Findings and Next Steps in Energy Efficiency Measurement and Attribution:

Energy Savings, Net to Gross, Non-Energy Benefits, and Retention from Energy Efficiency Behavior

Lisa A. Skumatz, Ph.D.
Skumatz Economic Research Associates

Contributing authors:
M. Sami Khawaja, Ph.D. and Jane Colby, The Cadmus Group

Prepared for CIEE

SERA

Scope

- Techniques for:
  - Gross effects
  - Net effects attribution
- 4 evaluation topics used in market progress, B/C, attributing savings & shareholder benefits, comparing to supply alternatives, program decision-making
  - Impact
  - Attribution / FR / NTG
  - NEB
  - Persistence
- Research methods: outreach to 100; review of 250+ reports
  - Summary / primer and gaps / next steps

SERA

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…

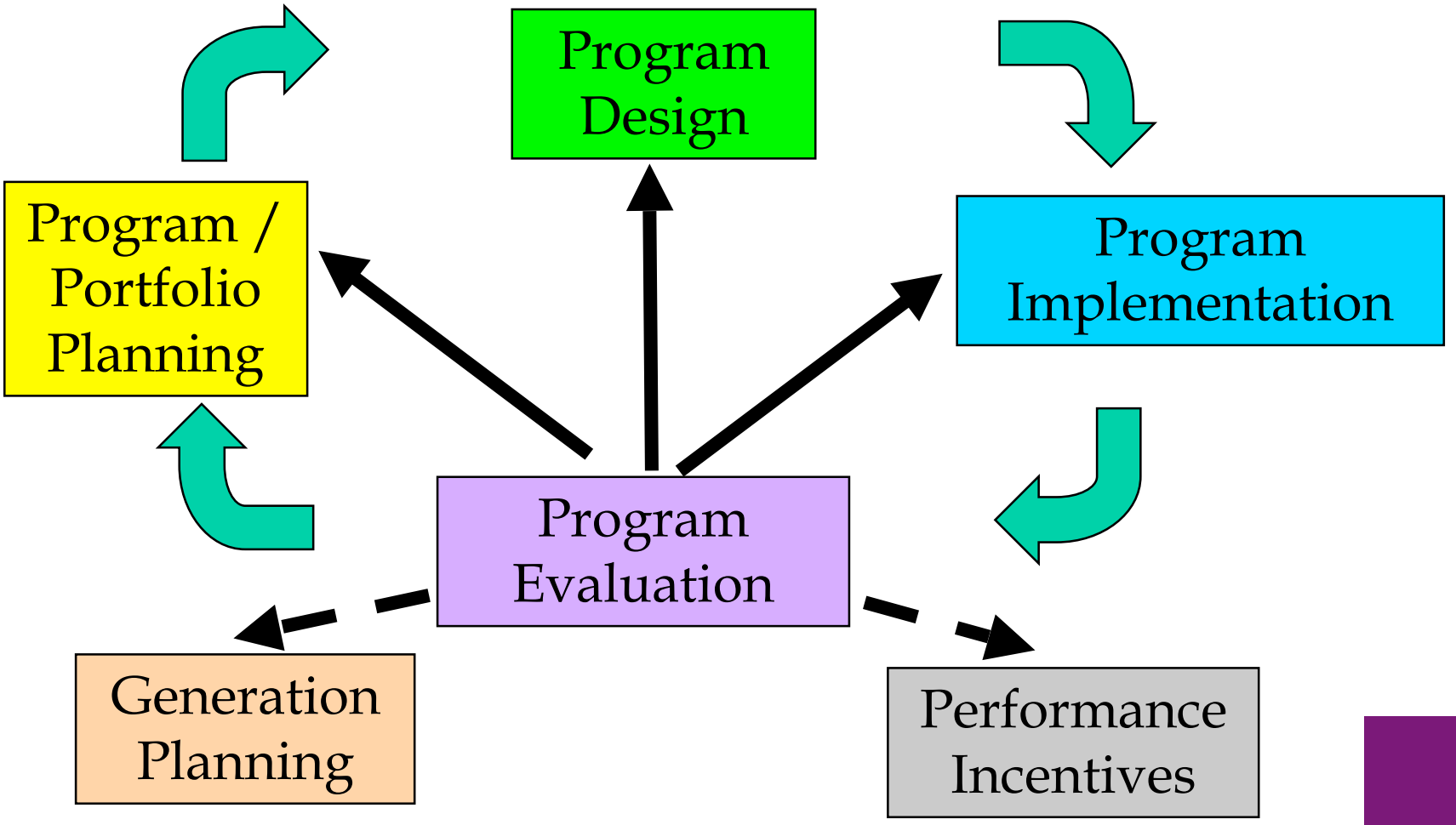
SERA

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

SERA

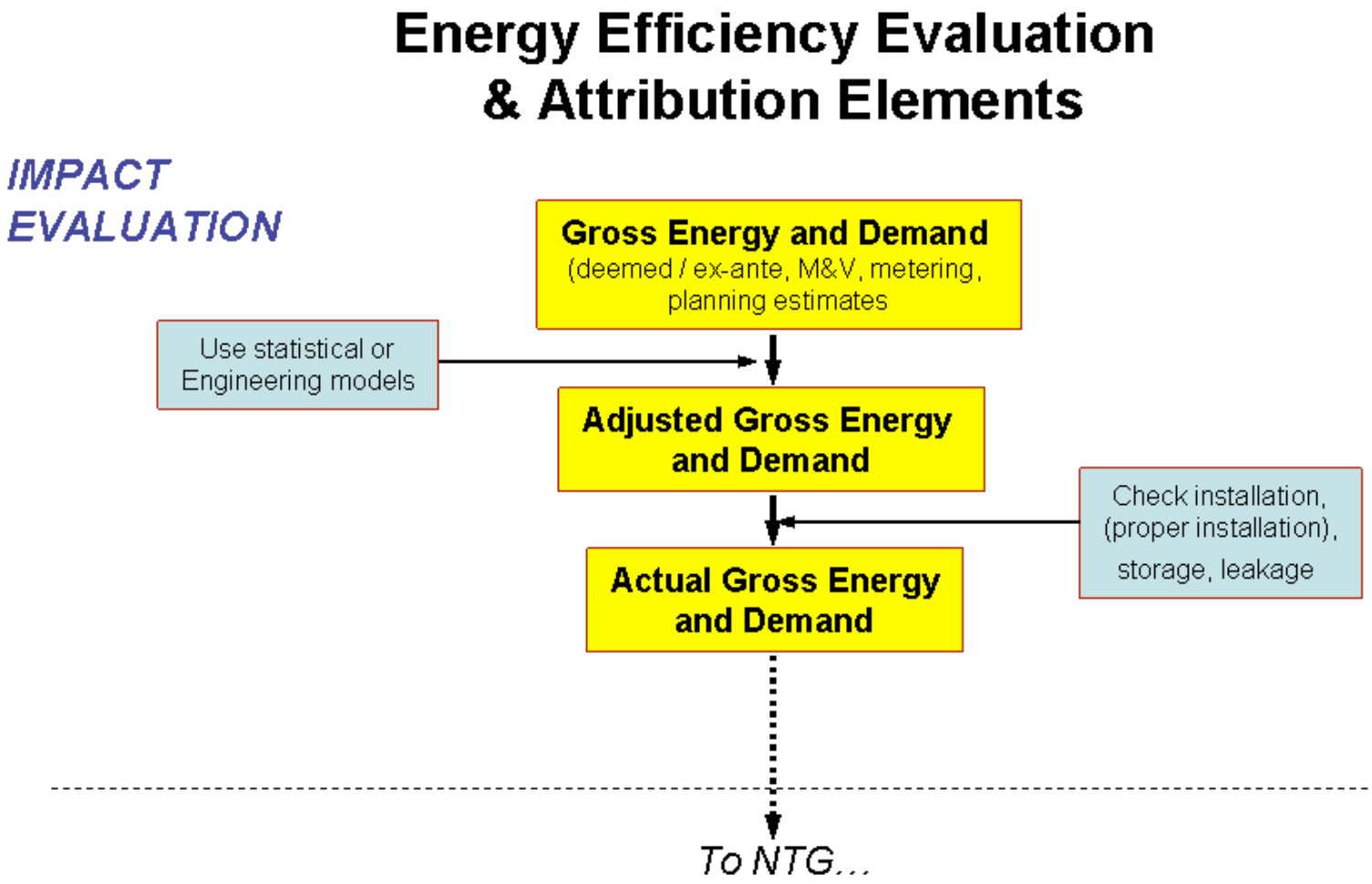
Behavioral Inputs to Planning, Program Design and Program Implementation



SERA

Gross Impacts

Impact Evaluation Elements - Overview



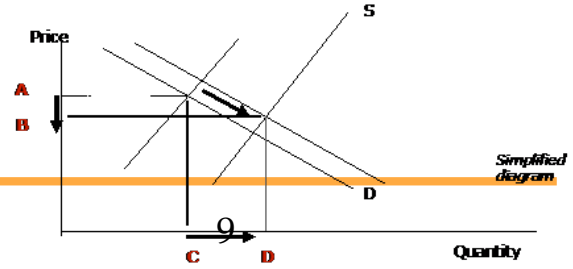
Gross Impacts Methods

- We define 5 classes of methods
- M&V
  - Engineering calculations
  - Isolated ECM metering
  - Whole building metering
  - Calibrated / simulation modeling
- Deemed savings
  - If savings well-known, documented, small; non-overlapping
  - Sources: DEER, other

SERA

Gross Impacts Methods

- Statistical Analysis
  - Comparison group, difference of differences
  - Time series comparisons / billing analyses
  - Combination
    - ▲ Modeling methods: NAC, conditional demand, SAE, ANCOVA
- Sales / Market Share
  - Data source issues – sales, shipments, reporting, cost, etc.
  - Indirect through price – reflected impact; inferences for exit & rebates (NEEPP)



SERA

Gross Impact Methods

- Surveys
  - As inputs for other methods and pre/post/control
  - Important for behavioral
  - Accuracy concerns
- Balance evaluation cost with value of information received
  - More accuracy – may need on-site validation
- Methods review by type, application, region
  - Methods here; some patterns in results in paper

SERA

Variations / Practices by Program Type

Type	Issues	Example Methods
Large C&I	Individual, <10% Interactive, >10%; assumpts issue Data missing	M&V; combo eng & met SAE deemed
Res & Small Com'l	Interactive, behavior CFL (hours issue) New construction (baseline, interaxn) Plug loads	SAE, M&V(site), billing Deemed M&V/calib sim, M&V, engineer, deemed
Educ/ Outreach	Supporting / indirect / few savings attrib Behavioral Education with Wx Education only, training, CBSM	Often not measured M&V sim; on-site verif SAE if lg; billing/control Billing/eng/control, surveys

SERA

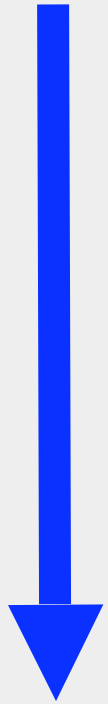
Variations / Practices by Program Type

Type	Issues	Example Methods
Mktg/Advert	Effectiveness for changing markets/behaviors	Focus/survey, purchase tracking, random assign; multiple comparisons
MT	Retailer incentives, broad marketing	More steps (ID) survey, site, NTG, regional comparisons, regression w/ explanatory
Demand Response	Rate design, incentives, technology to change demand	Metering, but baseline using rep. day, statistical analysis; metering + regression
Performance contracting	Guaranteeing savings to pay program costs	M&V stipulated for some; add verification / statistical analysis, calib. simulations; verif/3 tiers

SERA

Variations / Practices by Use / Application

By Use / Application	Increasing Rigor (& cost)	By Considerations
Assessing progress	Deemed	Uncertainty small, low cost, small value implications, e.g.small resid programs
Information on C/E		
DSM planning input (tradeoff)		
Paying participant		
Paying utility incentive		
Alternative supply	Detailed M&V, site verification, +	High certainty needed, large impacts, large cost



Variations / Practices

- No systematic differences by region
- Do vary by utilities, regulatory environment / requirements, and budgets
- California protocols define rigor for CA
- NEEP developing protocols
  - Noted issue of baseline conditions; variations in deemed, assumptions
- Cost ranges: CA 7.6%; elsewhere 1.6-3.1%

SERA

Issues / Problems by Program Type

Type	Issues	Methods / Consider
Large C&I	Usually use M&V; complex ECMs / assumptions / calculations; large variations / implications	Valid assumptions ➔ meter? Verify?
Res & Small Com'l	Com'l lighting issues - hours and interactive effects Residential – behavioral changes can overshadow savings with stats analy New construction – time to model wih M&V, calibr sim; lg sample (PNP) for SAE	Metering, model for interaxn? Survey/ site visit; cost issue No breakthroughs / expense, application
Educ/ Outreach	Variability in information, delivery, presentation; variability in follow-through; small so SAE difficult; M&V survey / bias?; lags, participants; clutter/baseline; retention (minimal work)	Survey / pre/post/control; Basic experimental design; No significant breakthroughs

SERA

Issues / Problems by Program Type

Type	Issues	Methods / Consider
Mktg/Advert	Similar	
MT	Information from channels and consumers; multiple surveys / metering; secondary data issues and limited for commercial; control group problems	Surveys, metering, statistical… Control group method getting obsolete / impossible ➔ market studies?
Demand Response	Finding right model and conditions for baseline	Average of pre/post days, representative day; regression
Performance contracting	Not specifically addressed	

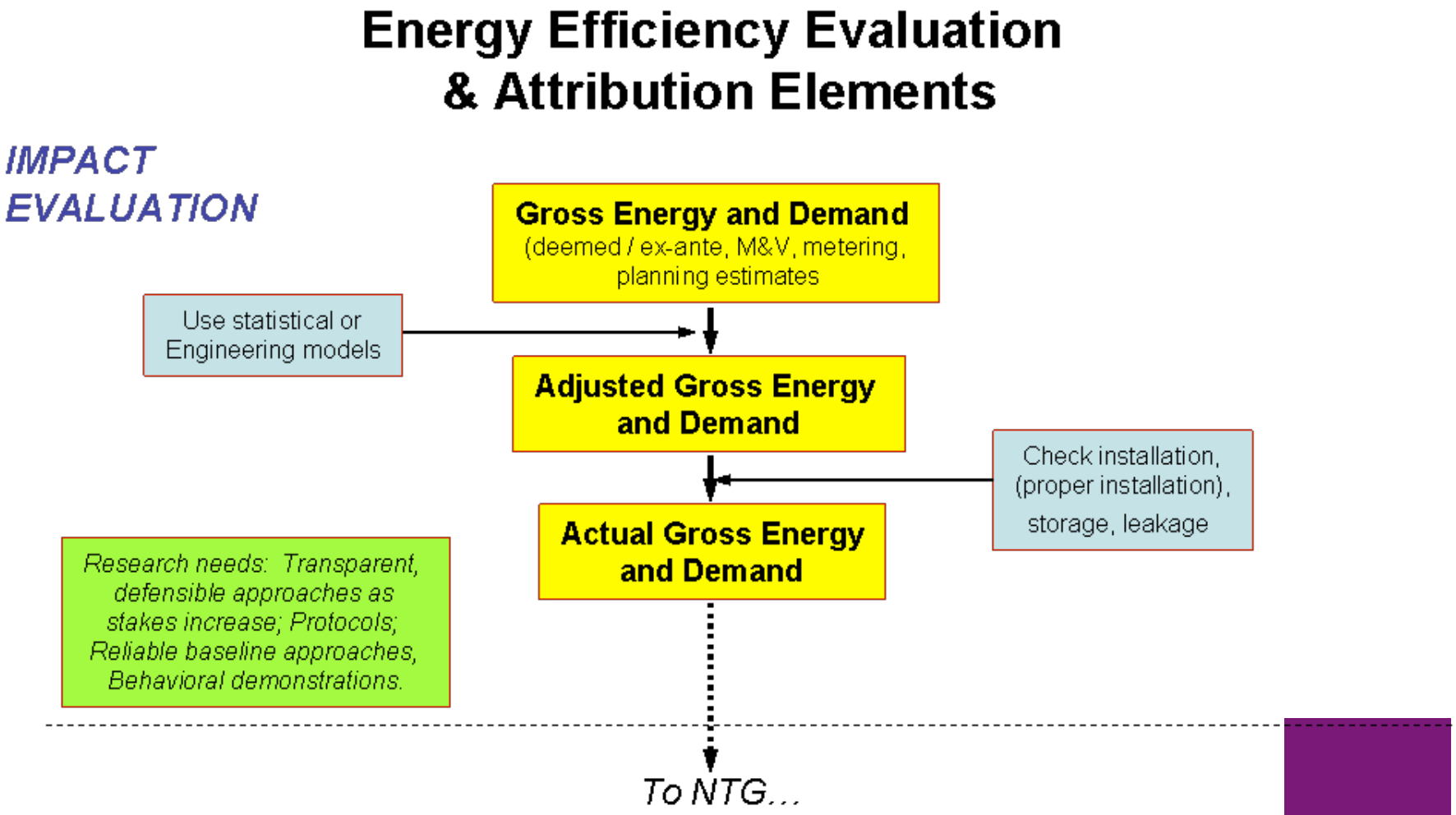
SERA

Other Issues / Problems

- Other Problems
  - Cost-effectiveness
  - Participant payments
  - Utility incentives
  - Progress toward potential
  - DSM planning
  - Accuracy issues

SERA

Gross Energy and Demand



Conclusions - Gross Energy Savings Measurement

- Impact evaluations apply at least one of following 5 methods:
  - Measurement and verification (M&V)
  - Deemed savings
  - Statistical / billing analyses
  - Market progress / market share analysis
  - Surveys
- Education and behavioral programs have been evaluated but require tailored, rather than prescribed, evaluation methods
- Direct and indirect impacts can be measured with up-front experimental design methods and sufficient sample sizes
- Program attribution is challenging
  - Measure, program
  - May only be possible to estimate market effects from a portfolio of programs

SERA

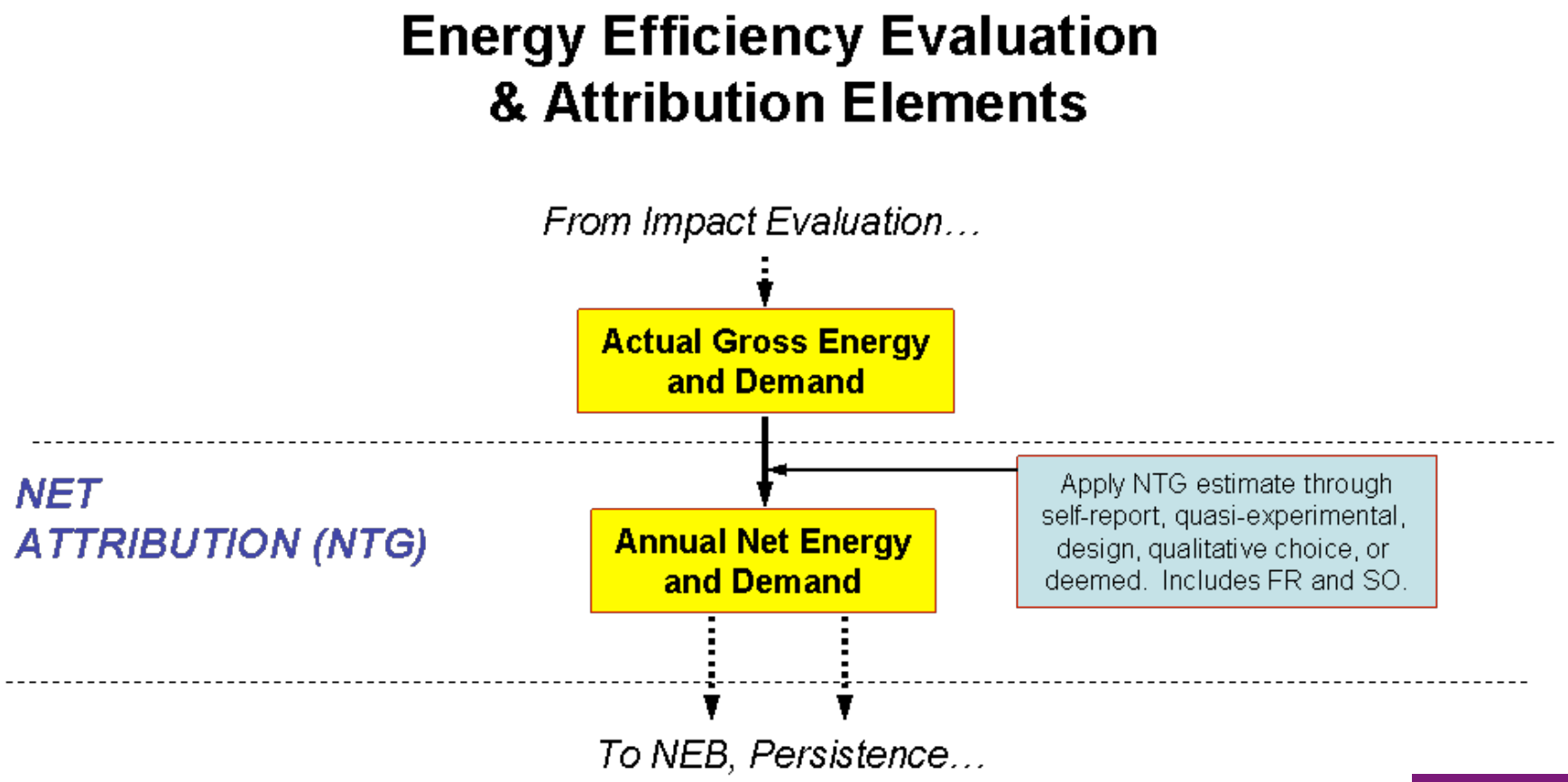
Recommendations - Gross Energy Savings Measurement

- Conduct market assessments up front
- Conduct market and appliance / equipment saturation surveys
- Improve modeling and other approaches for assessing behavioral programs

SERA

Net Savings / Attribution / NTG

Attributing Net Energy and Demand



Attributing Net Effects

- Elements
- Free ridership (FR)
- Spillover (SO)
  - 3 types
- Net-to-Gross (NTG)
  - Only equals FR if SO=0
  - Formulations

SERA

Current Methods / Practices

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

SERA

Current Practices

- Spillover more complex than free ridership
  - "Participants"
  - Measurement / surveys
- FR more commonly considered than SO
- Controversy
  - Error
  - Expense
  - Baselines
  - Chatter
  - Uncertainty

SERA

Current Practices

- State practices
  - California Standard Practice Manual, or portions
  - Results from studies
- Methods and gaps
  - Most self-report or enhanced methods; few more advanced
  - Very few with confidence intervals
  - NE more commonly included SO
  - Few consider kW, Therms
  - Ex ante / ex post uncommon
  - Ranges for results for FR, NTG
  - Variations by measures

SERA

Variations in NTG

	Net To Gross , Free Ridership, Spillover
General results	Most utilities and regulators exclude NTG or assume values that incorporate only FR and range from about 0.7 to 1.0 (*ex ante*). *Ex post* results have been measured for many programs; spillover is measured much less often than free ridership.
Variations by measure type, program type or region	Clear patterns for FR, SO, or NTG results by measures, program types, and regions have not been demonstrated to date. Assume program design / measure variations are important; NTG affected by whether spillover is included.
Variations for behavioral vs. measure-based programs	NTG for behavioral not found generally

SERA

Issues / NTG and Elements

- Refinements in standard practices
  - Simplistic ➔ Partial FR, long term tracking
  - Causality ➔ Splitting the credit ("…a village…" Bensch)
  - Randomized methods essential
- Methodological work
- Quantitative studies

SERA

Issues / NTG and Elements

- Concern that California methods / results / applications rule
- Need to recognize both FR and SO; capture NP SO; recognize FR not bad in MT world
- All agreed FR use in assessing design, exit, refinement; some concern about use as penalty in cost recovery / most in favor, otherwise just an effect
- Omit spillover in many
  - SO critical for behavioral / education ➔ part of the point; omission / penalty is unbalanced
  - Underinvestment; not considered in regulatory tests – NO INNOVATION
  - End up with mediocre efforts / programs
  - Geographic boundaries issue / local vs. broader
- Modified TRC requested for all prgms– GHG, NEBs, FR, innovation, SO, boundaries
  - Especially punishes behavioral / education
  - Measure-by-measure problem – cherry-picking

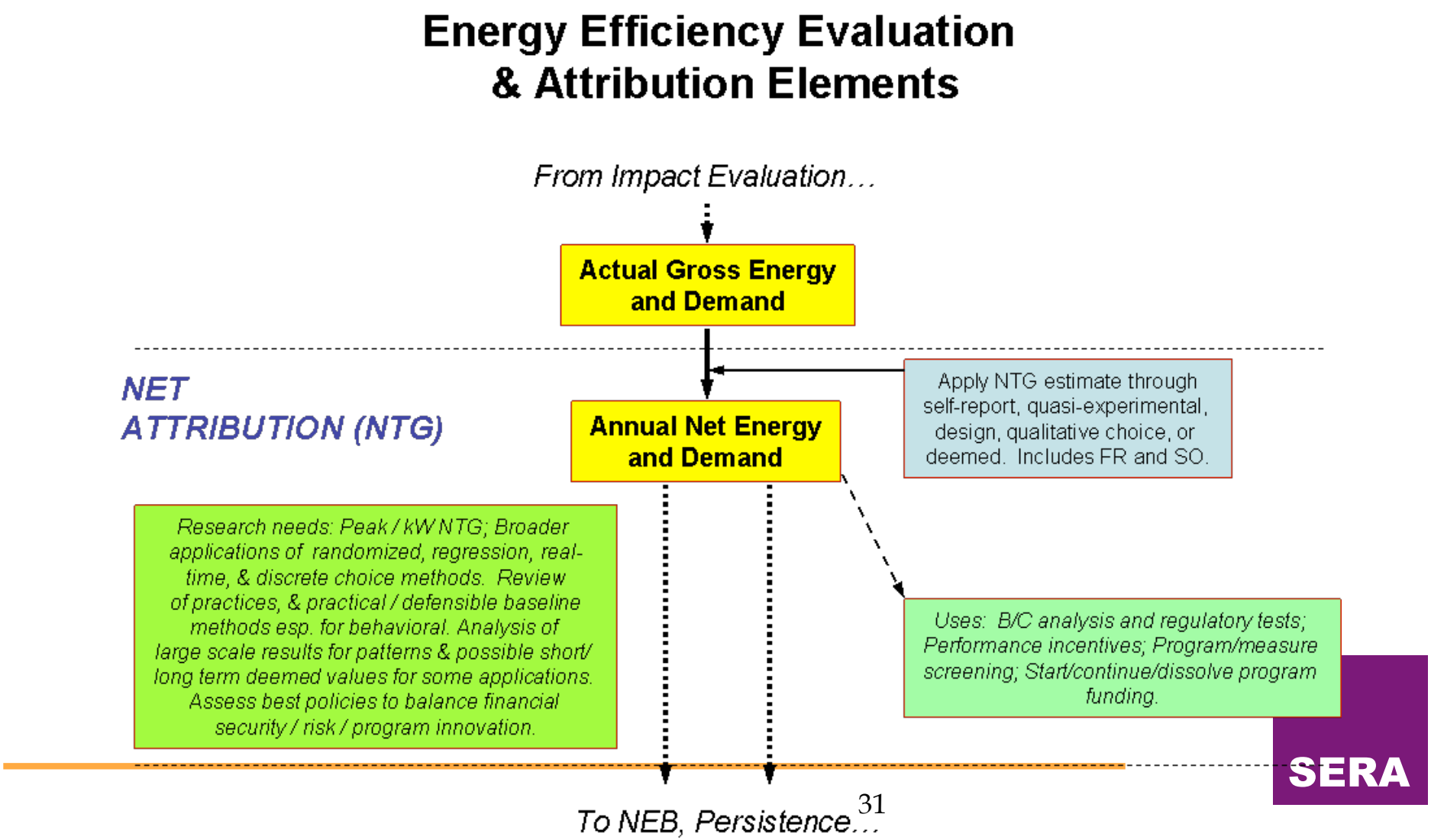
SERA

Key Uses / NTG and Elements

- Challenges, but "…not measuring is not the answer" (Rufo)
- Key uses
  - FR - Program design, exit timing
  - SO - Performance of education, behavioral
  - Distinguishing good programs / performance / time; overlook good programs
  - Mixed reports on feedback loop; process, logic models
- Better programs if
  - Precision issue / vary by application (incentives vs…)
  - NTG / FR replicable methods with flexibility in methods by type of program
  - Key – comprehensive market assessment work for BASELINE, a priori
  - Real time data collection; discrete choice models; random assignment
  - Data base

SERA

Attributing Net Energy and Demand



Conclusions - Net Energy Savings Measurement

- Net-to-Gross (NTG, reflecting free ridership and spillover) apply at least one of following four calculations:
  - Deemed NTG
  - NTG adjusted by models with a dynamic baseline
  - Paired comparisons NTG
  - Survey-based NTG
- Spillover is more complicated than free ridership to measure
- Considerable, and growing, controversy regarding the use of NTG, especially in regulatory applications
- Evaluation of free ridership and spillover serves other purposes
  - Identify superior program designs
  - Identify program exit timing

SERA

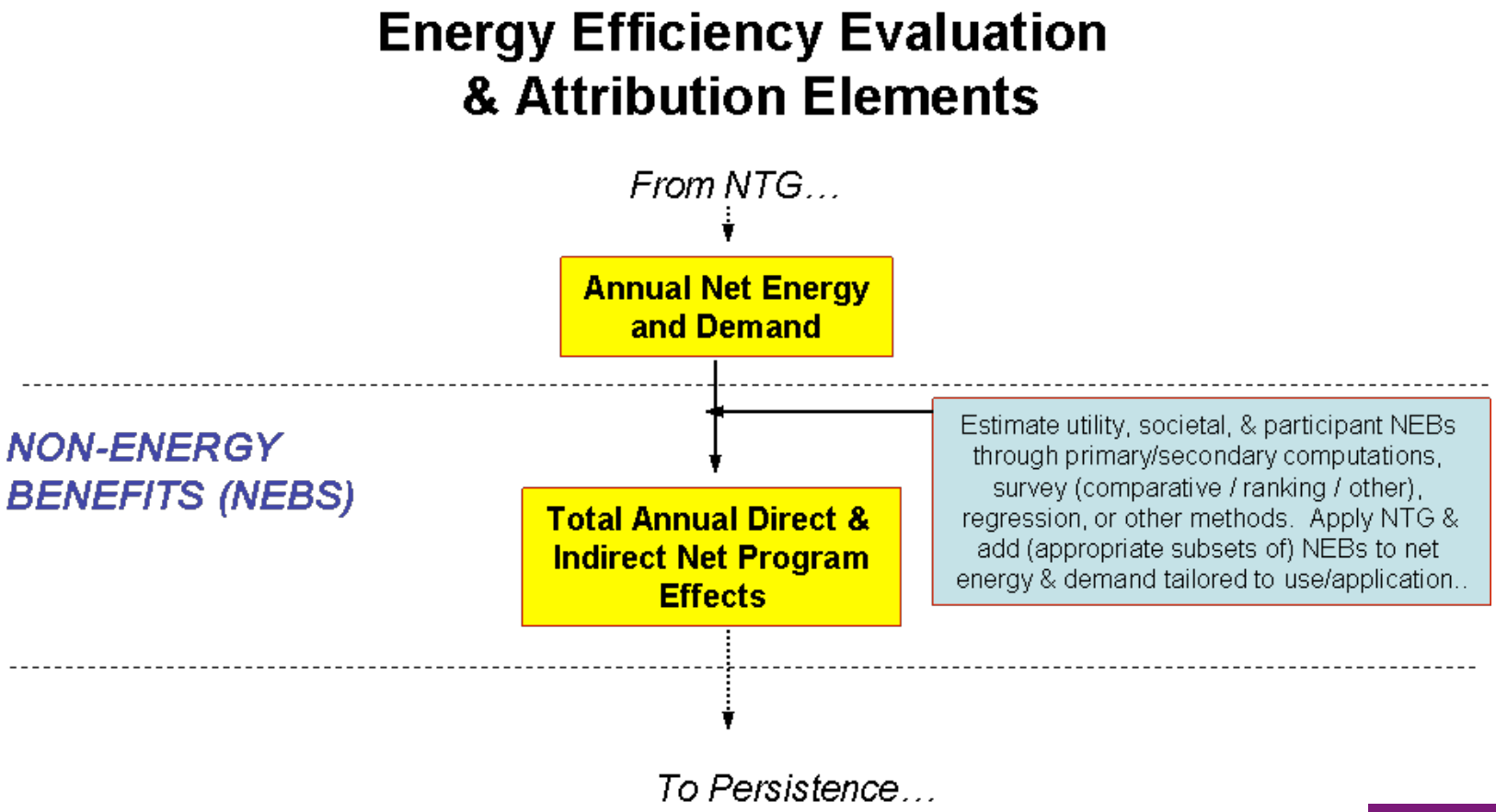
Recommendations - Net Energy Savings Measurement

- Consider short-term (year 1 or 2) and long-term (year 3) deemed values
- Develop enhanced NTG, free ridership and spillover methods
- Conduct experimental designs for evaluation
- Encourage more real-time evaluation data collection for refining programs
- Develop enhanced modeling methods for improving estimates of attributable impacts
- Compile NTG results into a database and continuously update with new research and evaluations

SERA

Non-Energy Benefits (NEBs)

Non-Energy Benefits (NEBs)



Non-Energy Benefits

- Omitted program effects, positive & negative
- 3 perspectives – utility, society, participant
  - Limited "drivers"; NEB laundry list
- Uses
  - Utility – current (few) and potential (regulatory tests, program admin cost)
  - Society – current (deemed GHG, scenarios); potential (TRC)
  - Participant – current (marketing / screening / modified TRC for readily measurable); potential (Portfolio dev'p, refinement, mktg, regulatory tests – participant cost)

SERA

NEB Drivers

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

SERA

NEB Categories by Perspective – From Drivers

Utility	Society	Participant	
•Carrying cost on arrearages •Bad debt written off •Shutoffs •Reconnects •Notices •Customer calls / bill or emergency-related •Other bill collection costs •Emergency gas service calls (for gas flex connector and other programs) •Insurance savings •Transmission and distribution savings (usually distribution) •Fewer substations, etc. •Power quality / reliability •Reduced subsidy payments (low income) •Other	•Economic development benefits – direct and indirect multipliers •Tax effects •Emissions / environmental (trading values and/or health / hazard benefits) •Health and safety equipment •Water and waste water treatment or supply plants •Fish / wildlife mitigation •National security •Health care •Other	•Water / wastewater bill savings •Operating costs (non-energy) •Equipment maintenance •Equipment performance (push air better, etc.) •Equipment lifetime •Shutoffs / Reconnects •Property value benefits / selling •(Bill-related) calls to utility •Comfort •Aesthetics / appearance •Fires / insurance damage (gas) •Lighting / quality of light •Noise •Safety	•Control over bill •Understanding / knowledge •"Care" or "hardship" (low income) •Indoor air quality •Health / lost days at work or school •Fewer moves •Doing good for environment •Savings in other fuels or services (as relevant) •GHG and environmental effects •Negatives

SERA

NEBs – Best Practices

- Best practices / issues
  - Redundancy / perspective
  - Net positive / negative
  - Net standard efficiency
  - Net free riders
  - Minimizing overlap / double-counting (number of categories / drivers)
  - Application subsets
- Review of status of measurement methods by NEB – (by individual category in paper); summary here
  - Direct estimation
  - Models
  - Secondary plus literature or measurement
  - Survey-based

SERA

Progress and Gaps in NEBs

- Greatest progress – beyond "lists"
  - Climate change - models - System average vs. margin*(recm. minimum) vs. hourly dispatch. Issues – additionality, program/project; uncertainty
  - Economic development – models – net, baseline discussion
  - Some in societal health and safety / limited
  - Participant
- Little progress / gaps
  - Utility T&D, kW, capacity, heath and safety –
    - ▲ Low value because important ones unstudied
  - Society: Water infrastructure, GHG issues; kW/capacity; national security, health and safety, neighborhood improvement
  - Participant: measurement / tests; transferability, policymakers, B/C

SERA

Participant NEBs Measurement Methods

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	…

SERA

NEB Uses – Current and Potential

	Mktg/ targeting	Pgm refinement	Customer B/C	Portfolio dev'p	Regula-tory B/C tests	Other
Utility	N	C	N	C	F	
Society	F	C	F	C	P, F*	
Partici-pant	C	C	C	C	P, F	

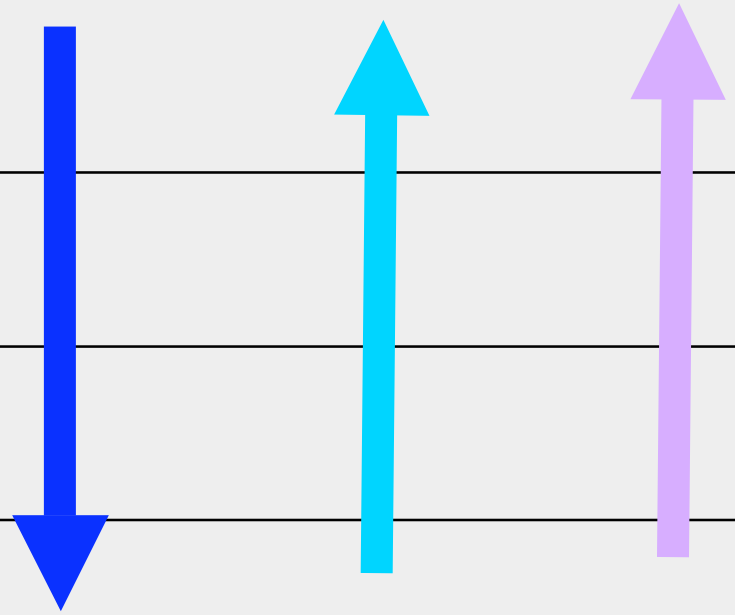
Key: C=current; P=partial; F=future potential; N=not applicable

Table updated from BC Hydro original

SERA

Methods to Include NEBs in Regulatory Tests

	Maximize DSM opportunities	Minimize Regulatory Risk	Minimize Evaluation Cost
Adder			
Readily Measurable			
Hybrid			
All NEBs			



SERA

State / Regulatory Treatment of NEBs

Pgm Marketing only	Ont, Manitoba, Quebec, many others
Project screen	WI
Pgm screen – not req'd	MT, GA, SC, AR, other
Pgm screen - adder	For low income at least; CA, ID, OR, UT, WA*, WY; CO (20/5), NH (15% all pgms)
Pgm screen – readily measured	MA, VT, BC Hydro, OR (esp C&I)
Pgm screen - scenario	NYSERDA,
Pgm screen – broad	None found

More aggressive

MUCH more information in the paper

Expanded from original from BC Hydro

SERA

NEB Value Patterns

Perspective	Utility	Society		Participant
	Overall	GHG	Economic	Overall
General	Small, less than 10% of NEBs	Significant	Can be Significant if measures	Large, often exceed energy savings
By prgm type	Lgr for low income (financial); Peak high potential	Peak/off peak / season	Varies by >10x depending on local empl mix, type	Higher for whole building programs than individual measures; shell / comfort measures high value
Behavioral	No current work; large potential with time shift pgms	No work; similar to above	No work; if no new measures, no effect	Applied to a few (Cx, Real time Pricing, training, LI educ, E*) w/ significant NEBs
Sector	Low income higher value			Different NEBs highest valued resid vs. comm'l
Region	CZ affects arrears, possible line loss	Generation fuel mix, peak / off peak	Strong variation with local industry mix	CZ influential because comfort (ht/cool); can be 15% of partic NEBs, and insul big driver; no other patterns

NEBs – Issues & Experience

- Other issues:
  - Relation to process* (add?), impact, and NTG evaluation; add to protocols
    - ▲Exit, refinement information, "disconnect"
  - Multiple levels of participants with MT, market programs
  - Behavioral programs – full of NEBs

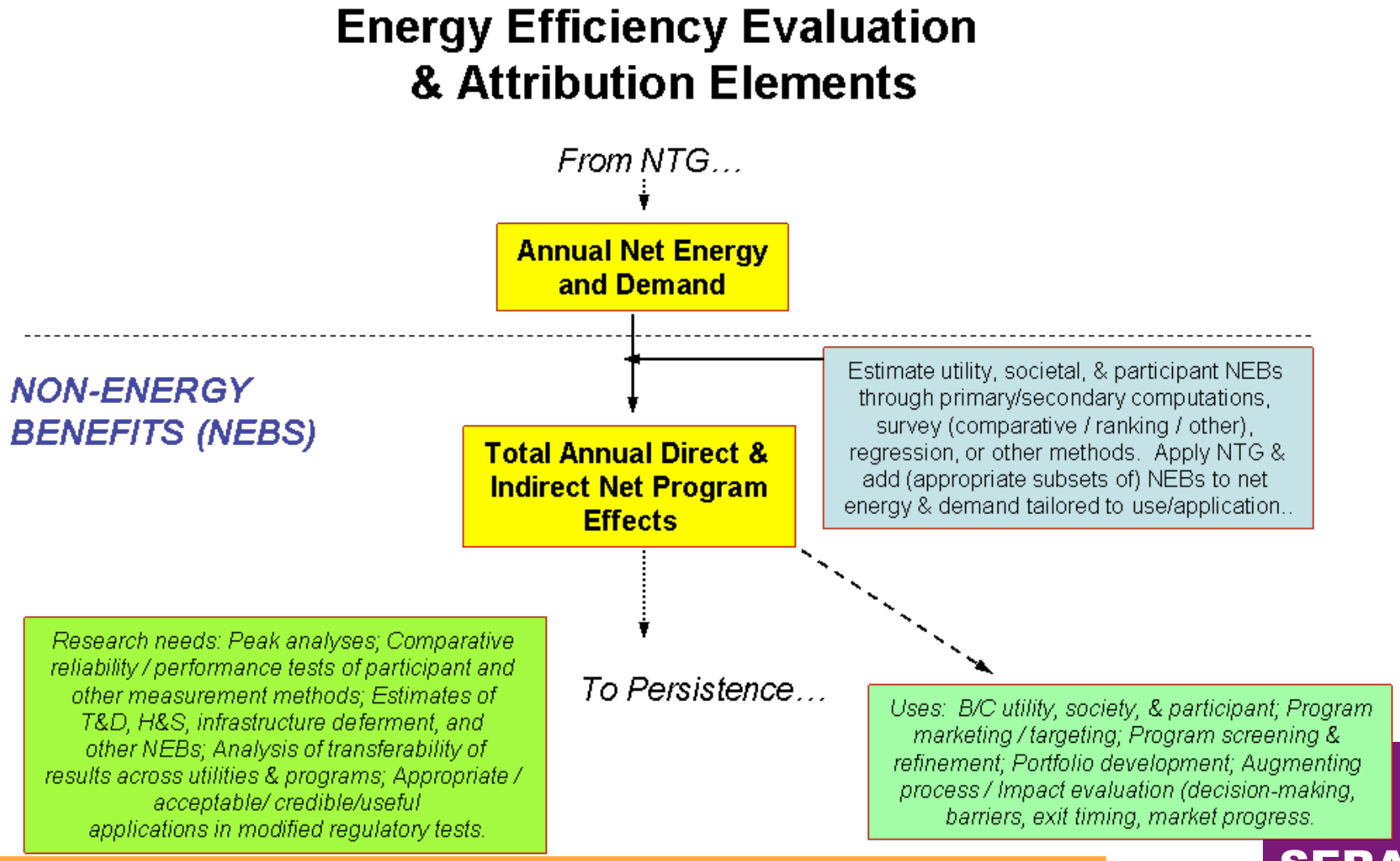
SERA

NEBs – Issues & Experience

- Important applications
  - Recommendations for focus on B/C inclusion of NEBs**
  - Chicken and egg – not bother research if not used for valued applications - protocols
  - Advances through adders, readily measured, hybrid, to subsets
    - ▲ Do-able: environmental, economic ("approve" models?)
    - ▲ Scenarios including some participant
    - ▲ Behavioral NEBs
    - ▲ Peak / off peak / kW
    - ▲ Agreement on some values, methods
  - Research needs mentioned earlier

SERA

Non-Energy Benefits (NEBs)



SERA

Conclusions - Non-Energy Benefits (NEBs) (1)

- NEBs are often ignored in program evaluation
- NEBs are evaluated under three perspectives:
  - Utility
    - Indirect costs or savings to utility or ratepayers
    - Fairly small NEBs (bill payment improvements, infrastructure savings)
    - Not researched: line loss reductions, insurance impacts, time of day/capacity impacts
  - Society
    - Emissions, job creation/ economic development, health - increasing value
  - Participant
    - Operations and maintenance, comfort, productivity, etc.
    - Studies show large estimated NEBs, exceeding value of energy savings
- NEBs are important for behavioral and education programs and participants

SERA

Conclusions - Non-Energy Benefits (NEBs) (2)

- NEBs are real and measurable and represent important factors influencing program and measure adoption
- Unclear on how and when regulators will incorporate NEBs into the program review process
- By omitting these impacts, regulators may discourage adoption of programs - especially, behavioral and education programs
  - Investment also allocated sub-optimally…

SERA

Recommendations - Non-Energy Benefits (NEBs)

- Report program and portfolio metrics with various proportions of NEBs incorporated
- Research to fill in remaining gaps / come to "agreed" methods

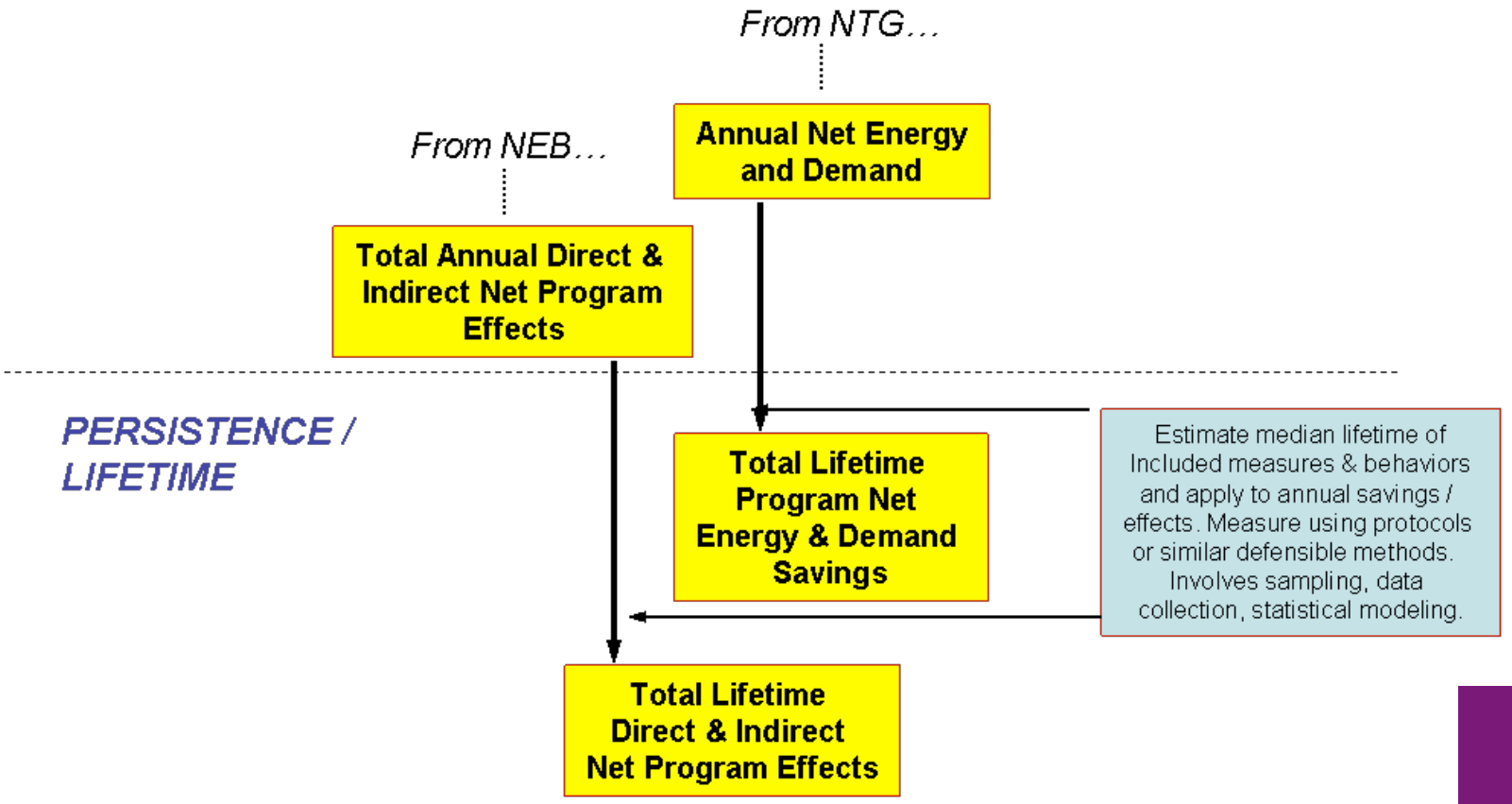
SERA

Persistence / Lifetime

SERA

Persistence

Energy Efficiency Evaluation & Attribution Elements



SERA

Persistence

- Persistence, measure life, EULs; 50% median, in place and operable
- Protocols
- Best practices summary on:
  - Sampling, data collection, analysis, modeling, comparisons / context, documentation
- Remaining useful lifetime (RUL)
  - Few primary studies; conceptual issue
  - Varying opinions; not a priority in industry so far; not ad-hoc values
  - Two phases - issues: 1) revised curve; 2) baseline at future date
  - Strong application for behavioral
    - ▲ adoption curves / timing / lifetimes? Measurement issue

SERA

Persistence

- Technical degradation (TDFs)
  - Addressed in CA-EM&V protocols
  - Differences in decay? Very few primary studies
  - 2 effects - Technical degradation & behavioral / operational based on quality of use & upkeep – need studies on combination
  - Behavioral very parallel; no studies

SERA

EUL Values Used in US - Residential

Lighting	HVAC	Shell & Other
•Lighting – CFL Bulbs: 6-8 years, with some recent work starting to incorporate variations based on assumptions about hours per day that the bulb operates •Hardwired fixtures – 15-20 years for interior and exterior fixtures •Lamps (table or touchier) – 5-10 years for most studies[1], depending on type •Occupancy sensors – 10-15 years	•HVAC replacement – 15-25 years •HVAC and water heating in Energy Star – 15-25 years •Room A/C – 11-15 years •Programmable thermostat – 10-12 years •Whole house fans – 25 years •Attic ventilation fans with thermostat controls – 19 years	•Duct sealing and air sealing – each 15-20 years •Insulation 20-25 years •Duct insulation – 20 years •Windows – 20-35 years •Weatherization – combined measures – 20-25 years •Pipe wrap – 10-20 years •Tank temperature turn down – 4-7 years

SERA

EUL Values Used in US - Commercial

Lighting	HVAC
•Lighting – CFL Bulbs: 3.4-6 years with some recent work starting to incorporate variations based on assumptions about hours per day that the bulb operates in business locations •Fluorescent fixture – 11-16 years •Hardwired CFL – 10-15 years •HID (interior & exterior) 13-15 years •Occupancy sensors – 8-15 years •Daylighting dimming – 9-10 years	•Packaged AC / HP – 12-15 years •Chillers – 19-23 years •Economizers – 7-15 years •Energy Management Systems (EMS) – 10-15 years •Motors – 13-20 years

SERA

Issues in EULs

- Process values lacking (small sample size)
- Some dependent on operating assumptions
- Some end-uses missing:
  - Cooking, air compressors, ASD/VSD, refrigeration / freezer in some sectors
  - Missing for plug loads
  - Building shell – at least verify
  - Priority depends on future savings, rarity, variations; waiting hurts EUL data
- Trend toward simplified tables, BUT research shows strong variations in turnover by business type

SERA

EULs for Behavioral Programs

- Missing for behavioral / educational programs
  - 2 studies
  - CBSM
  - Best practices with nuances - Partial retention; frequency of data collection; large surveys and random assignment
  - Retention of "upstream" complicated

SERA

Variations in Persistence

	EULs
General results	Early work in NW – gravitation to CA values. CA requires ex post statistical verification, but for subset of measures – led to refinements. Some measures with inadequate / missing – especially behavioral
Variations by Program type	Almost all EUL results are by measure, not by program design or incentive provided. Not clear if they should vary by program type.
Variations for behavioral vs. measure-based programs	Missing for behavioral programs including education / training, commissioning training, and similar programs.

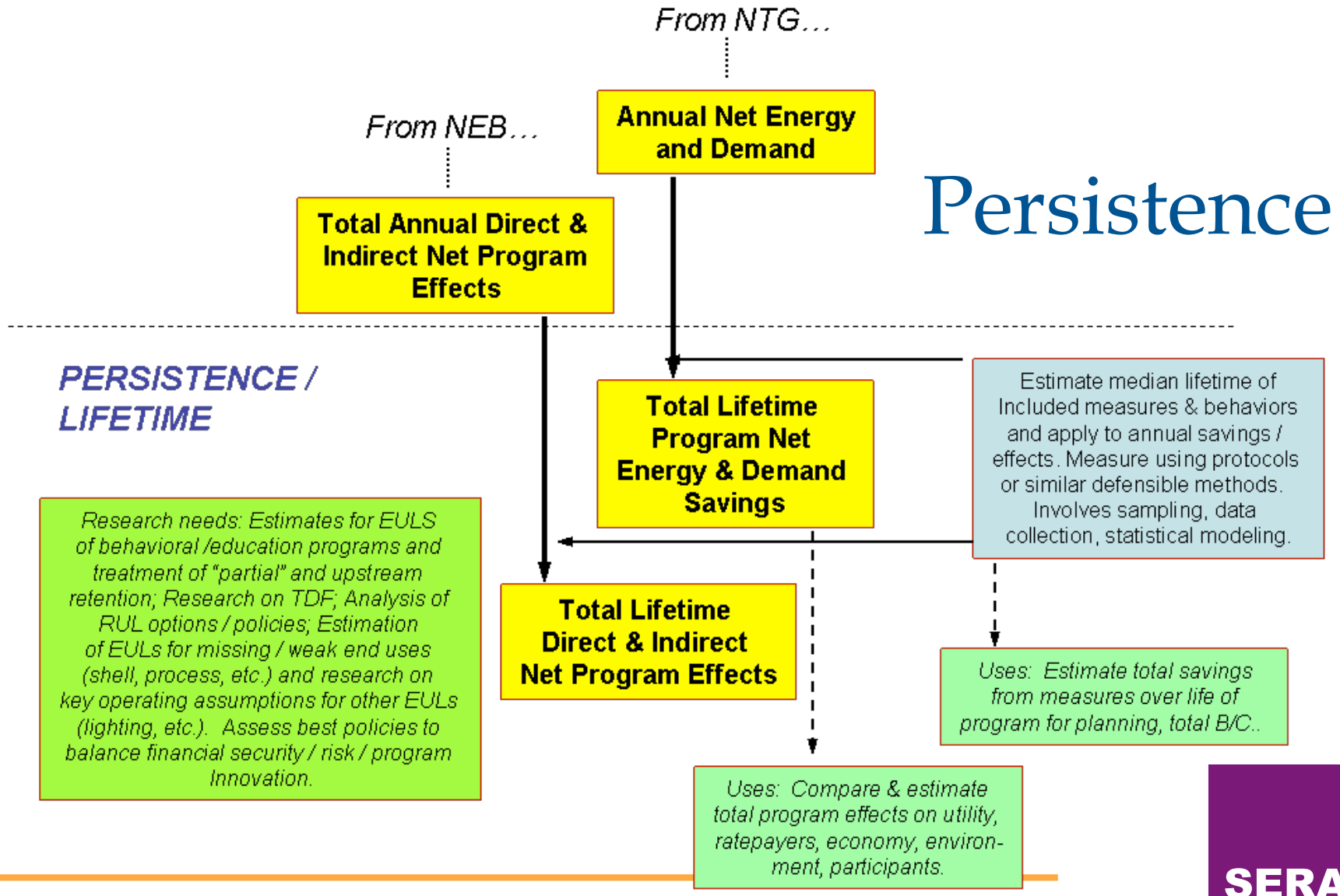
SERA

Issues / Problems

- Best practices
- Results / gaps
- TDF
- RUL
- Behavioral
- Key component of program savings
  - Potential bias away from new, creative
  - Risk
  - Complexities for behavioral
- Little primary research / dormant / agreement

SERA

Energy Efficiency Evaluation & Attribution Elements



Conclusions - Measure Lifetimes

- Measure lifetimes are a key element in the calculation of energy savings from energy efficiency programs
- Measure lifetimes (and methods) are fairly consistent for many measure-based programs in residential and commercial sectors
  - Issue of simplified EUL tables / caution
- Shortage of primary research on technical degradation (TDF)
- Virtual absence of studies addressing retention or persistence of energy savings from behavioral and education programs
- Identifying the measure lifetimes of behavioral and education programs is complicated as more media messages on behavior and education "bleed" across territories

SERA

Recommendations - Measure Lifetimes

- Conduct measure lifetime studies on:
  - Process equipment, some shell measures, cooking, refrigeration, and air compressors
- Conduct technical degradation studies that account for mechanical and behavioral performance-related changes
- Conduct studies on retention or persistence of energy savings from behavioral and education programs
- Require new behavioral programs to conduct retention assessments every year or two
- Apply different evaluation methods to a variety of behavioral programs

SERA

Questions / Comments / Discussion?

SERA

Contact Information

Lisa A. Skumatz, Ph.D.
Skumatz Economic Research Associates, Inc. (SERA)
762 Eldorado Drive, Superior, CO 80027
303/494-1178
Skumatz @ serainc.com

M. Sami Khawaja, Ph.D., Cadmus Group
Sami.khawaja @ Cadmusgroup.com
Jane Colby, Cadmus Group
Jane.colby @ cadmusgroup.com
Assistance from Gregg Eisenberg

Thanks to Respondents to calls and survey!!!

SERA