NON-ENERGY BENEFITS (NEBS):

20 years – Monetizing NEBs/Multiple Benefits in Buildings

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NON-ENERGY BENEFITS

- Program **value** beyond savings
- **20 years** of progress/ where we are
- **Motivation**
  - 0 is the wrong number
  - "Bundled features" / rational / tunnel
- **B/C incomplete** – Benefit-cost - Biased investments / decisions because all costs, not all benefits
- High value from quantitative studies

Source: Skumatz / SERA research

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20 YEARS OF NEBS PROGRESS…

Phase 1: Perspectives, Basic Measurement *1994-1998*

Phase 2. Estimation & Benefit-Cost (B/C) & Revised Tests *1996-2001+*

Phase 3: Measurement, Use, & Expansion *2001-present*

Phase 4: Refocus B/C Applications *2008-present*

But there still isn't agreement on name! - NEB, OPI, NNEB, MB, co-benefits…

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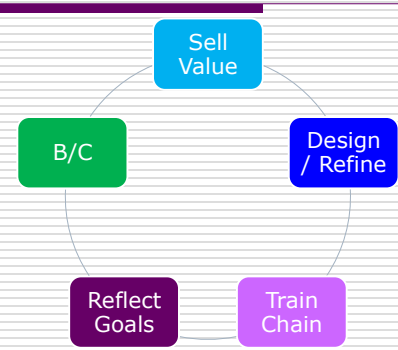
KEY APPLICATIONS OF NEBS



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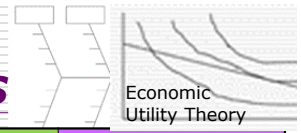
NEBs, DRIVERS, 3 BENEFICIARIES



Utility/Ratepayer	Societal	Participant
o Payments/financial	o Economic development / job / multipliers	o Payments & collection
o Debt collection efforts / calls	o Tax impacts	o Education
o Emergencies / insurance	o Environmental	o Building stock
o T&D, power quality, reliability	o Emissions	o Health
o Subsidy (Low Income)	o Health	o Equipment service including productivity, comfort, maintenance, etc.
o Other	o Water & other resources / utilities	o Other utilities (water, etc.)
	o National security	o Other (transactions, environmental, psychic, etc.)
	o Wildlife/Other	

More than 60 categories derive from these drivers
Include subsets as appropriate to application

Source: (Skumatz/SERA, 2004)
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➔*Methods & bracket (e.g. 1994 – 2001 health, fire/insurance…)*

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NEB RESULTS: MEASUREMENT & EXAMPLES FROM 20 YEARS

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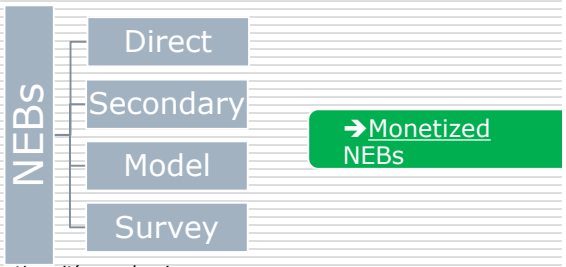
NEBs MEASUREMENT & DATA – 4 MAIN MEASUREMENT APPROACHES



Story of a ferry… then it's academic

Source: Skumatz / SERA research; may be used with permission of author

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MEASUREMENT ISSUES & BEST PRACTICES

- Best measurement practices
  - "NET" in multiple facets
  - Large sample, non-overlapping, applicable subset
  - Valuation, discount rates, host of other best practices / research
- Measurement accuracy issue
  - Relative to other B/C elements
- Transferability (independent vs. climate, measures, recipients, etc.)?

Source: Skumatz / SERA research

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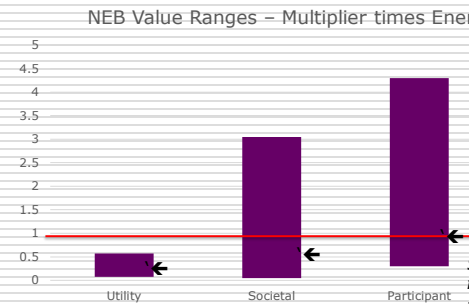
ARE NEBS HIGH VALUE? RESULTS OF NEBs RESEARCH



TRANSFERABILITY – *Results & range depend on programs, Measures, climate, client acceptance: (from NEB-It™ Model) … Some are program-independent*

Similar information for each NEB category – residential & commercial

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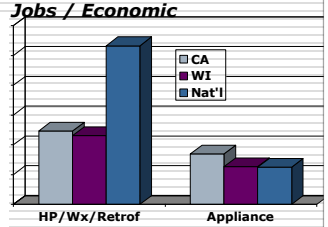
SOCIETAL AND PARTICIPANT NEBS – VARY BY PROGRAM

Societal

Environmental

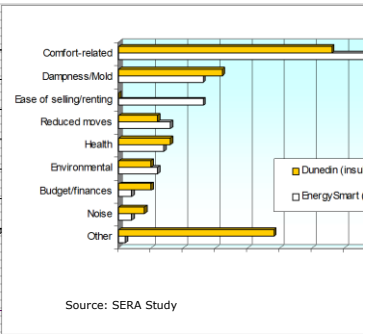
Jobs / Economic



Audience, scope…

(Source: Skumatz /SERA
ECEEE 2007, ACEEE 2006)-2015

Participant



Source: SERA Study

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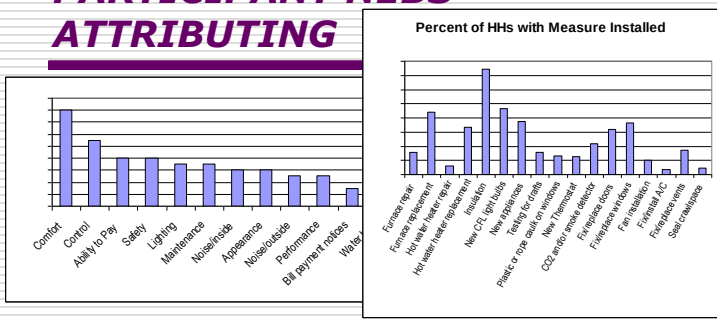
PARTICIPANT NEBS – ATTRIBUTING



ATTRIBUTION: Regressions to decompose/attribute drivers:
Measures: Insulation, furnace, draft repair
Demographics: Children, elderly,

(Source: Skumatz /SERA
ECEEE 2007, ACEEE 2006)-2015

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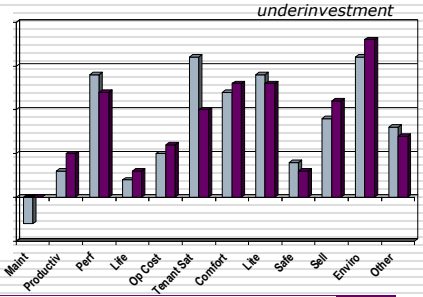
NEGATIVE NEBS VALUE / PERCEIVED COST OF BARRIERS

Residential Example

Negative NEBs	Solar W/H
Appearance	-$14 NZ
Maintenance	-$9 NZ

Commercial Example

Audience, disconnect, underinvestment



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NEBS VALUE / VARIATIONS & CONTEXT

Residential Examples

Residential Program	Relative NEB	Positive NEBs	Negative
Wx	<100%	Comfort, Sale, Green, Years, Other	Few
Wx	<<100%	similar	Few
Wx	>>100%	similar	Few
Wx	>>100%	similar	Few
Wx	>100%	similar	Few
Light	range	Green, Light, Satisf, Life	Quality
Appliances	<100%	Green, Water, Performance, varies	Varies
Windows	<<100%	Noise, comfort, control	
Insulation	<<100%	Comfort, health, control	
Solar WH	<<100%	Green, control	
Real time, Zero & low energy, education, renew, many others			

Commercial Examples

Com'l Program Type	Relative NEB Value	Positive NEBs	Negative
New Construction	Range ~100%	Comfort, Light, Tenant Satisf, Ops /Perf, Productivity, Green, Leasing	Maintenance
MF New Construction	Range	Operations/Perf, Green, Lifetimes, Comfort	
Technical Assistance	<100%	Green, Operations, Performane, Lifetime, Comfort, Safety	Maintenance, labor, lighting
Audit	<<100%	Water, Performane, Safety, Light, Productivity	
Commission-ing	C/sq ft.	Operational deficiencies, O&M knowledge, Comfort, Productivity	Scheduling
Lighting	Range	Green, Performance, Other Ops, Lifetime, comfort, safety	Maintenance
Boilers	>100%	Control, Footprint, Tenant Satisfaction, Noise	Lifetime
Motors, Air compressor, HVAC, Daylighting, rebate, PV, renew, others			

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➔ ***Direct Implications for B/C***

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NEBS – WIDELY RESEARCHED

- >20 years, >100 programs & portfolios, many states in model
  - Methods, gaps, priorities, applications
- NEB-It Model to assemble results, quickly analyze
- Transferability of results – depends
  - Measures
  - Climate
  - Targets
  - Inclusions
- Policy - Deliberations in multiple states

'NEB-It" Model

Source: Skumatz / SERA research
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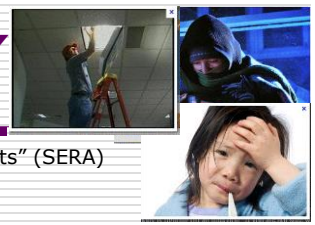
NEBS PRIORITY RESEARCH



- Greatest progress – beyond "lists" (SERA)
  - Utility
  - Societal
  - Participant
- Needs more work / gaps (SERA)
  - Utility
  - Society
  - Participant
  - Overall

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NEBS IN POLICY CONTEXT: BENEFIT-COST / COST-EFFECTIVENESS APPLICATIONS

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NEBS IN TESTS – REDUCE BIAS

- Benefit Cost / Cost-Effectiveness Tests -TRC / Societal, Participant, UCT, RIM… NEBs
  - *Tests already include all costs (easily tracked); use NEBs to provide truer representation of Benefits to address bias… NOT ABOUT "BELIEVING" IN NEBS…*
    - *Better guide measure, program, portfolio investment*
  - **Address by**:
    1) include monetized NEBs or
    2) exclude all costs associated with achieving NEBs
    3) or use UCT (utility cost test)
  - B/C early, then "conservative" awaiting evidence

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NEBS IN COST-EFFECTIVENESS TESTS

- Updated definitions for all BC tests to incorporate appropriate NEBs & refined tests, starting in 2000

Test	Benefits	Costs	States Using Traditionally	Improved treatment with NEBs
Utility Cost (or Program Administrator Test) (UCT or PAC)	• Avoided supply costs for transmission, distribution, and generation (T&G) • Avoided gas and water supply costs	• Program administration • Participant incentives • Increased supply cost	CA; CT; HI; IA; IL; IN; MI; MN; MO; NY; OR; RI; TX; VA; WA; BPA	Use cost only paid by the utility

- **Chicken & Egg** – NOT about "believing" in NEBs. Important uses ← → trusted values; money if "serious" application; evidence
  - Much investment, data, expertise, increments in 20 years… Dominoes…

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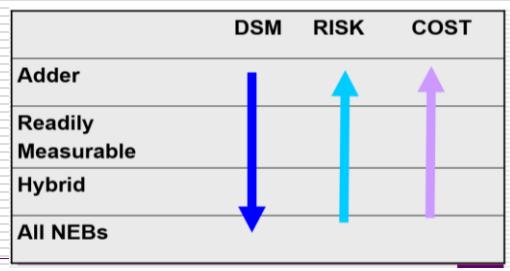
POLICY: US STATES WITH NEBS IN COST-EFFECTIVENESS TESTS

- A number of states include some subset of NEBs – multiple options



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HOW ACCURATELY TO MEASURE NEBS? TRADEOFFS

- **Tradeoffs** – How much to improve tests? How accurately to estimate NEBs? Look at costs & benefits of NEB improvements
  1. What **value range (low to high)** arises from reasonable cost measurement of important / biggest NEBs (evaluation budget)
  2. Does inclusion of LOW vs. HIGH end of the RANGE ***change the decision or B/C conclusion***?

If **NO**, You're done & bias addressed sufficiently

IF **YES**, Refine measurement up to value or cost of "wrong" decision

'NEB-It" Model

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TAKEAWAYS

- 20 years of literature & methods research
- Measured / measurable / high value
  - Methods / best practices / skills
  - Relative to…
  - Patterns / transferability
  - Attribution to measures
  - Most questions already answered…
- Monetizing vs. case studies…
- Multiple applications; audience issues
- Important to reducing bias in decision-making
- Dominos, choices in approach

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THANK YOU!!

Questions?

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