effects attribution – covered: (see website for paper!)
 - Impact
 - Attribution / Free Ridership (FR)/ Net to Gross (NTG)
 - Non-energy benefits (NEBs)
 - Persistence
- Definition: behavioral, adoption / participation (e.g.)
- Research methods: outreach to 100; 250+ repts
 - Summary / primer and gaps / next steps

CONTEXT

- Investment dollars at risk
 - Program evolution / behavioral / methods review
- Debate over precision
 - Granger – evaluation to avoid making wrong decisions
 - Multiple applications... varying precision needs?
- Program decisions to be advised include:
 - Public dollars responsibly spent
 - Apportionment of dollars between strategies
 - ID when to exit or revise program
- Precision based on value / cost of possibility of wrong decision...
 - Yes/No vs. precise level of shareholder dollars...

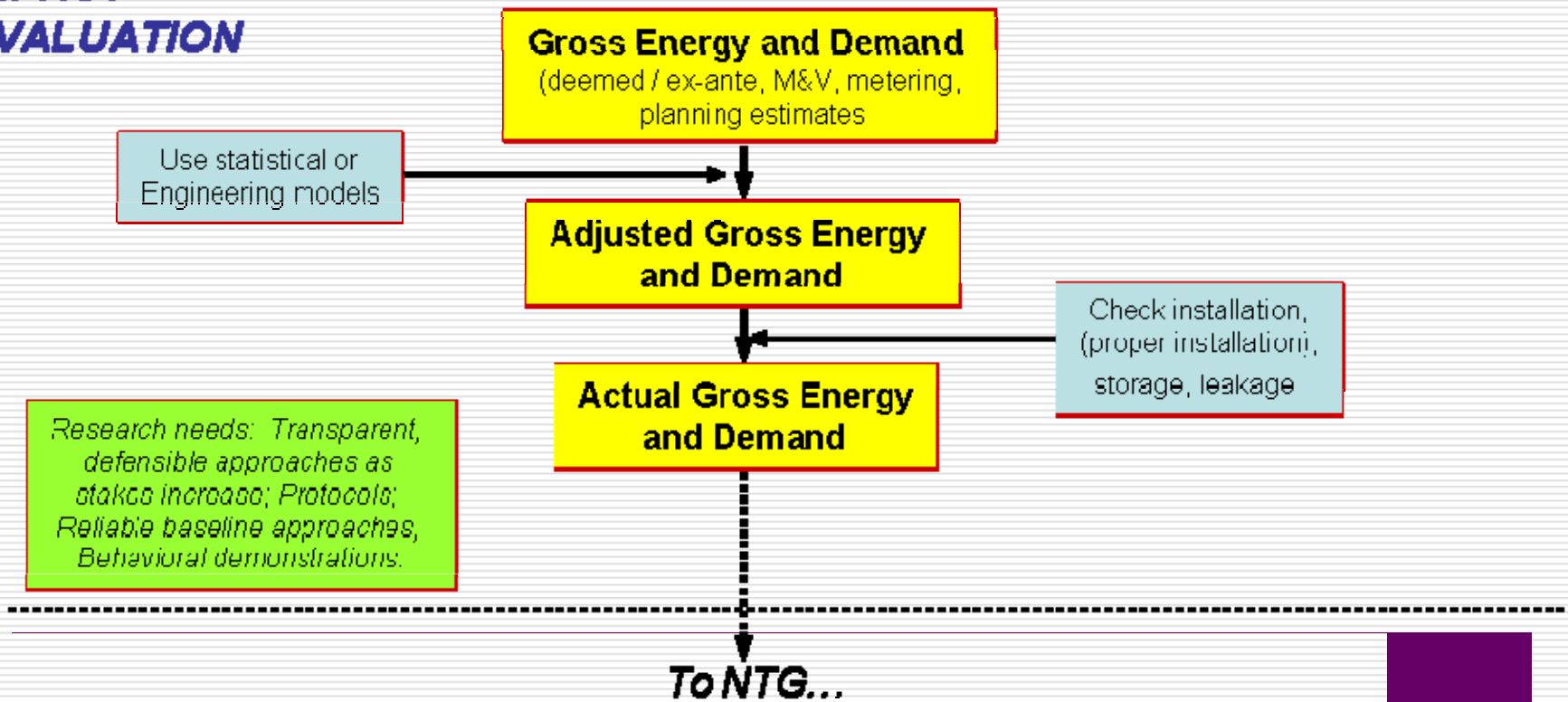
CONTEXT

- Key uses of evaluation results
 - Program planning
 - Program marketing & optimization
 - Integrated planning, portfolio optimization, scenario analysis
 - Generation alternative
 - Performance incentives
- Accuracies differ but inputs include various elements of the 4 topics we researched

GROSS IMPACTS

Energy Efficiency Evaluation & Attribution Elements

IMPACT EVALUATION



IMPACT / GROSS (ADJUSTED) SAVINGS ESTIMATES

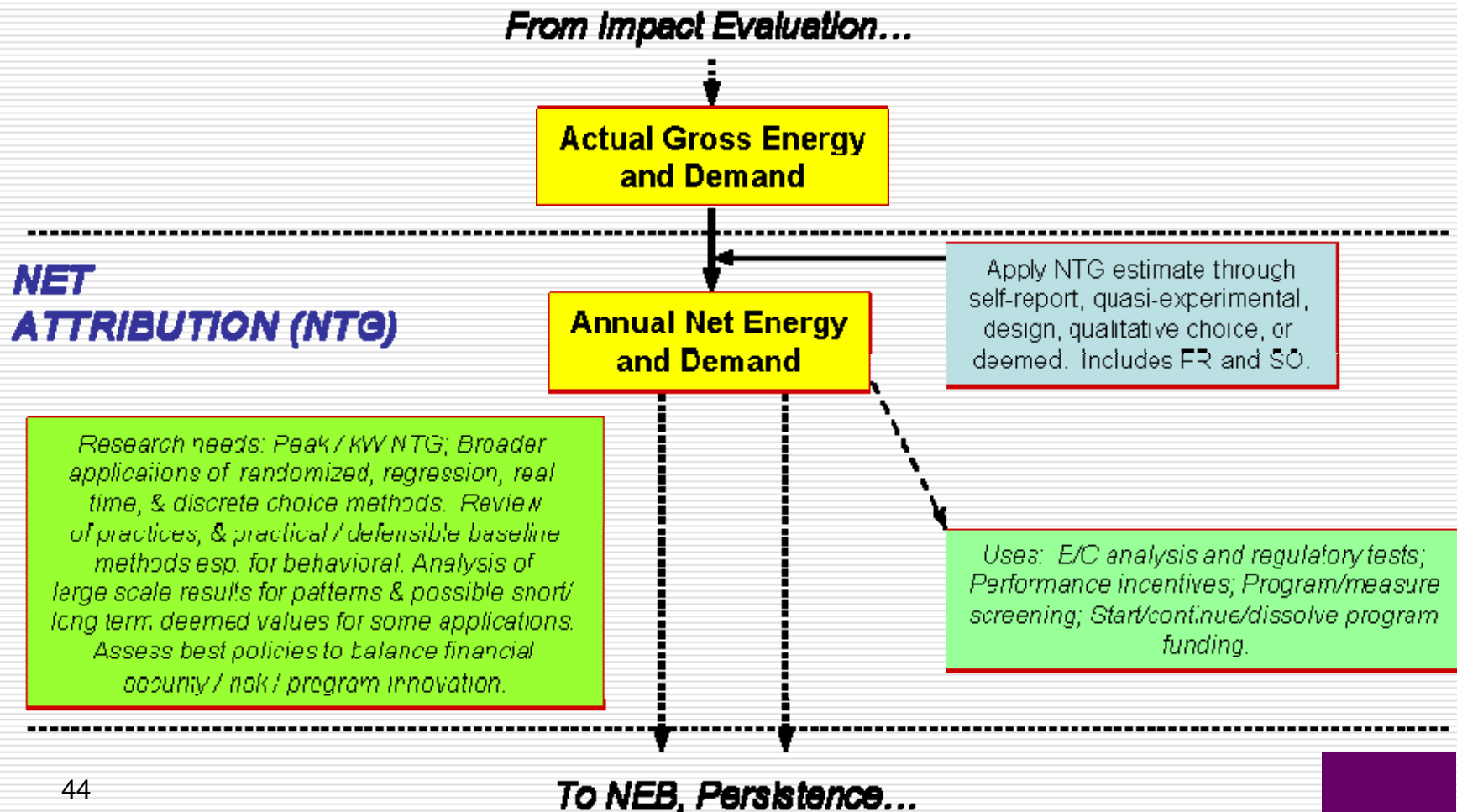
- 5 main estimation methods
 - M&V (engineering calcs, isolated ECM measurement, whole building metering, calibrated / simulation model)
 - Deemed savings
 - Statistical analysis (comparison, dif of diff, TS comparisons / billing analysis; conditional demand, SAE, etc.)
 - Sales / market share tracking (sales, shipments, store / shelf data)
 - Surveys (for behavioral, or as inputs to other methods)
- Pros and cons for use in traditional programs, used regularly
 - Many examples of each

IMPACT / GROSS (ADJUSTED) SAVINGS ESTIMATES

Behavioral /	Outreach Programs
Examples	<ul style="list-style-type: none"> ➤HMG daylighting 2006, Drakos low income 2007, Peters 1999 ➤Marketing / advertising arrested evaluation (intent)
Gaps / Issues	<ul style="list-style-type: none"> ➤Often treated as indirect or supporting elements, or effect attributed to measures ➤Few well-designed large-sample evaluations of behavioral type programs found
Best Practices / Rec'm / Suggestions for Behavioral / Outreach	<ul style="list-style-type: none"> ➤Strong experimental design for reliable estimates / random assignment important (reluctance, and can be tough) ➤Consider multiple strata for best assessment of impacts ➤Market assessments "up-front" and market & appliance / equipment saturation surveys for estimates and to design programs that are needed in the marketplace. ➤May need to measure creatively... flexibly, not strict protocols; clarity on goals

ATTRIBUTING NET EFFECTS

Energy Efficiency Evaluation & Attribution Elements



ATTRIBUTING NET EFFECTS - DEFINITIONS

- Share of gross savings that are attributable to program
- Free ridership (FR)
- Spillover (SO)
 - 3 types (inside project, outside project, non-participant)
- Net-to-Gross (NTG)
 - Only equals FR if $SO=0$
 - Formulations

CURRENT METHODS / PRACTICES - NTG

Method	Pros	Cons
Deemed / stipulated NTG	Simple, uniform, no debate; no risk in pgm design/perform, inexpensive, can reflect FR	Doesn't recognize actual performance differences / design/ implement
NTG adjusted by models / dynamic baseline	Can reflect performance diffs	Complicated to ID baseline; data intensive; expensive; Risk to designers; debate
Paired comparisons NTG	Can reflect performance diffs; straightforward / reliable evaluation design	Control groups can be difficult; statistical corr'ns, debate
Survey-based NTG	Estimate of FR and SO; explore causes and rationale	Self-report; timing; expensive; samples, instrument / response

CURRENT PRACTICES

- Many utilities / regulators use “deemed” (0.7/1.0) or ignore SO
- Complexities in spillover (participant, surveys)
 - BUT spillover key part of many behavioral program’s delivery... shortchanged
- Controversy: exactitude in “gross”; then NTG applied (hypothetical) – Error, Expense, Chatter , Uncertainty ...
 - Baselines (perhaps not even “code”/research on standard practice needed)
- → Lack of trust in results; understate credit, underinvestment /mis-investment

WHAT PRECISION IS NEEDED?

- Granger – ‘...avoid making wrong program decisions...’
 - Things that are measured tend to improve
- Looking for “right” decisions about...
 - Assure public dollars spent responsibly
 - Apportion dollars & efforts between strategies
 - Help ID appropriate time for exit or revision
- Evaluation of free ridership and spillover serves other purposes
 - Identify superior program designs
 - Identify program exit timing
- Consider continuum of accuracy depending on application (more dollars at risk, more accurate).
“Threshold” values for some applications / “swing”

Pgm Plan
C/E, refine

Mktg /
Optimiz

Integr Plan/
Portfolio

Generation
Alternative

Perform.
Incentives

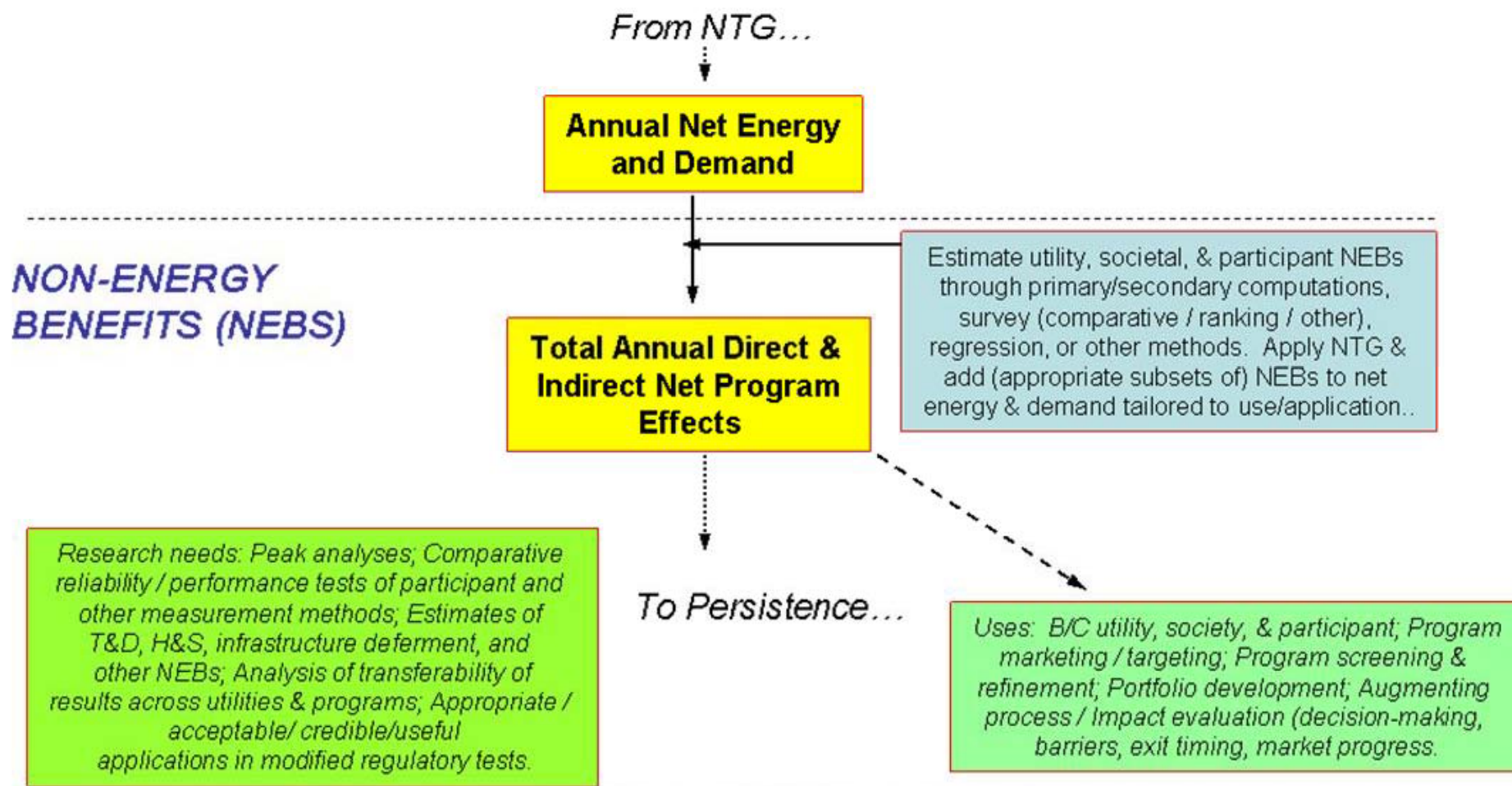
SERA

NET-TO-GROSS (NTG) ESTIMATES

Behavioral /	Outreach Programs
Examples	<ul style="list-style-type: none"> ➤ Few found (CYC, NYERDA) – no overarching conclusions
Gaps / Issues	<ul style="list-style-type: none"> ➤ Hard to measure for widget – harder for behavioral – not measuring not the answer (Rufo). Deemed leads to mediocre programs, no innovation (investment risk) ➤ Splitting the credit? – Takes a village... (Bensch) ➤ Problems in baseline assessment ➤ Spillover key part of many behavioral / outreach (goal) ➤ Few well-designed large-sample energy-related behavioral examples found ➤ What accuracy needed?
Best Practices / Rec'm / Suggestions for Behavioral / Outreach	<ul style="list-style-type: none"> ➤ Strong experimental design for reliable estimates / random assignment important ➤ Consider multiple group design for best assessment of impacts; statistical methods / corrections ➤ Timing close to decision-making; integrated data collection ➤ Varying precision / thresholds for different applications? ➤ Two stage for new programs?

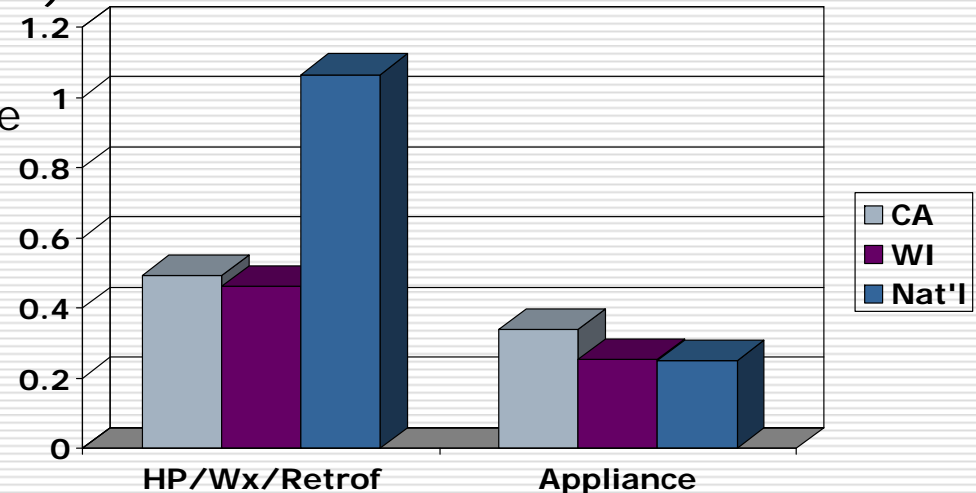
NON-ENERGY BENEFITS

Energy Efficiency Evaluation & Attribution Elements



NEBs

- Omitted program effects, positive & negative
- 3 perspectives – utility, society, participant
 - Limited “drivers”; NEB laundry list
- Progress in measurement methods (societal, esp. GHG and jobs – 3rd party models)
 - GHG – 3 levels
 - Simple – system average
 - Mid – peak/off peak
 - Hourly dispatch
 - Tradeoffs for uses
 - Region, fuel, TOD, etc.



- Progress in program variety and examples

NEBs

Utility/Ratepayer	Societal	Participant (all)
<input type="checkbox"/> Payments/financial <input type="checkbox"/> Debt collection efforts / calls <input type="checkbox"/> Emergencies / insurance <input type="checkbox"/> T&D, power quality, reliability <input type="checkbox"/> Subsidy (LI) <input type="checkbox"/> Other	<input type="checkbox"/> Economic development / job / multipliers <input type="checkbox"/> Tax impacts <input type="checkbox"/> Environmental <input type="checkbox"/> Emissions <input type="checkbox"/> Health <input type="checkbox"/> Water & other resources / utilities <input type="checkbox"/> National security <input type="checkbox"/> Wildlife/Other	<input type="checkbox"/> Payments & coll'n <input type="checkbox"/> Education <input type="checkbox"/> Building stock <input type="checkbox"/> Health <input type="checkbox"/> Equipment service incl. productivity, comfort, maint, etc. <input type="checkbox"/> Other utilities (water, etc.) <input type="checkbox"/> Other (transactions, enviro, psychic, etc.)

MEASURING PARTICIPANT NEBS

Method	Key Pros and Cons
A. Direct/ primary estimation; also market valuation	Good numbers, missing obs/bias, expensive; subset of NEBs
B. Computation using secondary data, estimates	Defensible; scenario analysis; quality depends on secondary assumptions, only subset of NEBs
C. Computation using regression	Strong / confidence intervals; expensive/data and labor intensive; appropriate for small subset of important NEBs
D. Contingent valuation - WTP/WTA; bounded CV	Common in literature; inexpensive; but volatile, uncertain resp; weaknesses from lit; Bounded - Fairly strong, quicker
E. Survey – relative Scaling - comparative/numeric; Labeled Magnitude Scaling (LMS)	Demonstrated in academic literature; fast, strong, robust, inexpensive; easy for respondents, can do to large sample & many NEBs, less volatile than WTP; careful Q / “enumerator”
F. Ranking survey - Ordered logit, ranking, AHP, conjoint	Robust, strong, slow, complex, difficult to administer/expensive; careful Q
G. Other survey approaches – Hedonic Regression	Demonstrated in academic literature; statistical power / explanatory factors; data / expensive; limited NEBs; only applied once so far
H. Other survey methods-	Strong/robust, but complex, costly, limited
I. Other	...

USES OF NEBs - UPDATE

- Applications in
 - Marketing & targeting (societal & participant)
 - Program refinement (all three)
 - Internal B/C customer (societal & participant)
 - Portfolio development (all three)
 - B/C tests (all three potential, BUT...)
- No utilities with broad, formal use of NEBs in regulatory process
 - Informal use in marketing, targeting, potential for others (many examples); key in low income (missing)
 - Use in regulatory processes
 - Scenarios
 - "Readily measurable"
 - Screens

NEBS AND REGULATORY TESTS

- Direct and improved economic and GHG NEBs in screening & B/C
 - TRC – case to include resource-related (GHG, labor, Water/wastewater)
 - Societal – case to include utility, societal, participant
 - Low income – reflect goals
- Readily measured NEBs into screening and B/C
- Developing acceptable multipliers for “other” HTM for proxies / conversation
- Use metrics for NEB values for screening, B/C, protocols

CONTEXT AND CURRENT USAGE OF NEBS IN TESTS

(Source: SERA)

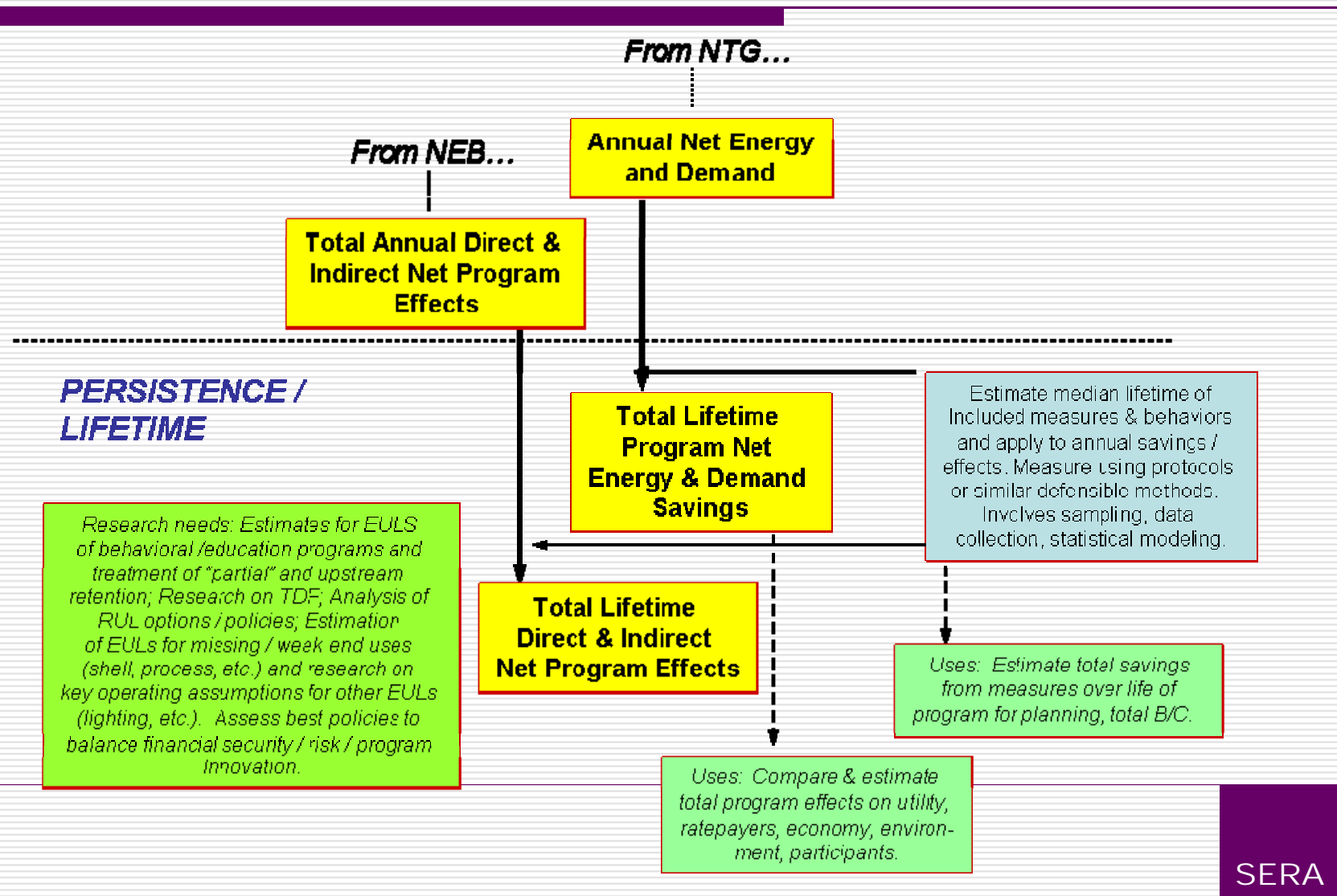
Inclusion	Discussion	State
GHG, Prop value, tax, health, jobs in formal B/C for low income req'd for legislature; only Low income; Maint / eqpt replacement	Also used for marketing / outreach – adapted from LIPPT; updates	VT
Variety of NEBs for all 3 perspectives; scenarios including percentages of NEB values examined / presented for regulators	Also marketing / outreach	NY
B/C model used includes NEBs reflecting utility cost savings & some participant NEBs (reliable & with “real economic value”)	Current TRC model includes some NEBs / unclear source	MA
10% environmental “adders” included if allowed by regulators	Limited arrearage analyses, some other NEBs allowed if low income programs don't meet threshold	CA, ID, OR, UT, WA (in past) WY, other
CO: 20% electricity adder; 5% gas adder for all programs; NH had 15% adder	CO: Re-examining; orig.derivation not well documented	CO, NH
TRC calcs include GHG; also Trust allows “readily measured” (incl. comm'l)	Measure-specific so some low income measures	PNW, BPA, Trust, NEEA
Not officially incorporated or not required and thus not measured		Others ⁵⁶

NON-ENERGY BENEFITS (NEBs)

Behavioral /	Outreach Programs
Examples	<ul style="list-style-type: none"> ➤ Numerous behavioral / outreach examples (CX, ENERGY STAR, training, LIEE, pricing, others); ➤ Understanding & control important contributors ➤ Strong NEB values indicating important consideration in behavioral ➤ Growing literature
Gaps / Issues	<ul style="list-style-type: none"> ➤ Methods improving / controversy for some ➤ “Soft”, Not included in serious applications (B/C?), so methods only explored to certain degree ➤ Gaps in important NEBs (health, infra, hardship, and others) ➤ Applications –design / progress / gaps (being used); and technical (not being used)
Best Practices /Rec'm for Behavioral / Outreach	<ul style="list-style-type: none"> ➤ Net, incremental, attributable ➤ Primary, secondary modeling for some; strong for societal ➤ Surveys and advanced statistical methods for others

PERSISTENCE / RETENTION

Energy Efficiency Evaluation & Attribution Elements



RETENTION / PERSISTENCE

- ❑ Persistence, measure life, EULs, 50% median, in place and operable
- ❑ Protocols, best practices summaries on samples, data collection, analysis, modeling, comparisons, documentation
- ❑ Some variations in considering adaptations for behavioral programs

MEASURE LIFETIME ESTIMATES / RETENTION

Behavioral /	Outreach Programs
Examples	➤ Only 1-2 examples (Harrigan), short term; a few recent additions (Peters)
Gaps / Issues	➤ Missing for behavioral, education/ training, commissioning, others ➤ Important –parallel concept to technical degradation ➤ Need “partial” retention concept ➤ Lack of exploration; Months? Years? ➤ Lack of existing research on behavioral retention ➤ Remaining useful lifetime / baseline issues
Best Practices /Rec'm for Behavioral / Outreach	➤ Presumably similar approach, but consider data acquisition differences and data uncertainties

NEXT STEPS / RESEARCH NEEDS FOR BEHAVIORAL

- Significant gaps in behavioral program evaluation
 - As they increase in importance, more research on methods, best practices, and comparisons is needed
- KEY will include best practices with widespread adoption of large sample, good experimental design, random assignment, statistical models that control for differences
 - Can be tricky – split cable, experimental design, pilot tests
- Discrete choice modeling approaches
 - Incorporating explanatory variables, address imperfect control groups
 - Also allow some budget for experimentation of other approaches
- Real time data collection (also allows timely feedback)

NEXT STEPS / RESEARCH NEEDS FOR BEHAVIORAL

- Market assessments for baseline support, non-part spillover, decision-modeling
 - Especially behavioral, training, education programs
- Need to recognize both FR and SO;
 - unbalanced penalty to ignore SO (esp. behavioral / outreach)
 - capture NP SO – key element of education, market-based programs
- Treat behavioral programs with same respect – and requirements – as others
 - Measure to avoid mediocre programs, continue innovation

NEXT STEPS / RESEARCH NEEDED

Behavioral /	Outreach Programs
Gross savings	<ul style="list-style-type: none"> ➤ Evaluations with random assignment / statistical methods, test and control, quasi experimental, regressions to control for differences ➤ Evaluations of “types” of behavior / outreach, compare, develop robust database to research ranges, transferability, patterns
NTG	<ul style="list-style-type: none"> ➤ Incorporate random assignment, statistical methods, real time data collection, discrete choice models, into methods for behavioral ➤ Enhanced FR, SO methods; NTG / FR replicable methods with flexibility in methods by type of program ➤ Causality – split credit, not 0/1 litmus test proof ➤ Explore alternatives to deemed that balance risk (short term deemed; then measured?, etc.) ➤ Precision issue / vary by application ➤ Market assessments for baseline ➤ Data base of results across programs / comparisons / patterns

NEXT STEPS / RESEARCH NEEDED

Behavioral /	Outreach Programs
NEBs	<ul style="list-style-type: none">➤ Some NEBs lack strong estimates (health; hardship; infrastructure, peak impacts)➤ Internal tests of methods / comparisons➤ Policy debate on application, including possibly modified TRC, etc./lack of NEBs (& SO) punish behavioral
Retention	<ul style="list-style-type: none">➤ Studies of retention of behavioral asap➤ Consider data acquisition differences and data uncertainties (date?, data collection frequency)➤ Best practices with nuances – partial retention, retention of “upstream” complicated➤ Comparison of results for key factors affecting retention before values can be adopted / transferred as with measures currently (quality? Audience?, other?)

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Full paper on www.serainc.com and CIEE website.