

NON-ENERGY BENEFITS (NEBS)

What have we learned in 20 years?

NEBs for Marketing, Designing, C/E, and
Reflecting Quality of Life Changes

LIFE Conference, Albany, NY, May 29, 2014

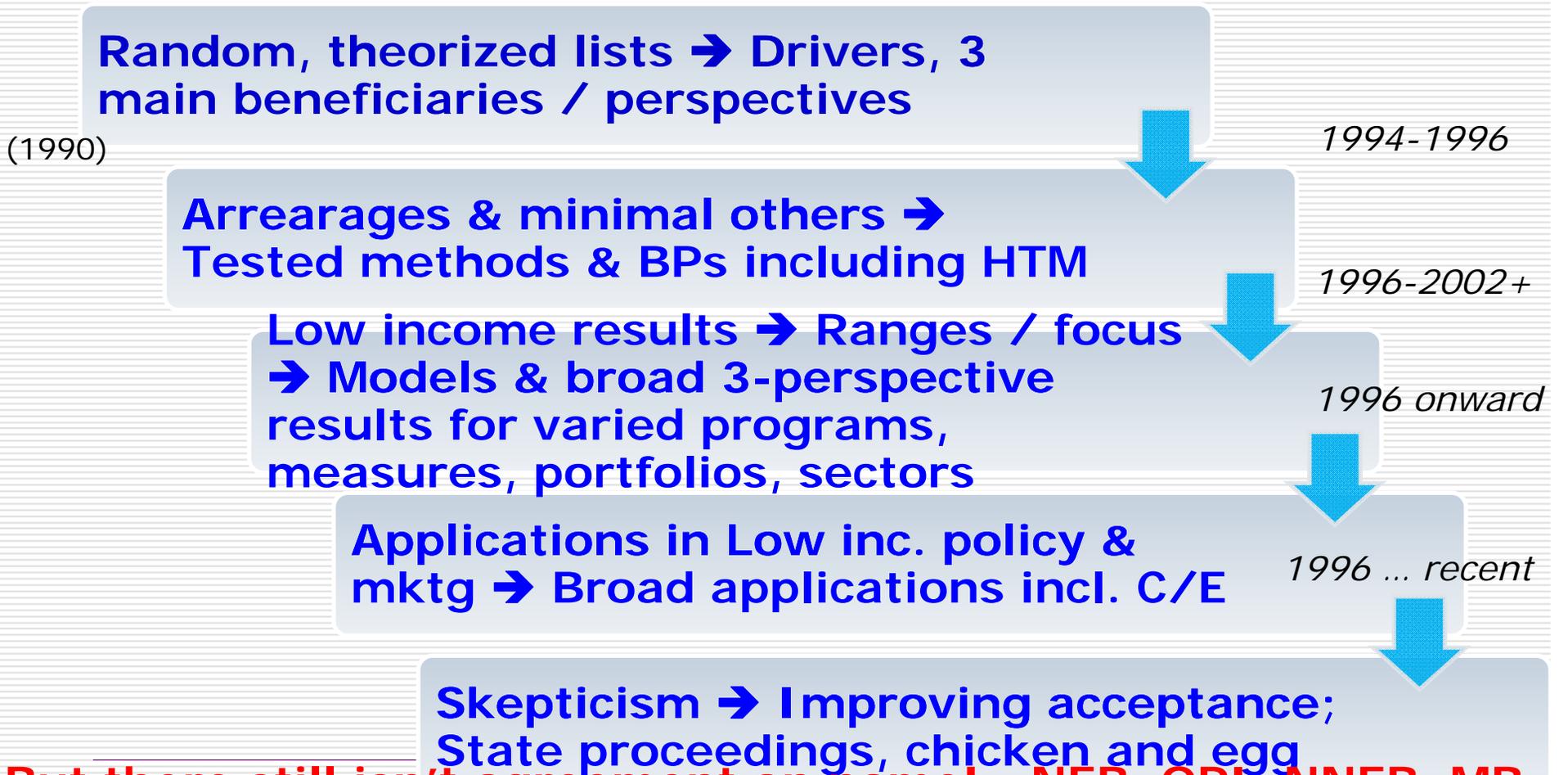


Lisa A. Skumatz, Ph.D.,
Skumatz Economic Research Associates, Inc. (SERA)
skumatz@serainc.com

WHAT MATTERS IN ENERGY EFFICIENCY PROGRAMS?

- What matters, depends on your values.
- Efficiency & savings are not all that matters...
- Especially to your target audience
- Let's talk about NEBs
 - → Background, Estimation, Results, Applications, C/E, Gaps

20 YEARS OF NEBS PROGRESS...

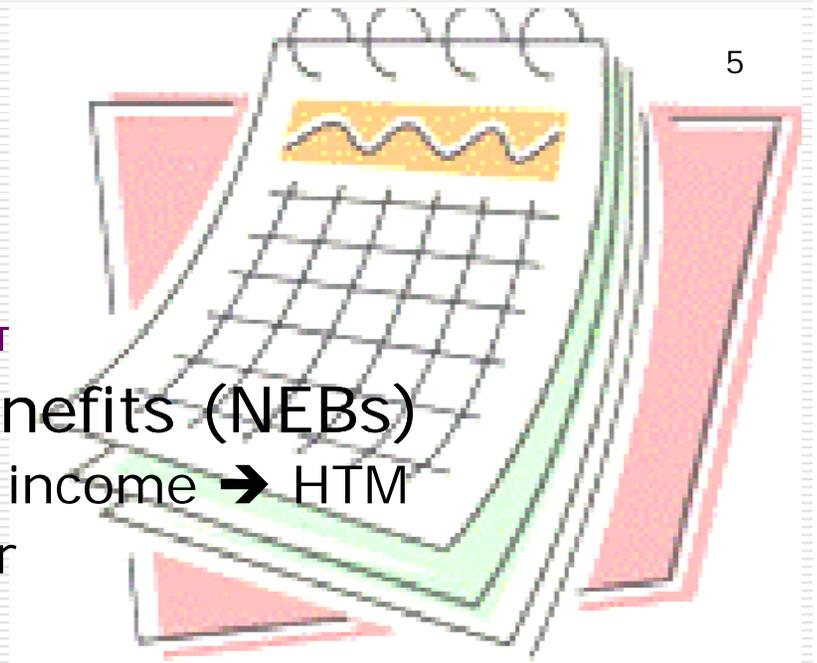


But there still isn't agreement on name! - NEB, OPI, NNEB, MB...

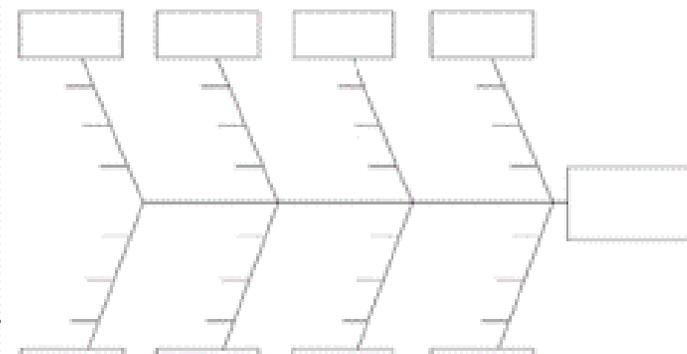
***NEB BACKGROUND /
REVIEW / CONTEXT***

*BACKGROUND / HISTORY**

- 20 years of Non-energy benefits (NEBs)
 - Random + arrearage → Low income → HTM
 - Low income policy → broader
- Motivation
 - Implicit assumption of “0” is wrong, B/C bias, Granger, evaluation to guide decision-making
 - Theory / “bundled features”, positive and negative effects other than energy savings
- 3 Beneficiaries, drivers (1994-5)
 - Utility
 - Society
 - Participants



NEB DRIVERS, 3 BENEFICIARIES



Utility/Ratepayer	Societal	Participant (all)
<ul style="list-style-type: none"> ○ Payments/financial ○ Debt collection efforts / calls ○ Emergencies / insurance ○ T&D, power quality, reliability ○ Subsidy (LI) ○ Other 	<ul style="list-style-type: none"> ○ Economic development / job / multipliers ○ Tax impacts ○ Environmental ○ Emissions ○ Health ○ Water & other resources / utilities ○ National security ○ Wildlife/Other 	<ul style="list-style-type: none"> ○ Payments & coll'n ○ Education ○ Building stock ○ Health ○ Equipment service incl. productivity, comfort, maint, etc. ○ Other utilities (water, etc.) ○ Other (transactions, enviro, psychic, etc.)

NEB CATEGORIES BY PERSPECTIVES – FROM DRIVERS

Utility

- 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

Society

- 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

Participant

- 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

(res & com'l)

- 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

Source: Skumatz/SERA, 1996 on)

NEBs – BEST PRACTICES*

□ History:

- Primary vs. secondary and tertiary effects (NEBs)...
- Noted key applications; then went “conservative” until comfort level increased & more estimations
- *Chicken and Egg – important uses* ← → *trusted uses*; (won’t incorporate effects until well-measured; no money at measurement unless “serious” applications...)

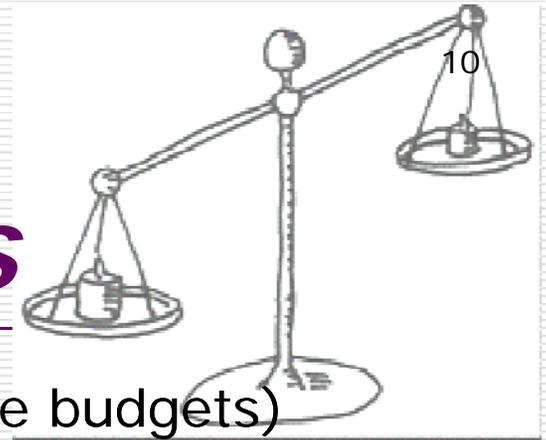
□ Best practices / issues – “NET NEBs”

- Redundancy / perspective
- Net positive / negative
- Net standard efficiency
- Net free riders

- Minimizing overlap / double-counting (drivers)
- Application subsets
- Attribution & precision; depends; relative to use; net
- MONETARY terms

NEB ESTIMATION APPROACHES

BACKGROUND – MEASUREMENT OF NEBS



- Early – arrearages and related (low income budgets)
- Challenge – “Hard to Measure” (HTM) – stuck, no progress
 - Traditional WTP/WTA; unsuccessful; ferry & academic (1996)
 - Methods progress - 20 years of research; hundreds of studies; US & international
 - Functions/objective vs. perceptions
- Goals and practical tradeoffs for defensible estimates
 - Need reasonable data quality
 - Need ability to collect data
 - Need sufficient number of observations for reliability / transferability / bias issues
 - Need quality responses
 - Singular NEBs issue / overlap
 - → Accuracy, consistency, unbiased, large sample...

NEBs MEASUREMENT – 4 MAIN MEASUREMENT APPROACHES*

Direct Measurement	Secondary + Lit/Meas	Modeling	Survey-Based
<ul style="list-style-type: none"> • → Records, billing data, market info; regression • Utility, arrears, debt, calls, notice, subsidies; broader individ. • Sample size 	<ul style="list-style-type: none"> • → Incremental incidence * valuation • Water savings, insurance, O&M, etc. • Many factors available 	<ul style="list-style-type: none"> • → 3rd party or specialized models • Emissions, Economics • Many straight-forward, but also slippery slope 	<ul style="list-style-type: none"> • → Multiple approaches • Participant effects (HTM) -only option for some <p>Survey options</p> <ul style="list-style-type: none"> • CV (WTP/WTA; open v. bounded) • Relative scaling (LMS, comparative, numeric) • Ranking (Ord. Logit, AHP, rank, conjoint) • Hedonic Regr • Other

Story of a ferry... then it's academic

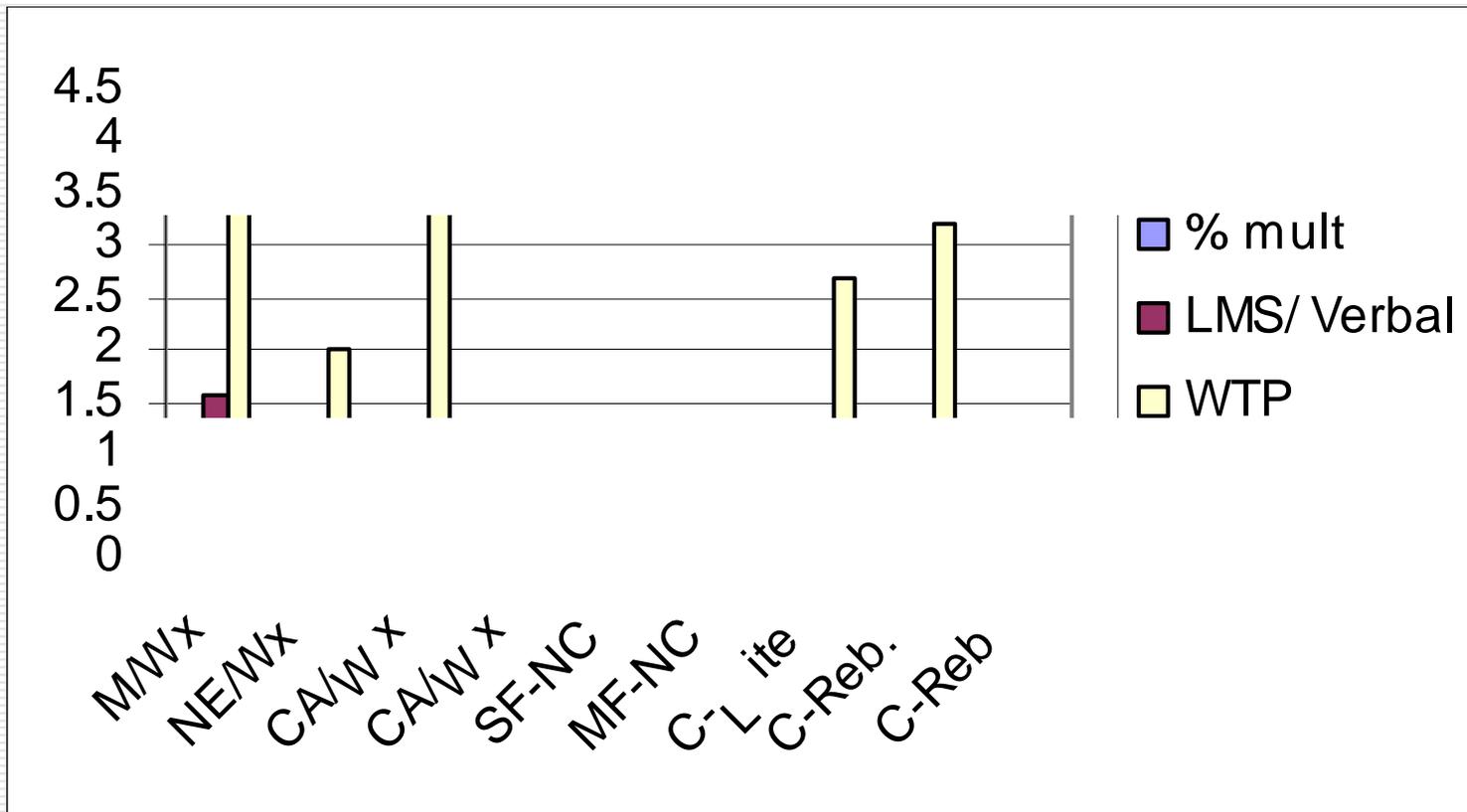
Strengths & weaknesses

Balancing precision & practical

Avoid bias, achieve high numbers

False comparisons?

PARTICIPANT MEASUREMENT METHODS COMPARISON – STATED PREFERENCE



Other papers compare WTP,
Bounded WTP, LMS (SERA/WEA 2006)

(Source: Skumatz/SERA
ACEEE paper 2002)

EMPIRICAL RESULTS – STATED PREFERENCE COMPARISONS

- Survey results
- Hi-efficiency versus standard model

Question format	NEB value (\$)
Relative scaling	75
Discrete CV	70
Rank-order	85
Open-ended CV (avg)	611
Open-ended CV (med)	36

ASSESSMENT OF NEB MEASUREMENT & DATA COLLECTION METHODS*

		LOW PERFORMANCE → → → → HIGH PERFORMANCE			
LOW COST ↓ ↓	○ Willingness to Pay (WTP) (volatile)				Web ⊖
	○ Willingness to Accept (WTA)				Verbal scaling, LMS
	○ Bounded				○ Comparative / numeric
				WTP/WTA	
				Mail-in ⊖	○ Discrete choice
				Email ⊖	○ Ranking
				Phone/fax ⊖	○ Ordered logit
HIGH COST	○ Direct valuation (obs, bias)			○ Regression (ltd categ)	
	○ Market valuation (obs, bias)			Intercept survey ⊖	

© SERA

© SERA

Based on SERA tests, comparisons, studies

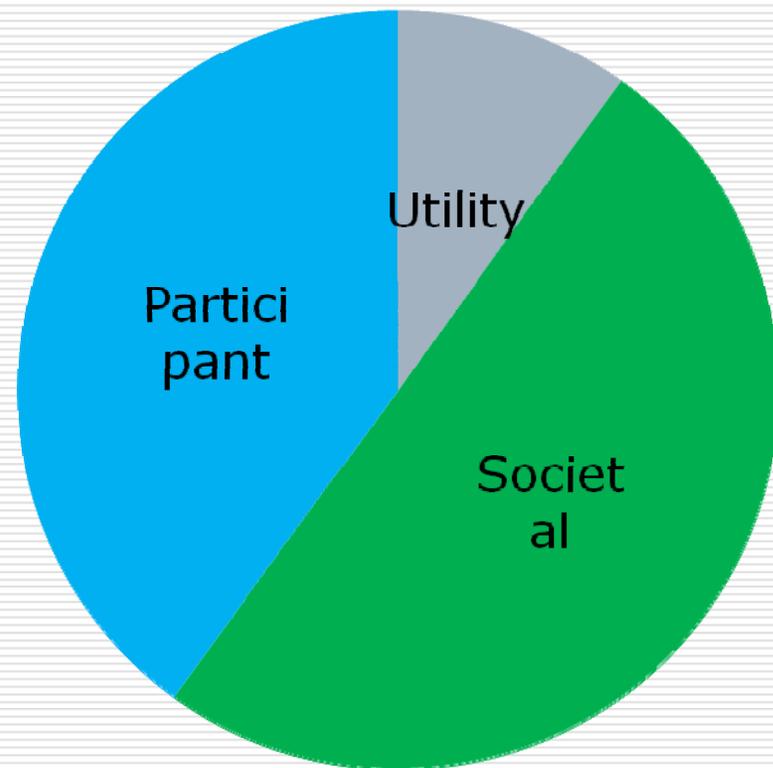


NEB RESULTS: EXAMPLES

Presenting Residential, low income examples; have many other residential & commercial as well – applies across all.

WHICH SOURCES OF NEBS ARE HIGH VALUE?

- Results sample of ~100 programs we've done & lit review
- Which sources dominate?
- Utility 10%; Societal 40-60%, participant 30-50%
- Considerable variation by program, climate, measures



WHICH NEBS ARE HIGHEST VALUE?*



- Utility (10%)
 - Few, low value (arrearages, subsidies)
- Societal (40-60%)
 - Emissions
 - Economic development
 - Potentially health (not well measured yet)
- Participant (30-50%); *(often higher for low income)*

Residential

- Comfort
- Avoid moving / homelessness; home value
- Illness / health
- Ability to pay other bills / savings
- Green

Commercial

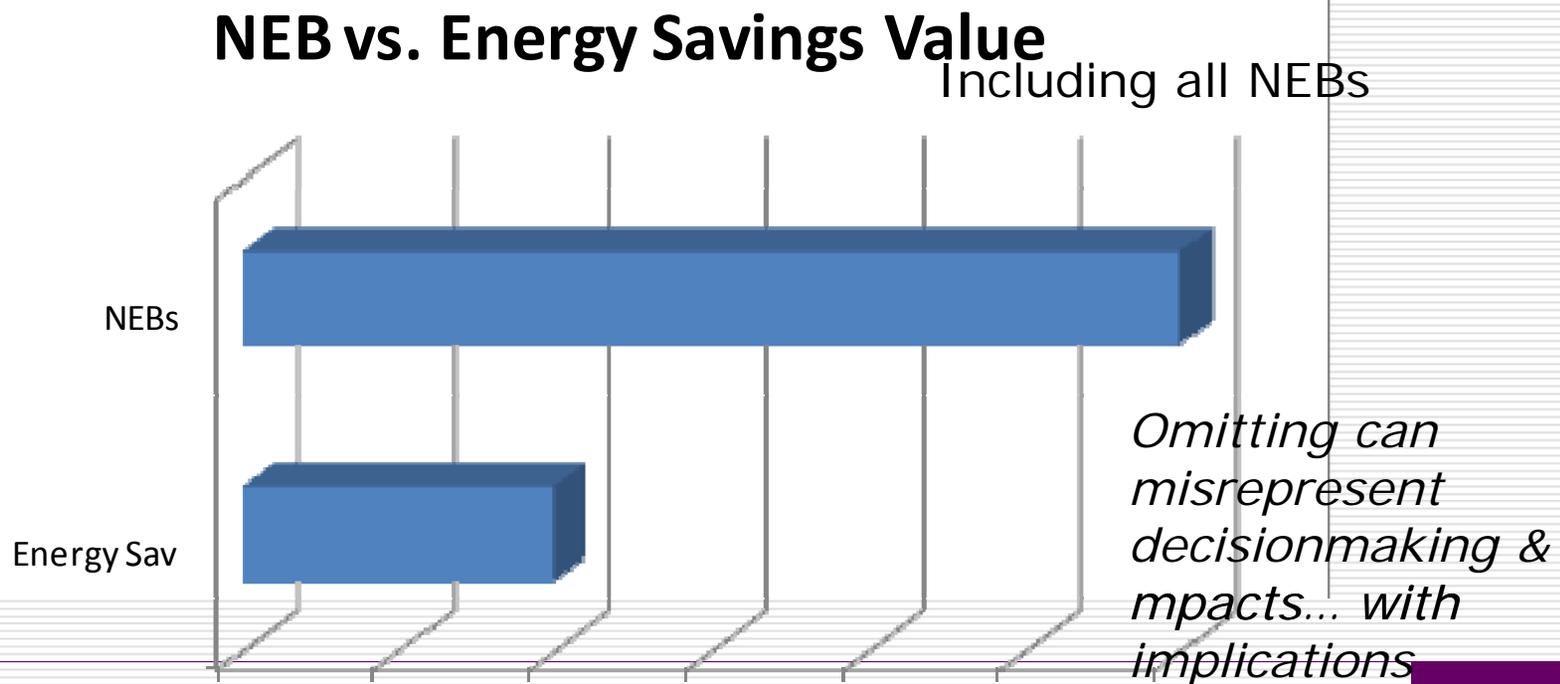
- Tenant satisfaction
- Maintenance
- Comfort
- Ability to sell
- Productivity
- Green



- Gaps
 - Health & safety, peak, infrastructure, security, hardship

ARE NEBS HIGH VALUE?

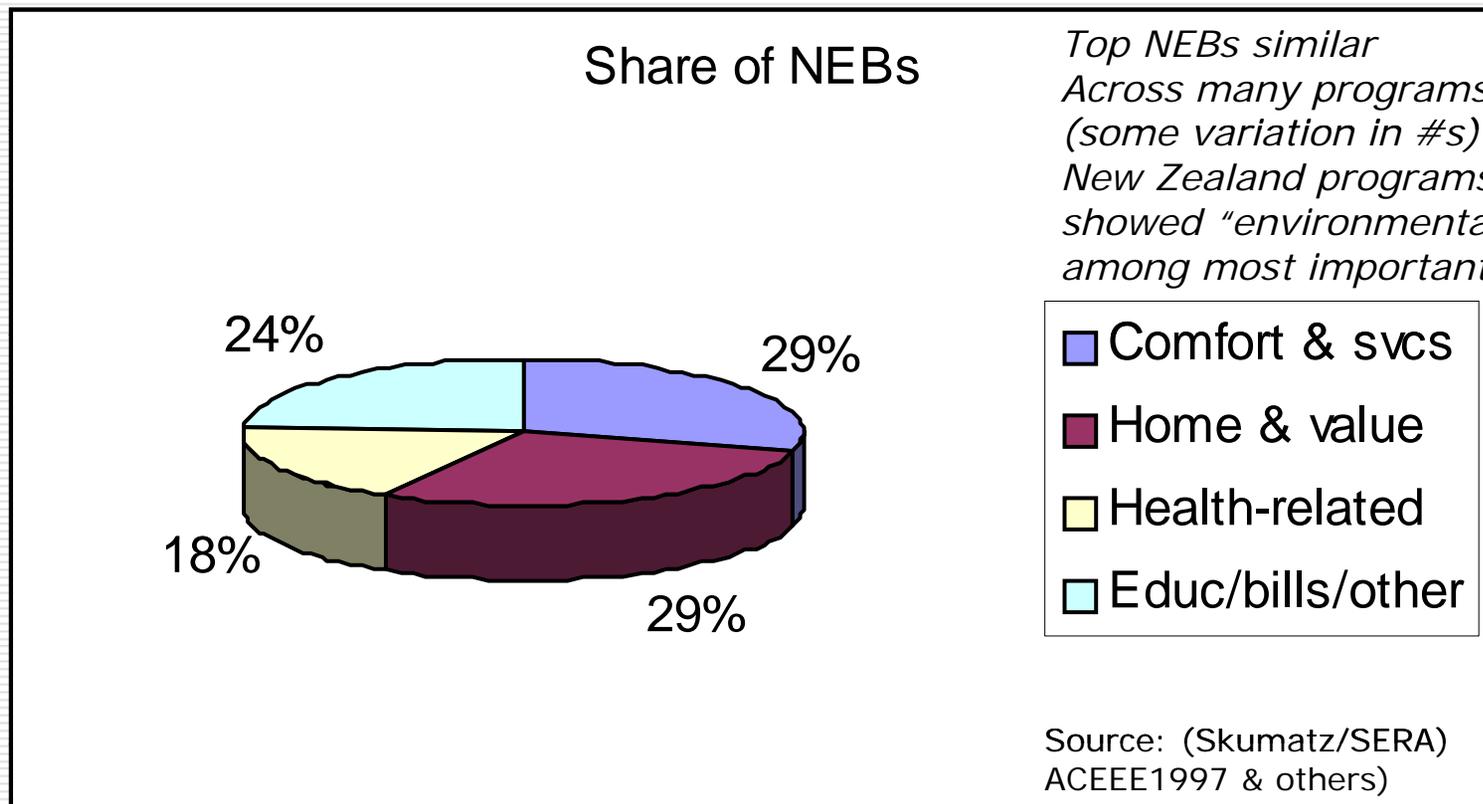
- *Energy savings are less than ¼ of benefits from low income weatherization programs – less than 1/10 for some programs*



Source: (Skumatz/SERA
2010 & others)

WHICH PARTICIPANT NEBS ARE HIGH VALUE?

□ Example Participant NEBs breakdown

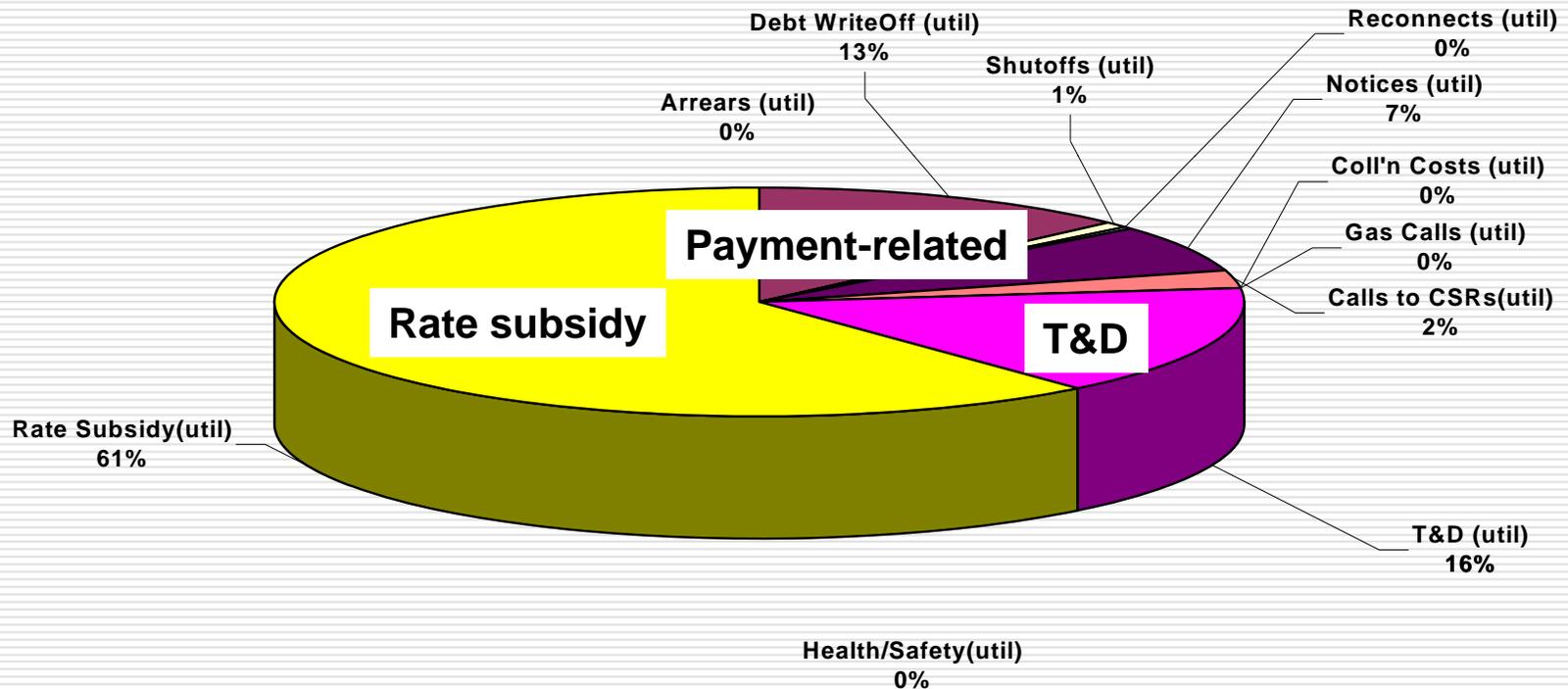


Persistence issues...

UTILITY NEBS

EXAMPLE: LOW INCOME WX

Utility NEBs for Template Program



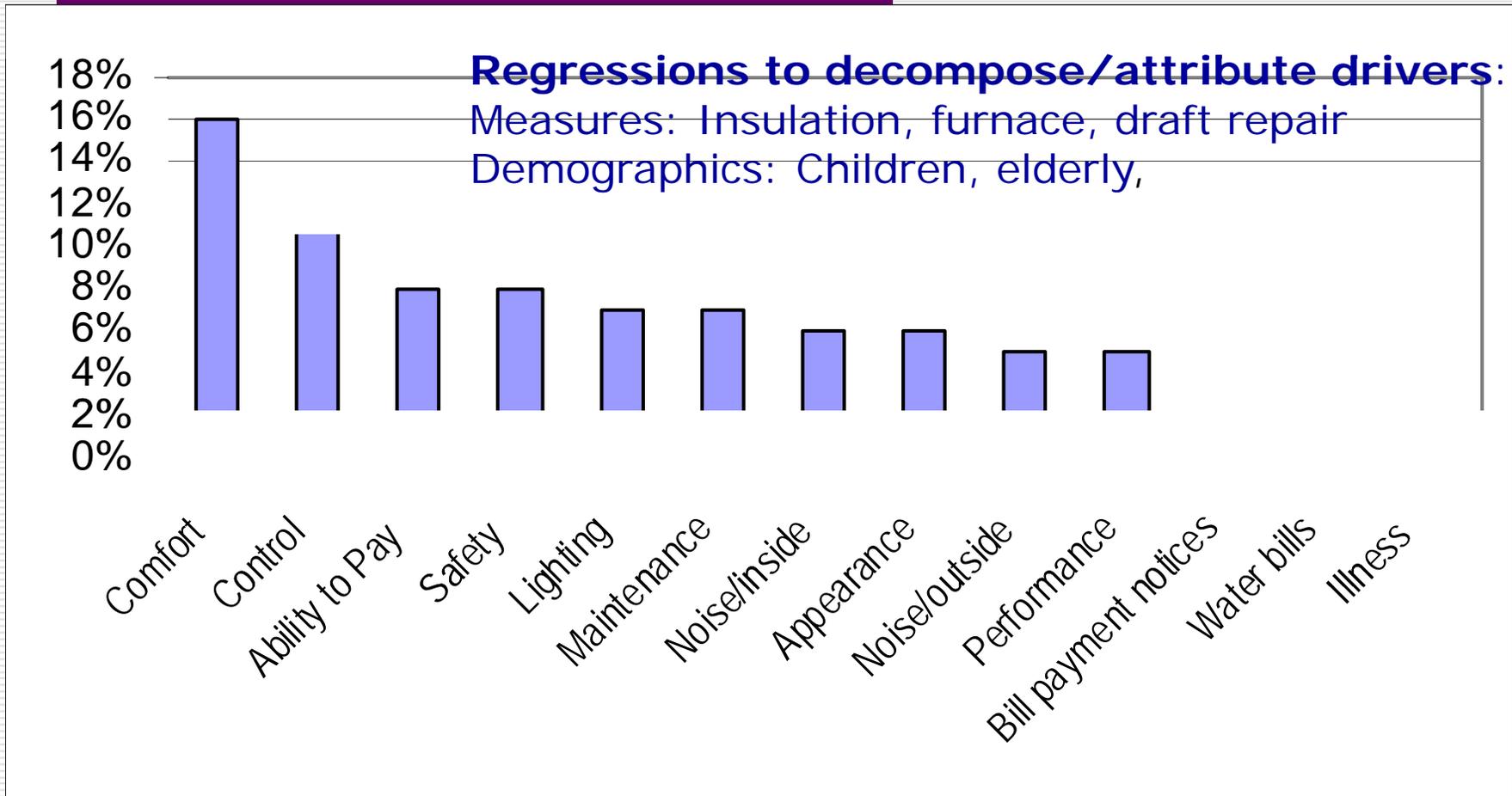
MODELS

Source: Skumatz Economic Research Associates research

SERA

TOP NEBS FOR WX PROGRAM

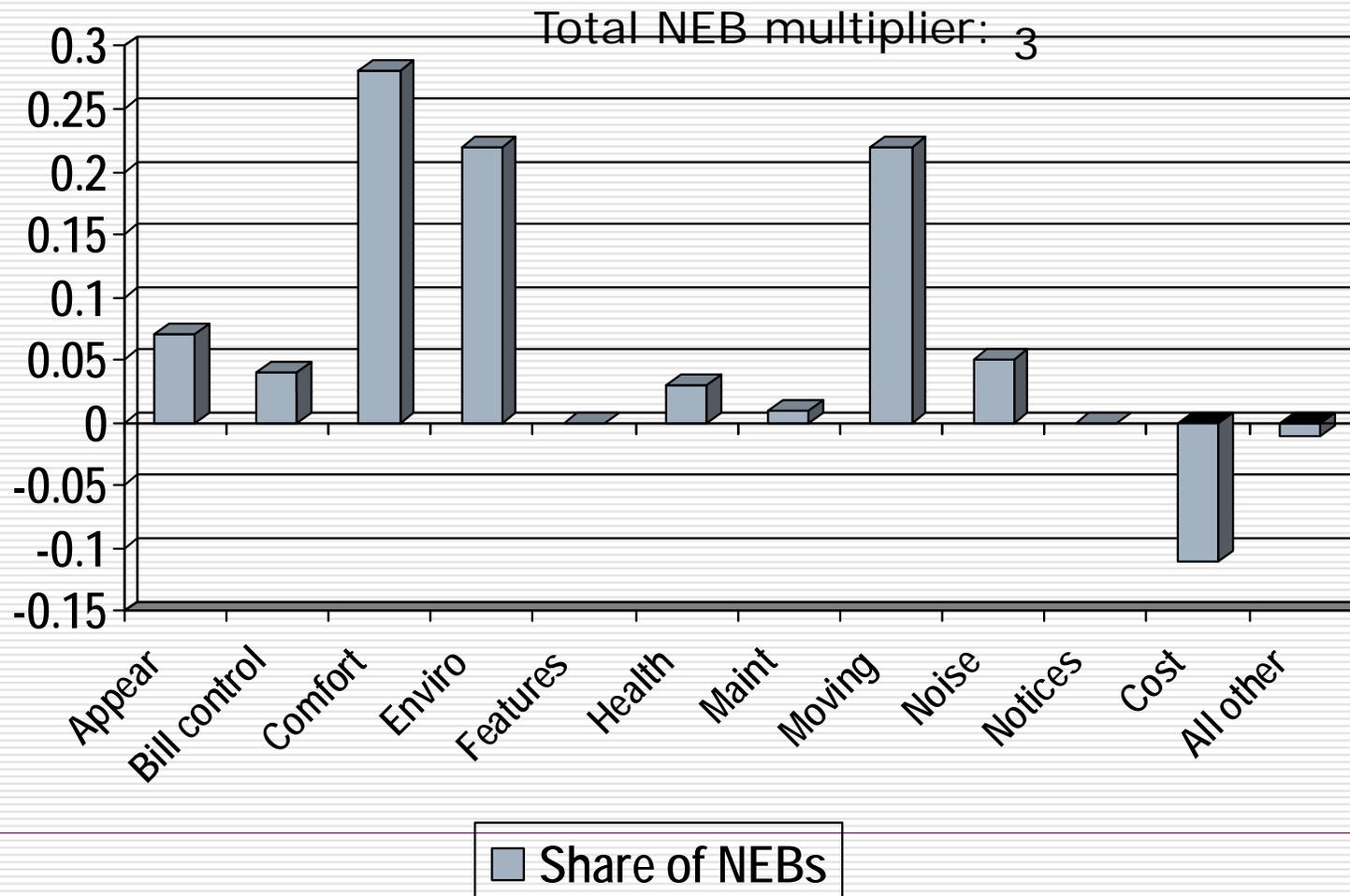
(Percent of total survey-based participant NEBs)



Source: Skumatz Economic Research Associates research

SERA

PERCENT OF TOTAL NET NEB VALUES BY NEB CATEGORY: ZALEH/NZ



Source: Skumatz/SERA

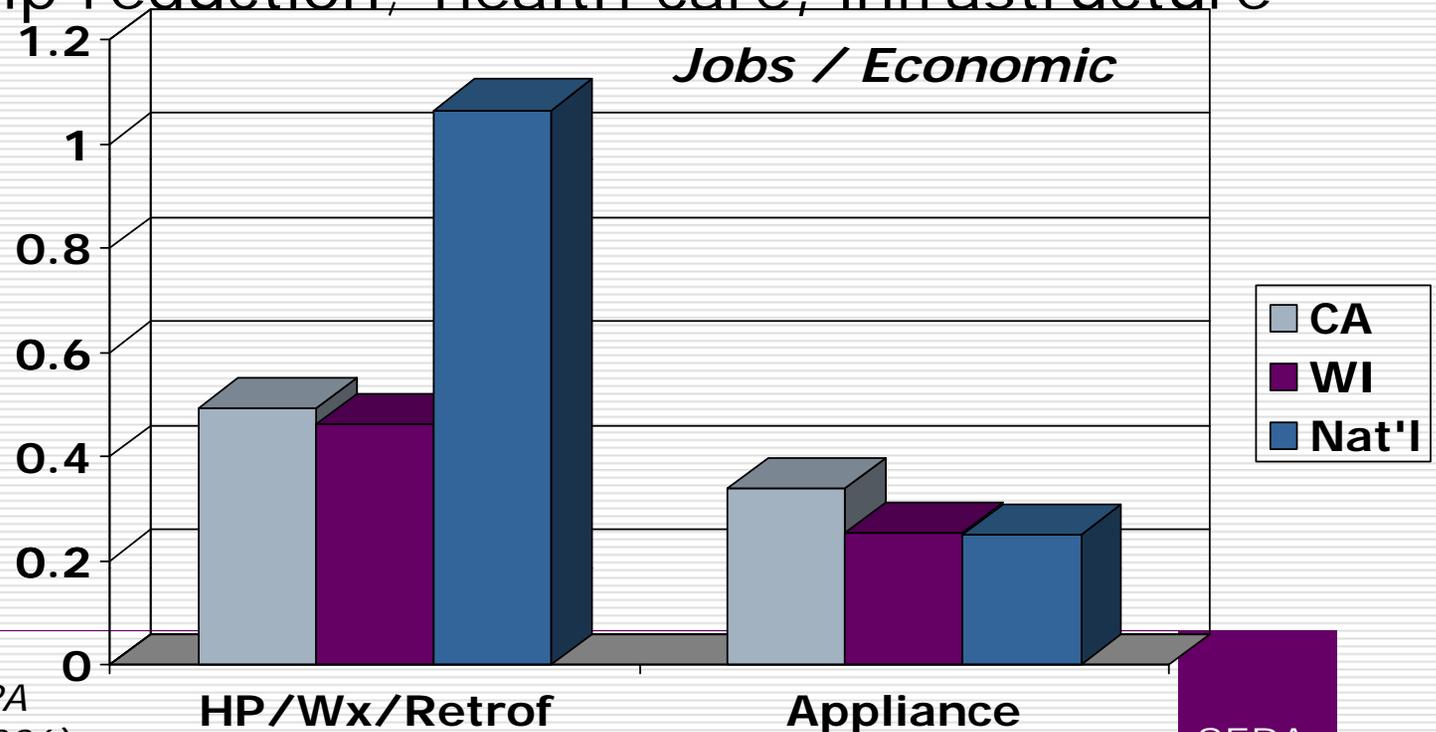


NEBS

- NEBs values depend on measures included
 - Decomposition of packages
- Some patterns
- Enemy of the good...

SOCIETAL IMPACTS

- Strong economic development performance
- Emissions – vary by generation; much measurement
- Hardship reduction; health care, infrastructure
- Gaps



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

SERA

NEBS MEASURED IN SURVEYS: CHANGES IN...

- Comfort
- Aesthetics / appearance
- Lighting quality / quantity
- Noise
- Safety
- Property value(*)
- Moves
- Control over bill / knowledge / concern / notices, etc.
- Doing good for environment
- Equipment lifetime*
- Equipment maintenance*
- Illness / lost days / visits / cost
- Other bills*
- Business productivity
- Other
- Valuation metrics vary for valuing these impact changes
 - Some directly valued from survey responses (depending on method)
 - Others "valued" (e.g. calls times length times value of time)

Some can be derived other ways, checked

Some should be explored as financial calculations instead (*)

PROGRESS & GAPS IN NEBs*

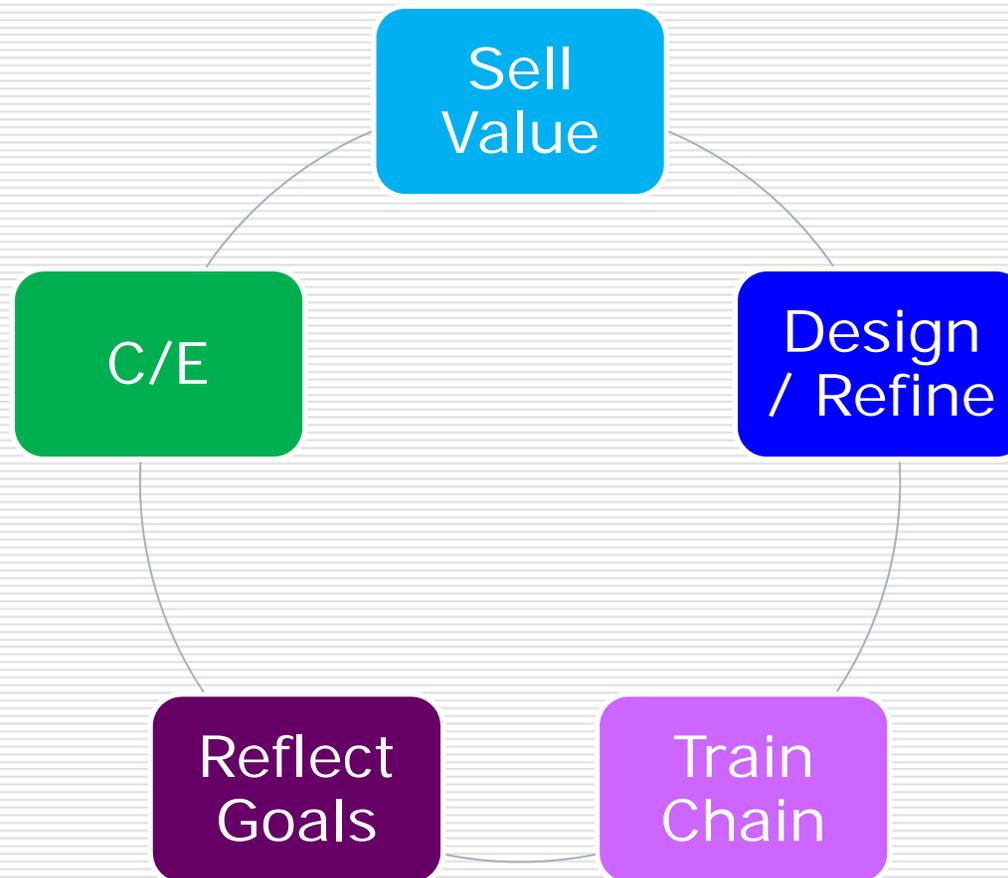
- Greatest progress – beyond “lists”
 - Utility: coll’n; some T&D, subsidies
 - Societal: Climate change – models; Economic development (net)
 - Participant: water/sewer, payment-related; property value, some illness, moves, “soft” in total (not assoc. with measures); some O&M & performance
- Needs more work / gaps
 - Utility: T&D, kW, capacity, health and safety, insurance, substation infra, power quality
 - Society: Water infrastructure, hardship; kW/capacity; H&S, neighborhood improvement; (wildlife; national security, tax)
 - Participant: Limited progress on hardship indicators (LI); com'l performance/prod; fire/safety/gas; chronic health/H&S / IAQ
 - Overall: persistence pattern (& underlying EULs weak); transferability, policymakers, B/C

RESULTS

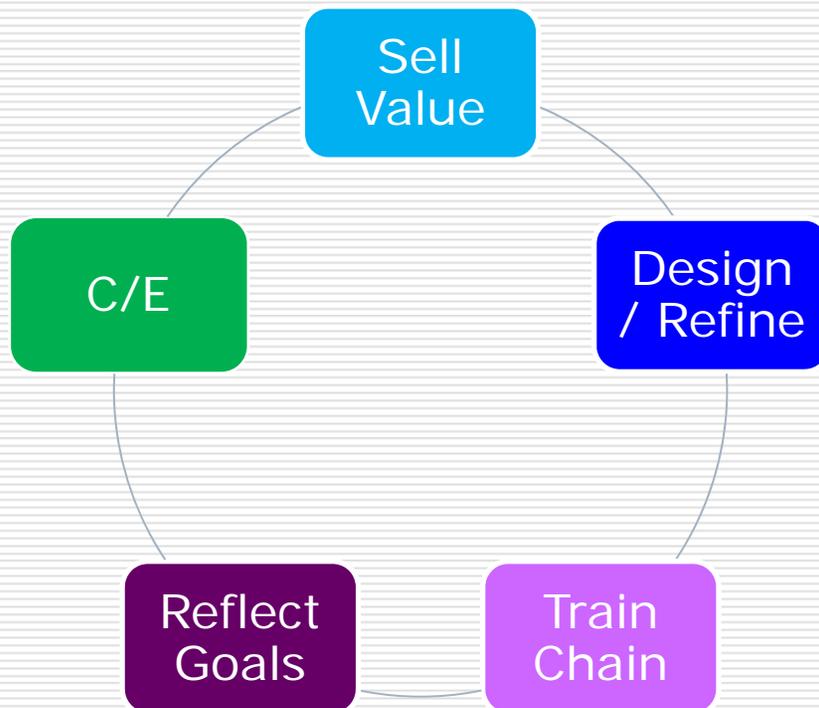
All Monetized

PROGRESS IN APPLICATIONS OF NEBS

KEY APPLICATIONS OF NEBS

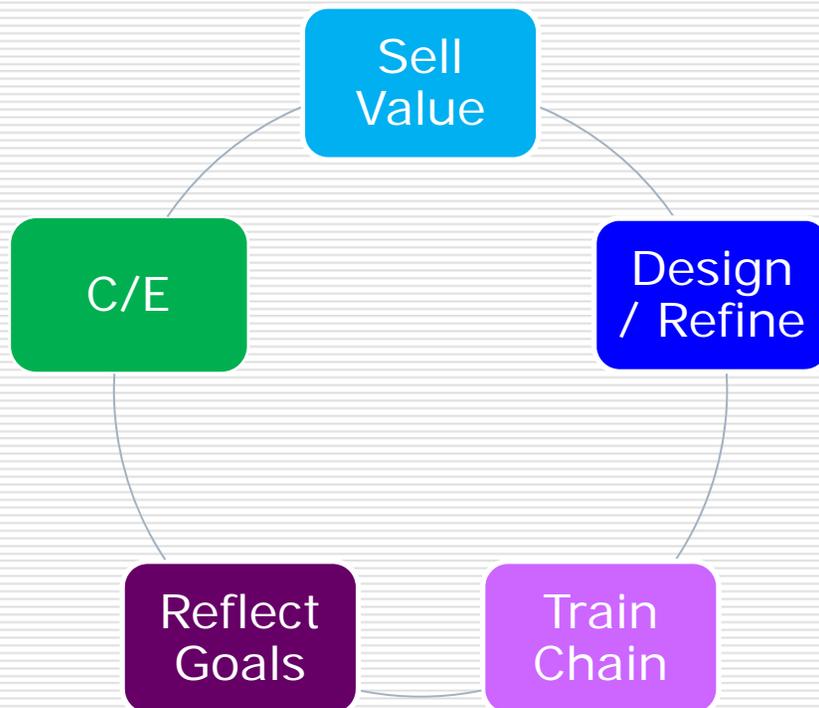


KEY APPLICATIONS OF NEBS



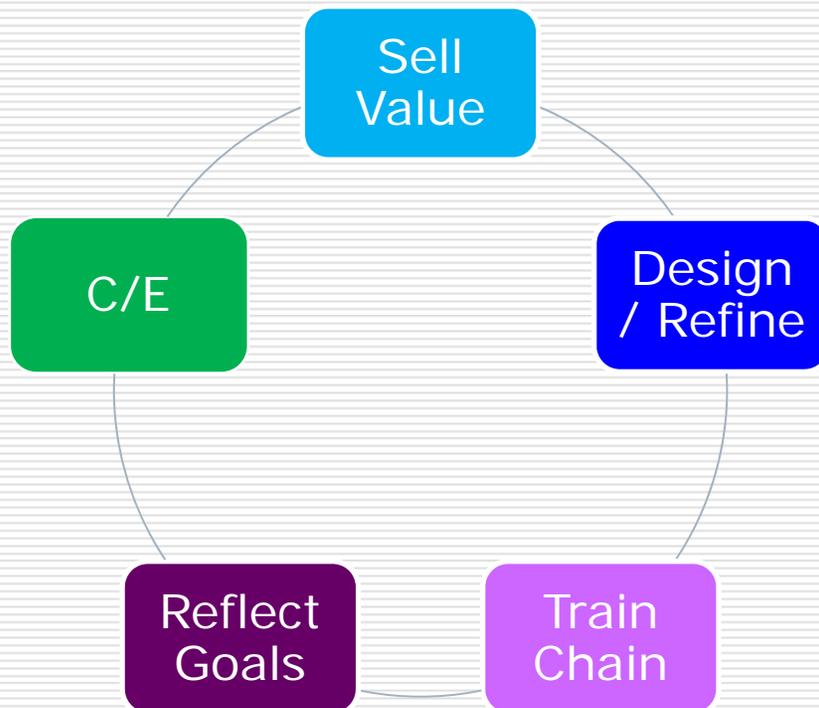
- Sell what is valued
 - NEBs are what is valued (market research)
 - Bundle of services – “utility” – NOT irrational
 - NEBs > Energy sav.
 - (trust in savings?)
 - Perception important
 - Easier to sell
 - Sell on THEIR values

KEY APPLICATIONS OF NEBS



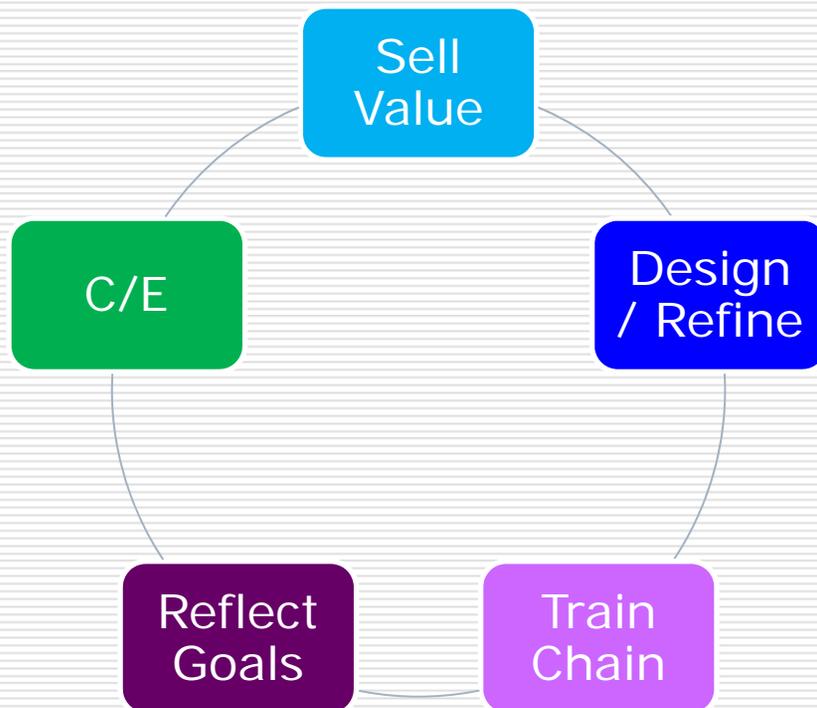
- Design / Refine / Evaluate Programs
- Positive → all equal...
 - Expand measures bringing most NEBs
 - Target those with greatest NEBs
- Negative
 - Refine program with rebates, warranties...
 - Up to \$ suggested
- Better process eval.

KEY APPLICATIONS OF NEBS



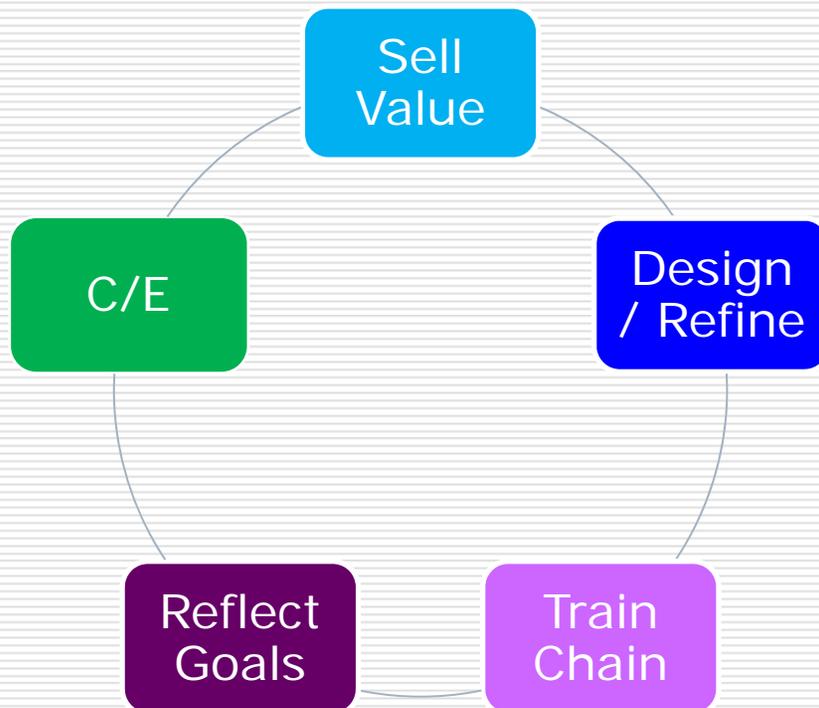
- Train the Chain
- Found “disconnects”
- Need their support
- Lost potential
- Train, educate to maximize support

KEY APPLICATIONS OF NEBS



- Reflect Policy Goals
- NEBs ARE THE GOALS of many low income programs / Q of Life
- Comfort, ability to pay, school retention, etc
- Hardship metrics

KEY APPLICATIONS OF NEBS



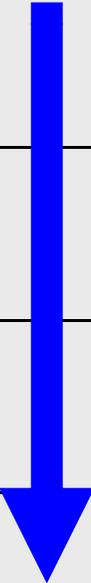
- ❑ Cost-Effectiveness
- ❑ Program & portfolio choice
- ❑ Bias in current tests – TRC, Societal Test, etc.
- ❑ Includes all costs, not (all) benefits
- ❑ Increase investment in EE, including LI
- ❑ Which NEBs depends on test
- ❑ Progress in states / participating, estimating

ADJUSTED PAYBACKS – ADDING ONLY PARTICIPANT EFFECTS

- Gross payback: 5.6 yrs → 2.5
- Net payback excl. FR: 9.0 yrs → 4.0
- B/C incl all partic NEBs: 0.9 → 1.9
- B/C adj for FR: 0.55 → 1.2



METHODS TO INCLUDE NEBs IN REGULATORY TESTS

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

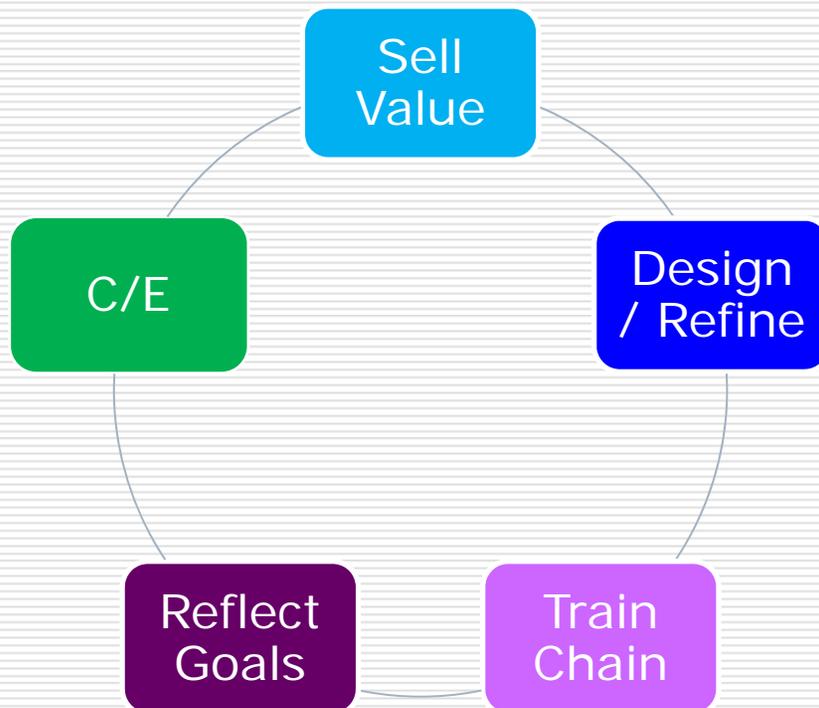
STATE / REGULATORY NEBS

- *Measured for 20 years*
 - *evaluated, worked with states & regulators & interveners in proceedings & stakeholder groups – incl. international*
- *More states reviewing*
- *Results show bigger NEBs for Low Income programs*
- *More states incorporate LI adders / policy recognition*

DIRECTIONS & LEFTOVERS*

- Feedback to design
- Perception they are inaccurate – Risk, accuracy
 - Level needed for decisions? Need reliability for important uses - False accuracy / spreadsheets & forecasting
- Perception that NEBs are costly
 - Next steps: CT - Incorporating NEBs into all process evaluations; incremental set of question on surveys
- Retention: follow measure? EULs reliable? 25 yr tech change
- Consequences of omission
 - Bias in EE investment; getting max for same budget/same for less
 - Incomplete understanding of participation,
 - Ineffective marketing / targeting campaigns,
 - Under-capture in market;
 - Inefficient / ineffective / suboptimal programs & portfolios...

SUMMARY ON NEBS



- Measured & valuable – MORE valuable than savings
- Tested, consistent methods
- Important uses incl. C/E
 - Bundle of services, Chicken & egg
- Key for bringing & reflecting value & goals –
- Can use NOW – sell on what they value – piggy-back on social mktg, SE...

We've measured for 20 years, evaluated, worked with states & Regulators & interveners in proceedings & stakeholder groups

THANK YOU!!



Questions?



Can you tell we do all-day workshops on this!?

Lisa A. Skumatz, Ph.D.

*Skumatz Economic Research Associates
(SERA), Phone: 303/494-1178*

[*skumatz@serainc.com*](mailto:skumatz@serainc.com)

