MEMORANDUM

TO: TECHNICAL ADVISORY COMMITTEE

FROM: CHERYL JENKINS, PROJECT MANAGER and SAM DENT, TECHNICAL LEAD - VEIC

SUBJECT: DOCUMENTATION OF TAC REVIEW OF NON ENERGY BENEFITS

DATE: 01/08/2016

Cc: ANNETTE BEITEL, SAG

Contents

1. Overview

During the development of the v5.0 Illinois Statewide Technical Reference Manual (TRM), the Technical Advisory Committee (TAC) were tasked with reviewing proposals to include the addition of Non Energy Benefits (NEBs) in to cost effectiveness screening calculations for a select subset of efficiency measures. NEBs represent additional benefits (such as improved comfort or health benefits) or costs (such as negative health impacts, negative aesthetics impacts) beyond energy savings which are a result of the efficiency measures. While the TRM currently accounts for some NEBs – namely water savings, carbon emissions, and some operation and maintenance costs, often there are additional impacts of the efficiency work that are more difficult to quantify.

A Stakeholder Advisory Group subcommittee spent time discussing the inclusion of additional NEBs and has determined that they should be developed on a measure-specific basis, rather than being a straight adder applied to all or to a particular market (e.g., low income), and that the TRM TAC is the appropriate place to develop and discuss the appropriate values to be applied.

VEIC received the following two proposals through the TRM issue tracker process:

1. Adding non-energy benefits to residential "whole house" measures and multi-family measures: Chris Neme, representing the NRDC. This proposal was based on work performed by Lisa Skumatz, from Skumatz Economic Research Associates, to review the NEB literature and make a proposal for appropriate values for Illinois.
2. Adding non-energy benefits to C&I .: Phil Mosenthal, representing the Attorney General. This workpaper recommended using the values developed by Massachusetts for commercial retrofit programs.

VEIC performed a review of the proposals and the studies used as the basis for the NEB values being proposed. Focus was upon ensuring that there was no double-counting of the benefits and costs already included in the TRM. The proposals were discussed on a number of TAC calls, and the first draft of an attachment to be included in the TRM - "Attachment B; Illinois Statewide Non Energy Benefits Methodologies" – was provided for review on 10/23/2015 (provided in Section 2 below).

A number of comments were provided by TAC members (summarized in Section 4 below and provided in their entirety in Section 5). A request to provide more detail from the studies on the exact type of NEB being included and their relative percentages was received, which led to a second deliverable of two Excel spreadsheets that attempted to provide this additional clarity (provided in Section 3 below).

Through review of the comments and subsequent TAC discussions, it soon became clear that a consensus inclusion of NEBs in any form[1] was not going to be possible. Many comments and concerns were of a policy nature (i.e., are NEBs appropriate to be included at all; if so, exactly what type of NEB are appropriate, etc.), and it was noted that the TAC is not the appropriate arena for such policy based discussions. Furthermore, there was a desire for both Illinois-specific evaluation efforts and, perhaps most importantly, guidance from the Illinois Commerce Commission (ICC) as to what, if any, are appropriate additional considerations that can be applied to the Total Resource Cost test for cost effectiveness, before parties felt they would reach a comfort level for their inclusion.

This memo aims to provide the detail around what was proposed and the comments received, in order to document the concerns that have been raised through the TAC process and to aid the furthering of this discussion through alternative avenues.

[1] In addition to reviewing the proposals, there was also discussion again about providing a single program/ population wide adder, and/or making the adders considerably lower for conservatism. None of these options were approved by the TAC.

2. **Attachment B; Illinois Statewide Non Energy Benefits Methodologies, 10/23/2015 Draft**

Illinois Statewide

Technical Reference Manual

for Energy Efficiency

Attachment B

Illinois Statewide

Non Energy Benefits

Methodologies

DRAFT

Effective for Evaluation:

June 1st, 2016

A. RESIDENTIAL WHOLE HOUSE RETROFIT NON ENERGY BENEFITS

Figure 3 below represents Technical Advisory Committee (TAC)-approved (Note this is language for if/when it is approved – rather than suggesting it already is) multipliers to first year kWh or Therm savings to determine a lifetime net present value (NPV) of Non-Energy Benefits (NEBs) for measures in a Residential whole house retrofit program. This additional benefit should be added to the Energy benefits and applied in the Cost Effectiveness Tests.

The values are based upon a workpaper produced for the Illinois Technical Advisory Committee by Skumatz Economic Research Association*; Skumatz Lisa A., 2015, Considering the Inclusion of NEBs in IL TRM for Single and Multi-family Whole Building Retrofit Programs: The Issue of Measure-Based NEBs.* The study examined literature from across the nation and found "consistency in some NEB categories, sufficient to indicate strong NEB values and attribution to some measures". The ultimate recommendation was to base Illinois NEB values for whole house Retrofit program measures on an evaluation prepared for Massachusetts Program Administrators; *NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation*. This study, itself based upon in-depth participant surveys and extensive literature review, was found to be robust and provides measure attribution and total non-energy benefits values consistent with other studies. Table 9-10 from this study provides the attribution of NEB values to energy efficiency measures through a whole house retrofit program and the values are summarized below in Figure 1. Note that two exceptions, appliances and lighting, are provided, where the recommendation was to instead use work performed in *Skumatz, Lisa A., 2004, Non-Energy Benefits from ENERGY STAR®: Comprehensive Analysis of Appliance,Outreach, and Homes Programs, Proceedings of the 2004 ACEEE Summer Study, Asilomar, CA, August.* Figure 2 below provides these additional values, noting that the 2004 study results for lighting are further refined to remove impacts from longer measure lives and operation and maintenance (O&M) savings due to those already being accounted for in the TRM measures themselves.

Figure 1: Recommended NEB Values as Multipliers on Bill Savings

Measure	NEI Multiplier on Energy Savings	Measure	NEI Multiplier on bill savings
Air Sealing	47%	Insulation	116%
Appliance (refrigerators and freezers)	See Figure 2	Lighting	70% (See Figure 2)
Cooling systems	27%	Service to heating or cooling system	4%
Duct Sealing	4%	Low Flow Showerhead	1%
Heating & Cooling system	24%	AC system sizing	4%
Heating & Hot water system	7%	Programmable Thermostats	12%
Heating system	231%	Window	6%
Hot Water System	8%	Weatherization	114%

Figure 2: Estimates of Appliance NEBs as a Percent of Measure Savings – Bill Savings Multipliers

Household appliances	Refrig-erators	Dish-washers	Clothes Washer	Room Air Condit-ioner	CFL Bulbs	Lighting Fixture
NEB Multiplier as a percent of the measure's energy savings	29%	65%	54%	71%	70%	30%

Upon review, NRDC amended their proposal by requesting the removal of the lighting adders at this time stating that they believe "there is empirical evidence to suggest that there are lighting NEBs beyond those associated with either the environmental benefits and longer measure life than incandescents/halogens (which translates to O&M savings). Lisa's 2004 ACEEE paper makes that clear. However, it is also true that environmental benefits and lifetime/O&M benefits, both of which are already captured in either avoided costs or the current TRM assumptions, are the biggest of the lighting NEBs".[2] Lighting assumptions have therefore been removed from the following table.

To turn the percentage multipliers of bill savings from the tables above into a single lifetime NPV NEB adder per first year kWh or Therm, VEIC used the appropriate measure lifetime assumptions in the TRM and an average Electric and Therm residential retail rate (derived from Electric and Gas Sales Statistics documents published on the Illinois Commerce Commission website[3]) to calculate the following factors[4]:

[2] Email to TRM administrator from Chris Neme, 10/22/2015.
[3] http://www.icc.illinois.gov/publicutility/salesstatistics.aspx?type=e
[4] See 'Residential Whole House Retrofit NEB factor calculator.xls' for more details.

Figure 3: For measures in whole house retrofit program only
To calculate a *single NPV* non-energy benefit, multiply the first year annual kWh or therm savings by:

Electric Saving Measures	$/First year kWh
Airsealing	$0.53
Refrigerators	$0.28
Dishwashers	$0.66
Clothes washers	$0.58
Room AC	$0.68
Cooling Systems	$0.34
Duct Sealing	$0.05
Heating & Cooling system	$0.30
Heating System	$2.92
Hot Water system	$0.08
Insulation	$1.76
Service to heating or cooling	$0.01
Low Flow Showerhead	$0.01
Programmable Thermostat	$0.06

Gas Saving Measures	$/First year Therm
Airsealing	$4.21
Dishwashers	$5.28
Clothes washers	$4.62
Duct Sealing	$0.43
Heating & Hot Water system	$0.85
Heating System	$24.74
Hot Water system	$0.65
Insulation	$14.00
Service to heating or cooling	$0.06
Low Flow Showerhead	$0.07
Programmable Thermostat	$0.45

B. COMMERCIAL RETROFIT NON ENERGY BENEFITS

For Commercial Retrofit programs, the following annual non energy benefits (NEBs) were approved through the TAC process. These are based upon another Massachusetts study: *KEMA, Inc, 2012, Massachusetts Program Administrators Final Report – Commercial and Industrial Non-Energy Impacts Study.*

VEIC reviewed this study and confirmed that it was appropriately based upon participant benefits and not societal benefits (so carbon emissions were not included), and that water impacts were also handled separately (so as not to double count water savings claimed through the TRM). The values proposed in this study, however, did include O&M benefits, and so the appropriate O&M percentages of total (also provided in the study in tables 4-7 and 4-12) were removed for those measures where these O&M impacts are already being accounted for directly in the TRM (namely lighting and CHP). The resultant values are provided in Figure 4 below:

Figure 4: For measures in C&I Retrofit or Direct Install program only
To calculate the *annual* non-energy benefit, multiply the kWh or therm savings by the following multiplier for each year within the measures lifetime:

Fuel	Program	Measure/End Use	Annual $ NEB / kWh
Electric	C&I Large Retrofit or Direct Install	Rx Lighting	$0.01
		Rx HVAC	$0.10
		Custom HVAC	$0.02
		Custom Lighting	$0.02
		Refrigeration	$0.05
		Other	$0.06
		CHP	$0.01
Fuel	**Program**	**Measure/End Use**	**Annual $ NEB / First year Therm**
Gas	C&I Large Retrofit	Boiler Reset Controls	$1.35
		Steam Traps	$1.35
		Thermostats	$1.35
		Custom	$0.25
	C&I Direct Install	Thermostats	$1.35
		Duct Insulation	$1.35

Refining the Non Energy Benefit values presented above and the determination of appropriate values for additional measures should be an area of focus for future evaluation and discussion.

Note the format is a different form to the RES multipliers. For Res it is a single value based upon multiplying the Lifetime NPV of NEBs by the first year annual savings. For C&I it is an annual adder which would be added each year within the measure life.
Ultimately we should likely make these consistent, and the methodology we chose should be determined by which is easier for the program administrators to apply in the screening tools.

3. Additional 11/11 deliverable

A. SELECT TABLES FROM "RESIDENTIAL WHOLE HOUSE RETROFIT NEB FACTOR CALCULATOR_V2.XLS";

	Table 9-10 from NMR Cross-cutting study, Non Low Income								
	NOTE: Percent of Bill Savings are Provided here								
	Thermal Comfort (% bill savings)	Noise Reduction (% bill savings)	Health Impacts (% bill savings)	Property Value (% bill savings)	Equipment Maintenance (% bill savings)	Durability of Home (% bill savings)	Total	Non Low Income Total Excluding Property Values	**Proposed Lifetime NEB**
Airsealing Elec	8%	16%	8%	7%		8%	47%	40%	**47%**
Airsealing Gas	8%	16%	8%	7%		8%	47%	40%	**47%**
Cooling Systems	3%	9%	3%	3%	6%	3%	27%	24%	**27%**
Duct Sealing Elec	1%		1%	1%		1%	4%	3%	**4%**
Duct Sealing Gas	1%		1%	1%		1%	4%	3%	**4%**
Heating & Cooling system	4%		4%	4%	8%	4%	24%	20%	**24%**
Heating & Hot Water system	1%		1%	1%	3%	1%	7%	6%	**7%**
Heating System Elec	39%		39%	34%	83%	36%	231%	197%	**231%**
Heating System Gas	39%		39%	34%	83%	36%	231%	197%	**231%**
Hot Water system Elec				4%		4%	8%	4%	**8%**
Hot Water system Gas				4%		4%	8%	4%	**8%**
Insulation Elec	20%	37%	20%	19%		20%	116%	97%	**116%**
Insulation Gas	20%	37%	20%	19%		20%	116%	97%	**116%**
Service to heating or cooling Elec	1%		1%	1%	1%	1%	5%	4%	**4%**
Service to heating or cooling Gas	1%		1%	1%	1%	1%	5%	4%	**4%**

	Table 9-10 from NMR Cross-cutting study, Non Low Income								
	NOTE: Percent of Bill Savings are Provided here								
	Thermal Comfort (% bill savings)	Noise Reduction (% bill savings)	Health Impacts (% bill savings)	Property Value (% bill savings)	Equipment Maintenance (% bill savings)	Durability of Home (% bill savings)	Total	Non Low Income Total Excluding Property Values	**Proposed Lifetime NEB**
Low Flow Showerhead Elec				1%			1%	0%	**1%**
Low Flow Showerhead Gas				1%			1%	0%	**1%**
AC System Sizing	1%		1%	1%	1%	1%	5%	4%	**Not currently a measure in TRM**
Programmable Thermostat Elec	3%		3%	3%		3%	12%	9%	**12%**
Programmable Thermostat Gas	3%		3%	3%		3%	12%	9%	**12%**
Window	1%	2%	1%	1%		1%	6%	5%	**Not currently a measure in TRM**
Weatherization	20%	36%	20%	19%		19%	114%	95%	**Not currently a standalone measure in TRM**

Table 1, p2-82 Skumatz, Lisa A., 2004, Non-Energy Benefits from ENERGY STAR®: Comprehensive Analysis of Appliance, Outreach, and Homes Programs, Proceedings of the 2004 ACEEE Summer Study														
NOTE: Percent of total NEI are provided here														
	Equipment Maintenance Cost	Appearance	Appliance Performance	Appliance Lifetime	Noise Levels	Personal Satisfaction	Comfort	Safety	Ease of Selling Home	Ability to Stay at Home	Water Savings	Doing good for Environment/ Environment Benefits	NEB Multiplier (as share of savings)	**Proposed Lifetime NEB**
Refrigerators	9%	4%	13%	7%	10%	17%	9%	2%	11%	3%	0%	15%	29%	**29%**
Dishwashers Elec	5%	4%	8%	8%	9%	11%	6%	4%	8%	8%	12%	17%	65%	**65%**
Dishwashers Gas	5%	4%	8%	8%	9%	11%	6%	4%	8%	8%	12%	17%	65%	**65%**

Table 1, p2-82 Skumatz, Lisa A., 2004, Non-Energy Benefits from ENERGY STAR®: Comprehensive Analysis of Appliance, Outreach, and Homes Programs, Proceedings of the 2004 ACEEE Summer Study														
NOTE: Percent of total NEI are provided here														
	Equipment Maintenance Cost	Appearance	Appliance Performance	Appliance Lifetime	Noise Levels	Personal Satisfaction	Comfort	Safety	Ease of Selling Home	Ability to Stay at Home	Water Savings	Doing good for Environment/ Environment Benefits	NEB Multiplier (as share of savings)	**Proposed Lifetime NEB**
Clothes washers Elec	5%	4%	8%	10%	5%	10%	8%	5%	6%	7%	14%	18%	54%	**54%**
Clothes washers Gas	5%	4%	8%	10%	5%	10%	8%	5%	6%	7%	14%	18%	54%	**54%**
Room AC	6%	7%	10%	8%	11%	10%	9%	8%	7%	8%	0%	16%	71%	**71%**

B. SELECT TABLES FROM 'CI NEBS_V2.XLS'

NEB Category	Detail	Example	Notes
Operations and maintenance costs;	including associated labor and parts for both contractors and in-house staff.	1. Avoided light bulb and ballast changes 2. Avoided routine maintenance and repair 3. Avoided electrician/service visit 4. Avoided system monitoring/equipment checks (automatic sensor monitoring) 5. Avoided parts (e.g. bulbs, filters, etc.)	We removed this for Lighting and CHP (where attempts to quantify this are in the TRM already)
Administrative or other labor not associated with operations or maintenance;	company's time costs from the back office people, such as accounting.	1. Avoided electrician/service invoice processing 2. Avoided service or parts/supplies procurement 3. Avoided external contractor coordination 4. Avoided tenant/customer equipment complaints	
The cost of supplies, materials and materials handling;	Time and costs for people in the loading docks and warehouses.	1. Avoided parts handling in warehouse	
Transportation or materials movement costs;	including time, fuel costs, vehicle costs, wages.	1. Fewer parts deliveries 2. Avoided gasoline to pick up parts/supplies 3. Avoided vehicle maintenance (fewer parts/supplies pickups)	

NEB Category	Detail	Example	Notes
Other labor costs;	other labor at the company not covered in O&M, Administration, Materials Handling, or Materials Movement categories.	1. Avoided staff down time	
Water usage;	including the amount of fresh water or processing water used and waste or discharge water.	1. Avoided water pumped 2. Avoided water usage	This (and fuel savings) was handled seperately and so does not appear to double count for those measures in the TRM that already account for water savings.
The amount of product spoilage or defects;		1. Avoided product loss - manufacturing 2. Avoided product loss - non-manufacturing	
Waste disposal costs		1. Avoided waste disposal 2. Avoided waste disposal contract	
Fees including insurance, inspections, permits and legal fees;			
Other costs;		1. Avoided manufacturing downtime 2. Avoided accidents	
Sales;	This was intended to capture basic revenue changes resulting from the new measures. These could occur as indirect results of the new measures. For example, new lighting might improve visibility in a company's showroom and increase sales. Or, being more energy efficient could be reflected in the company's advertising and increase business from people trying to be environmentally sensitive.	1. Improved product lighting	
Rent revenues;		1. Decrease/avoid building vacancy	
Other revenues.		1. Increased property value 2. Increased productivity	

Fuel	Program	Measure/ End Use	NEBs included
Electric	C&I	Rx Lighting	Administrative Costs, Material Handling, Material Movement, Other Labor Costs, O&M, Sales Revenue, Waste Disposal

Fuel	Program	Measure/ End Use	NEBs included
	Large Retrofit	Rx HVAC	Administrative Costs, Other Costs, Other Labor Costs, O&M, Rent Revenue
		Custom HVAC	Administrative Costs, Material Handling, Material Movement, Other Costs, Other Labor Costs, O&M, Product Spoilage, Rent Revenue, Sales Revenue, Waste Disposal
		Custom Lighting	Administrative Costs, Material Handling, Material Movement, Other Costs, Other Labor Costs, O&M, Product Spoilage, Rent Revenue, Sales Revenue, Waste Disposal
		Refrigeration	Administrative Costs, Material Handling, Material Movement, Other Costs, Other Labor Costs, O&M, Product Spoilage, Rent Revenue, Sales Revenue, Waste Disposal
		Other	Administrative Costs, Material Handling, Material Movement, Other Costs, Other Labor Costs, O&M, Product Spoilage, Rent Revenue, Sales Revenue, Waste Disposal
		CHP	Administrative Costs, O&M
Gas	C&I Large Retrofit	Boiler Reset Controls	Administrative Costs, Fees, Material Movement, O&M, Product Spoilage, Rent Revenue
		Steam Traps	Administrative Costs, Fees, Material Movement, O&M, Product Spoilage, Rent Revenue
		Thermostats	Administrative Costs, Fees, Material Movement, O&M, Product Spoilage, Rent Revenue
		Custom	Administrative Costs, Fees, Material Movement, Other Costs, Other Labor Costs, O&M, Product Spoilage, Waste Disposal
	C&I Direct Install	Thermostats	Administrative Costs, Fees, Material Movement, O&M, Product Spoilage, Rent Revenue
		Duct Insulation	Administrative Costs, Fees, Material Movement, O&M, Product Spoilage, Rent Revenue

Prescriptive Electric (p4-39, *KEMA, Inc, 2012, Massachusetts Program Administrators Final Report – Commercial and Industrial Non-Energy Impacts Study)*

	Admin	Fees	Material Handling	Material Movement	Other Costs	Other Labor	O&M	Other Revenues	Product Spoilage	Rent Revenue	Sales Revenue	Waste Disposal	Total Impacts
HVAC	8.2%*	0.00%	0.00%	0.00%	3.40%	-0.30%	69.8%*	0.00%	0.00%	18.90%	0.00%	0.00%	100.0%*
Lighting	5.0%*	0.00%	2.9%*	0.40%	0.00%	7.30%	73.7%*	0.00%	0.00%	0.00%	8.30%	2.3%*	100.0%*
Motors and Drives	0.6%*	0.00%	0.0%*	0.0%*	4.90%	0.20%	94.80%	0.00%	0.00%	0.00%	-0.50%	0.0%*	100.00%
Refrigeration	0.0%*	0.00%	0.0%*	0.0%*	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.0%*	100.00%
Other	1.00%	0.00%	0.0%*	0.0%*	0.00%	0.00%	99.00%	0.00%	0.00%	0.00%	0.00%	0.0%*	100.00%
NEI Reporting Category	5.4%*	0.00%	2.4%*	0.40%	0.60%	6.10%	73.5%*	0.00%	0.00%	2.80%	6.90%	2.0%*	100.00%

Prescriptive Gas (p4-44, *KEMA, Inc, 2012, Massachusetts Program Administrators Final Report – Commercial and Industrial Non-Energy Impacts Study)*

	Admin	Fees	Material Handling	Material Movement	Other Costs	Other Labor	O&M	Other Revenues	Product Spoilage	Rent Revenue	Sales Revenue	Waste Disposal	Total Impacts
Building Envelope	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.0%*	0.00%	0.00%	0.00%	0.00%	0.00%	100.0%*
HVAC	9.2%*	1.00%	0.00%	0.40%	0.00%	0.00%	85.1%*	0.00%	0.10%	4.10%	0.00%	0.00%	100.0%*
Water Heater	6.3%*	0.00%	0.00%	0.00%	0.00%	3.40%	90.20%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
NEI Reporting Category	8.6%*	0.80%	0.00%	0.30%	0.00%	0.50%	86.1%*	0.00%	0.10%	3.40%	0.00%	0.00%	100.0%*

4. Comment Summary

Comment Type	Examples of concerns expressed	Policy / Technical
Appropriateness of inclusion of different types of NEB	"unclear that the fifth category (Noneconomic benefits (e.g., comfort, noise, cool features)) should be included as benefits for ratepayer funded programs." "a clear line would need to be established in order to ensure the inclusion and exclusion of certain NEBs" "Opposes including participant non-energy benefits for items such as safety, health and comfort." "Some values suggest that program participants value NEBs more highly than the actual energy bill savings associated with the energy efficiency measures. This conclusion is highly questionable, is not supported by any studies or analysis that are specific to Illinois and casts significant doubt on the merit of the proposed NEB values." Concern over some NEBs being Transfer payments and therefore not appropriate for inclusion.	**Policy**
NEBs difficult to measure	"unsure of the proper way to give quantity to items of quality such as health or comfort" "may vary significantly from state to state as well as within the different geographies of a state" "Quantification of participant NEBs is highly subjective and is difficult to quantify and monetize." "because NEBs are often subjectively identified, proponents of measures or programs will have an incentive to identify, study, and present only positive NEBs associated with measures or programs." "Largely based on results of customer surveys rather than any objective quantification methods." "Progress continues to be made in methods and knowledge bases to make NEB utilization in EE program valuation increasingly confident, but at present the large uncertainty in such values and their derivation suggests the need for a stakeholder process to consider the veracity of available NEB information (both derivation methods and resulting data, both "foreign" and "native" to Illinois) in order to judge whether particular NEB values should be included in Illinois IOU B/C analysis – and, if so, what values or value ranges are appropriate. Such a stakeholder process will require a significant effort and time to implement and produce stakeholder-credible NEB data."	**Policy**
Impact on measure	"Adding the proposed NEBs in Attachment B will allow (IPA) vendors to	**Policy**

Comment Type	Examples of concerns expressed	Policy / Technical
offerings and potential detrimental effect on Illinois Ratepayers.	increase program administration costs and essentially increase their bottom line due to the increased Non-Energy Benefits in the screening." "Potential for non-energy benefits to disproportionately drive adoption of measures and programs that are not, in fact, energy efficiency measures or programs."	
Appropriateness of applying results from currently proposed, non-Illinois based studies to Illinois	"Does a low income based study translate to non-low-income programs? Is there a more recent study that could apply?" "Not clear that the results of cited NEB studies conducted in Massachusetts or elsewhere would readily translate to the Illinois context." "The information provided to support the recommended NEB values does not meet the standard of "quantifiable societal benefits" required by statute." "Bundled attributes and assigning values to the correct energy efficiency measures." "Potential for double counting." Need for greater clarification of which value is appropriate for which measures. "Illinois Evaluators should be able to replicate the methodology." "Are the survey instrument questions designed in a way that is consistent with standard Evaluation practices as endorsed by the Illinois Independent Evaluators?"	**Technical**

5. Written Comments Received

A. AMEREN COMMENTS

Attachment B – While AIC recognizes that both positive and negative Non-Energy Benefits (NEBs) occur, these benefits are difficult to measure and as a result, AIC questions the applicability of the values currently being proposed. The Total Resource Cost test does not include NEBs. The Societal Cost Test is the benefit cost ratio that includes NEBs. Illinois legislation specified that quantifiable NEBs may be included when performing the TRC analysis. AIC is unsure of the proper way to give quantity to items of quality such as health or comfort. Also, AIC believes that perceptions of quality may vary significantly from state to state as well as within the different geographies of a state. AIC also believes that applying values to these perceptions of quality to the lifetime of measures without having conducted follow up research on individuals' perceptions after time may be overstating values and thereby not truly quantifying the values. In short, AIC believes that a defined process and research within our own service territory is warranted before applying the proposed quantities to items of quality such as health or comfort. Items such as water savings with measurable benefits that are consistent year over year from an energy conservation measure ignoring changing habits are appropriate.

In addition, the state's current bifurcated process for funding electric efficiency programs between 8-103 and IPA procurement (16-111.5B) has a significant deficiency in protecting ratepayers when approving programs in the IPA procurement plan. Although AIC does not agree, several parties believe the only threshold for approval of energy efficiency programs through the IPA is passing a TRC screening. AIC has a significant concern that adding the proposed NEBs in Attachment B will allow vendors to increase program administration costs and essentially increase their bottom line due to the increased Non-Energy Benefits in the screening. In a perfect world this risk would be mitigated if we had a robust number of bids on a single program. Vendors would be forced to keep costs low if they were essentially competing with other bidders on individual programs. The fact is this currently isn't the case. Vendors tend to bid niche programs with little to no competing bids. To date, AIC has only had one program that had competing bids needing a decision from the ICC on which to choose in the IPA procurement plan process. For this reason, AIC currently believes that adding Attachment B to the TRM would cause Illinois ratepayers significant harm and therefore does not agree with its inclusion.

B. FUTURE ENERGY ENTERPRISES COMMENTS

Annette and I would like the table to be structured in a way that clearly shows the following information:

1- Negative and positive NEBs broken out;
2- Source documentation clearly indicated, with page citations (plus access to the sources);
3- To the extent there is a NEBs number included, we want to know what the NEBs actually are for each value you are considering, and what has been excluded;
4- How is "NEBs" being defined? Different jurisdictions define NEBs in various ways. (For example, some jurisdictions count carbon/water as NEBs and some do not).

Can VEIC please update the tables and provide information 5 business days in advance of the Nov. 17 TRM TAC discussion? These are requests on the form and substance of the information, and we think the information as included now is not clear enough for meaningful review and comment. It would be helpful to provide several business days for interested participants to review the substance of the updated tables with additional detail.

Thank you!

C. NICOR GAS COMMENTS

In addition to other comments that follow, Nicor Gas believes that it is difficult to fully understand the NEB adjustments from the long trail of references provided. Overall, the NEBs seem to come from five broad sources:

a. Environmental externalities
b. Customer O&M and water savings captures by other TRM variables
c. Additional customer economic benefits (e.g., improved employee productivity)
d. Utility economic benefits (e.g., fewer late payments)
e. Noneconomic benefits (e.g., comfort, noise, cool features)

It looks like VEIC has done a great job at backing out the first two categories. However, it is unclear that the fifth category should be included as benefits for ratepayer funded programs.

Also, Nicor Gas believes that it is particularly important for the Program Evaluators to comment and endorse these proposed methodologies.

Select text from 10/23 proposals:
"The study examined literature from across the nation"
Comment: Is this true?

"an evaluation prepared for Massachusetts Program Administrators; *NMR Group, Inc., Tetra Tech (2011).*"
Comment: We do not agree that there is consensus that this is applicable to Nicor Gas territory. Does a low income based study translate to non-low-income programs? Is there a more recent study that could apply?
RE Figure 1 and Figure 2:
Question – in this table the header for the two columns in white are different…one is energy savings, the other on bill savings. Does that mean there is no energy savings for low flow showerheads for example?

"another Massachusetts study: *KEMA, Inc, 2012, Massachusetts Program Administrators Final Report – Commercial and Industrial Non-Energy Impacts Study.*"
Comment: Same issue here – is this a good comparison to apply to IL?

How does one determine NEBs for a large C&I location? It isn't like a homeowner who "feels" the difference. Couldn't this be a factory – where there is really no perceived NEBs at all?

Re Duct Insulation: Would this also include pipe insulation?

D. COMED COMMENTS

ComEd Comments on NEB's for TRM Version 5.0

1. ***The information provided to support the recommended NEB values does not meet the standard of "quantifiable societal benefits" required by statute.*** The work paper and references do not include sufficient detail to determine 1) how the values were determined and 2) if they can be applied within the Illinois framework.

2. The Illinois SAG/TAC should be able to follow the logical connect between
    a. The specific attribute of an energy efficiency measure that has value beyond energy savings;
    b. How that attribute compares to the same measure attribute for the baseline alternative;
    c. How a NEB monetary value is uniquely determined for each attribute and for each measure.

    For energy savings determinations in the TRM, the methodology allows the SAG/TAC to explicitly follow the above logical steps. The information (work paper and references) provided on NEB's does not allow the SAG/TAC to follow these steps.

    Here are three examples of the types of problems that occur from this lack of information:

    i. ***Bundled attributes and assigning values to the correct energy efficiency measures.*** The TetraTech survey referenced combined "reduced draftiness" and "increased comfort". Illinois Energy Efficiency Programs offer incentives for air sealing, insulation and thermostats. How can a specific value be uniquely assigned to a program measure if attributes are valued in bundles? For newer thermostats, a significant portion of the savings is expected to come from adjusting home temperatures during times when the home is unoccupied. A positive NEB value from increased occupant comfort would not be possible for those savings. How are values derived from general surveys going to be adjusted to reflect the actual performance of the product?

    ii. ***Double counting.*** The survey questions on lighting bundle increased product lifetimes and lighting quality attributes. The TRM already includes a methodology to quantify the benefit of increased product lifetimes (O&M savings). We therefore do not have enough information to assign a value (if there is one) to lighting quality. Water savings are currently calculated

separately, but the proposed value for clothes washers, for example, already includes water savings.

iii. ***Definitional Confusion***. The work paper includes values for Low-Flow showerheads (1%), Hot Water System (8%), and Heating and Hot Water System (7%). We would need clarification on these values to be able to know for sure how they would be applied to the 5 Water Heating measures offered. What is the difference between "Hot Water System" and "Heating and Hot Water System" (Is the latter hydronic heating only?)? Does the Hot Water System include delivery measures like showerheads and aerators or only "upstream" measures like pipe wrap and temperature setback? In addition, we would need clarification on whether these values include water savings, which we calculate separately.

3. Illinois Evaluators should be able to replicate the methodology. Are the survey instrument questions designed in a way that is consistent with standard Evaluation practices as endorsed by the Illinois Independent Evaluators? Are the responses from other jurisdictions transferable to Illinois customers? Can the methodology be replicated to be used to quantify any NEB's for Illinois customers? These questions should best be answered by the Evaluators.

4. ComEd believes meeting the statutory test of "quantifiable" should include transparent, repeatable, industry-accepted methods used to determine values for NEB's. The quantifiable water savings and increased lifetime benefits that have been reflected in ComEd's cost-effectiveness testing are based on external calculations of values and not perceived values from surveys. The sources for these values are based upon industry standards or other nationally established sources. Specifically,
    a. Water savings are based upon measurements consistent with Federal Standards. The value of the savings is then determined by what actual Illinois customers would have paid for the water saved.
    b. Manufacturer lighting product lifetime ratings are based upon testing data supplied to and validated by EPA or the Design Lights Consortium for lighting products.

E. ICC STAFF COMMENTS

ICC Staff Comments on 10/23/15 DRAFT IL-TRM Attachment B Non Energy Benefits

November 6, 2015

Introduction

In reviewing the Proposed Attachment B, entitled Illinois Statewide Non Energy Benefits Methodologies, Staff has identified both general and specific concerns. The general concerns are explained below, and the specific concerns with the Attachment B, proposed values set forth therein, and studies those values are based upon, including applicability to Illinois, will be submitted at a later date. To be clear, Staff has not exhaustively evaluated the proposal and all relevant support, and notes that certain details concerning the survey results, measure and participant characteristics to further segregate out relevant NEBs for potential applicability to specific components of Illinois programs are not available within the referenced studies. Staff reserves the right to raise additional concerns it identifies as it continues its review of the proposal (or any updated proposal) and underlying support. Staff also reserves the right to object to the inclusion of Attachment B in its entirety. While Staff reserves its rights with respect to the inclusion of Attachment B and/or any of its specific terms and conditions, Staff has attempted to relate the concerns it has identified to date. Staff also shares in some of Ameren's and IIEC's concerns identified in their comments submitted on 11/6/15. Staff further pledges to work toward resolution of concerns with the goal of identifying a document that Staff will support and/or not object to.

General Concerns

Among the general concerns Staff has is the potential for non-energy benefits to disproportionately drive adoption of measures and programs that are not, in fact, energy efficiency measures or programs. In particular, it is conceivable, though perhaps improbable, that a measure or program could provide no energy savings of any kind, but yet still produce non energy benefits that exceed costs. Such programs should not be included within Illinois energy efficiency portfolios. A more likely scenario is that an energy efficiency measure or program provides energy savings sufficiently small such that a total resource cost ("TRC") test would produce a value less than 1, but the addition of non-energy benefits would raise the value above 1. Whether such programs should be included within Illinois energy efficiency portfolios depends, in Staff's view, on the degree to which TRC tests rely upon non-energy benefits in order to achieve values above 1. In order to address this concern, Staff recommends that, for informational purpose, TRC test results be reported including and excluding NEBs. Staff understands that a clear line would need to be established in order to ensure the inclusion and exclusion of certain NEBs (e.g., O&M cost savings versus less tangible NEBs such as comfort) in the TRC is performed consistently and Staff is willing to work with parties to develop a clear line that could be specified in the IL-TRM.

Staff also shares in Ameren's concern identified in their comments submitted on 11/6/15 concerning the potential negative implications to ratepayers should the NEBs be applied to the Section 16-111.5B energy efficiency programs that are submitted through the annual electricity procurement plan proceeding. To help address this concern, Staff recommends that the Attachment B NEBs explicitly specify that it is not applicable to Section 16-111.5B cost-effectiveness screening.

Staff is also concerned that, because NEBs are often subjectively identified, proponents of measures or programs will have an incentive to identify, study, and present only positive NEBs associated with measures or programs. To address this concern, Staff recommends that proponents of adding NEBs to TRC calculations bear the burden of demonstrating and supporting that they have comprehensively evaluated the programs and measures with respect to all potential NEBs and made reasonable attempts to quantify all associated NEBs, both positive and negative.

Staff also believes greater transparency in terms of how the NEB calculation was performed and what the proposed NEB values are intended to represent (e.g., comfort, health, noise reduction, equipment maintenance) and relative NEB % associated with each quantified component is needed in order to facilitate review of the level and nature[5] of NEBs that are being proposed. Although Staff was able to find the relative NEB % breakout for some of the residential NEB proposals included in the Attachment B in the studies referenced[6] within the

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[5] Having better visibility into the nature of the NEB components proposed would make it much easier for reviewers to identify and remove inappropriate NEB components. For example, it appears that the proposed aggregated NEB values for a number of measures inappropriately include a component for participant self-reported expected property value impacts as a result of the efficiency upgrade. Staff believes expected property value impacts should be excluded for several reasons:

(1) The increased property value is primarily a function of the reduced utility bills and that to include both would be double-counting.

(2) Also, from a societal perspective, increases to property value may be a benefit to owners but a cost to buyers and renters (i.e., property value impacts are a transfer, increased selling price results in seller receiving higher price but also purchaser paying higher price).

(3) Participant self-reported "expected" property value impacts are unreliable. Furthermore, anecdotally, have heard from realtors that if plan to make energy efficiency upgrade to home only do so if you plan to stay in the home for a while to benefit from the upgrade because it is doubtful you will be able to get money put in for efficiency upgrade back through increased selling price.

Property value impacts are discussed in the context of cost-effectiveness analysis of energy efficiency programs in the following reports: page 48 of *RAP, 2013, Recognizing the Full Value of Energy Efficiency (What's Under the Feel-Good Frosting of the World's Most Valuable Layer Cake of Benefits)*, p. 48 http://www.raponline.org/document/download/id/6739, and page 22 of *RAP and Synapse Energy Economics, Inc., 2012, Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for 'Other Program Impacts' and Environmental Compliance Costs*, p. 22 http://www.synapse-energy.com/sites/default/files/SynapseReport.2012-11.RAP_.EE-Cost-Effectiveness-Screening.12-014.pdf.

[6] Staff also recommends that website links be provided within the IL-TRM for the studies referenced to facilitate ease of review. Below are links for the studies referenced in the Attachment B proposal:

Skumatz Lisa A., 2015, Considering the Inclusion of NEBs in IL TRM for Single and Multi-family Whole Building Retrofit Programs: The Issue of Measure-Based NEBs.

Attachment B, Staff believes that in order to ensure double counting does not occur within the IL-TRM for particular measures, this breakout should really be explicit within the IL-TRM itself.[7]

In Staff's view, adopting these general recommendations will help ensure that the Commission has the information necessary to appropriately assess the importance of NEBs in determining TRC values and outcomes. Further, Staff reserves the right to assess such information and argue against the adoption of measures that pass the TRC test but that do so as a result of incomplete or over reliance on NEBs.

A summary of Staff's specific concerns regarding Attachment B, the proposed NEB values set forth therein, and the studies those values are based upon, including their applicability to Illinois, will be submitted at a later date.

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http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Sources/IL_NEBs_estimates_measures_Skumatz_for_NRDC_2015-08-03_Final.pdf

NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Sources/Tetra_Tech_and_NMR_2011_MA_Res_and_LI_NEI_Evaluation.pdf

Skumatz, Lisa A., 2004, Non-Energy Benefits from ENERGY STAR®: Comprehensive Analysis of Appliance,Outreach, and Homes Programs, Proceedings of the 2004 ACEEE Summer Study, Asilomar, CA, August. http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Sources/SS04_Panel2_Paper08.pdf

KEMA, Inc, 2012, Massachusetts Program Administrators Final Report – Commercial and Industrial Non-Energy Impacts Study. http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Sources/CEE_DNV_KEMA_FinalMA_NEI_Rpt_29Jun2012.pdf

[7] It appears to Staff that adoption of the proposed NEB values for certain measures may result in double counting. For example, from what Staff can tell from the study referenced, it appears that the proposed clothes washer NEB value incorporates water savings. The IL-TRM already quantifies water savings for clothes washers explicitly, and thus applying the proposed aggregated NEB value in the TRC analysis for clothes washers would result in double counting of benefits and skewed TRC results.

F. IIEC COMMENTS

The Illinois Industrial Energy Consumers ("IIEC") do not support the addition of proposed Attachment B to the Technical Resource Manual ("TRM") because IIEC opposes including participant non-energy benefits ("NEBs") for items such as safety, health and comfort in the calculation of the Total Resource Cost ("TRC") test in Illinois. The quantification of participant NEBs for such items is highly subjective and is difficult to quantify and monetize. This observation is confirmed by the fact that the proposed participant NEBs, in Attachment B to the TRM, are largely based on the results of customer surveys rather than any objective quantification methods. Moreover, the studies submitted in support of the NEB proposals are not Illinois-specific, and it is not clear that the results of the cited NEB studies conducted in Massachusetts or elsewhere would readily translate to the Illinois context.

IIEC is not unique in raising concerns about the speculative nature of participant NEB values. This is evidenced by the fact that the inclusion of participant NEBs in energy efficiency cost-benefit tests does not appear to be standard practice in the U.S. Indeed, one of the studies submitted in support of the NEB proposal concedes that NEBs "have been used only sparingly by utilities and regulators largely because of concerns about measurement uncertainty."[1]

Some of the proposed NEB values in Attachment B are so high that they appear unreasonable on their face. For example, the proposed NEB value for residential heating

[1] Lisa A. Skumatz, *Lessons Learned and Next Steps in Energy Efficiency Measurement and Attribution: Energy Savings, Net to Gross, Non-Energy Benefits, and Persistence of Energy Efficiency Behavior*, November 2009, page 9.

system retrofits is 231% of bill savings, while the residential weatherization NEB value is 114% of bill savings. These figures suggest that program participants value NEBs more highly than the actual energy bill savings associated with energy efficiency measures. This conclusion is highly questionable, is not supported by any studies or analysis that are specific to Illinois, and casts significant doubt on the merit of the proposed NEB values.

For the foregoing reasons, IIEC does not believe that participant NEBs, such as those set forth in the proposed Attachment B to the TRM, qualify as legitimate "quantifiable benefits" under Illinois law. Therefore, the subject NEBs should not be incorporated into the statutory TRC test used to evaluate the cost effectiveness of energy efficiency programs in Illinois. Consequently, IIEC believes that proposed Attachment B to the TRM should be deleted in its entirety.

G. NAVIGANT TRANSFERABILITY REVIEW COMMENTS

To: **Randy Gunn, Kevin Grabner**

From: **Mark Thornsjo**

Date: **November 27, 2015**

Re: **Illinois IOUs NEB Transferability Review**[8]

Background

The program evaluation effort underway for Illinois' investor-owned utilities (IOUs) considers the effect of non-energy benefits (NEBs) on demand-side management (DSM) program cost-effectiveness. Currently, Illinois includes monetizes the environmental cost of greenhouse gas emissions (GHGs) in the Total Resource Cost perspective in DSM programs' benefit-cost (B/C) analysis. No other B/C analysis perspective (i.e., Participant, Ratepayer, Utility) utilizes any NEB benefits or costs.

At issue is whether, to what extent and with what certainty such benefits (or costs – some non-energy impacts may have net costs) might be reasonably stated for Illinois' IOUs by applying NEB values estimated for DSM programs elsewhere. Basically, how well can values from elsewhere be applied to Illinois' IOUs? More specifically, three questions have been raised:

- Which other NEBs does Illinois want to include in DSM BC tests?
- Which NEBs fit best in which tests?
- Which NEBs can be estimated "well enough" from findings from other states, and which should only be estimated using Illinois-specific values?

[8] Considerable credit for informing this review goes to Lisa Skumatz/SERA's (et al.) work over the years, including the work paper written for Illinois currently being used to advise the NEB process there, and the NEB-related work performed for the CIEE in 2009. See associated work papers that incorporate extensive excerpts from various work SERA has done in this area.

I have conducted a cursory review of NEB literature cited for the evaluation and provided me to attempt an answer to the basic question stated above, and to tee up discussion of the three more specific questions listed.

The conclusion I reach to the basic question being put is that transferability depends on stakeholders' trust in and willingness to in utilize fundamentally uncertain information that will continue for the foreseeable future to be relatively uncertain compared to the traditional, explicitly monetized economic values used to assess DSM programs' costs and benefits.

Progress continues to be made in methods and knowledge bases to make NEB utilization in EE program valuation increasingly confident, but at present the large uncertainty in such values and their derivation suggests the need for a stakeholder process to consider the veracity of available NEB information (both derivation methods and resulting data, both "foreign" and "native" to Illinois) in order to judge whether particular NEB values should be included in Illinois IOU B/C analysis – and, if so, what values or value ranges are appropriate. Such a stakeholder process will require a significant effort and time to implement and produce stakeholder-credible NEB data.

Key Issues Affecting Transferability[9]

Many issues are associated with NEB values' veracity and transferability, but the following are critical to whether and how NEB values can be migrated in some way between regions:

- NEB estimation framework complexities – factors underlying NEB estimates, including NEB factor variability across regions and associated programs and EE measures
- Assessment rigor and associated estimation uncertainty (including uncertainty in underlying NEB factor impact estimation – e.g., customer ignorance and associated inability to identify or quantify NEBs, and associated biases; also, how climate change and other underlying impacts driving NEB values are estimated, as well as how those factors' impacts are monetized or otherwise valued – and the resulting potential for "false precision"
- Regulatory framework for treatment of NEBs in economic analyses
- Decision making needs – the perfect is the enemy of the good – the effect of "foreign" NEB estimates relative to size of "native" measure impacts and impact on program decisions, and how much better will program decisions become using even highly uncertain NEBs from other places?
- Likelihood of stakeholder agreement

Each of these points is briefly discussed below.

Complexity: NEBs reflect a highly complex world and, as such, contain huge numbers of underlying influence factors ranging across a wide range of technical, economic and cultural dimensions. Normalizing such factors in order to validate transference to another region is practically impossible. Instead, NEB researchers often look for consistency of foreign estimates as a key validation criterion. Consistency of foreign estimates, unfortunately, is not necessarily an indication of their being either transferable or, if they are transferable, sufficiently robust to be confidently applied to native programs/measures. This is because the foreign estimates themselves, consistent as they may be, may be consistent simply because they utilize similar estimation methods, not because they are correct.[10]

On the other hand, scarcity of high-confidence empirical estimates (i.e., primary survey-based, such as done for MA's 2012 C&I NEI assessment by Tetra Tech) may not be a barrier to transferring limited knowledge if such

[9] These transferability issues are over and above the many issues associated with estimating and monetizing NEB impacts being transferred – issues that reflect the many uncertainties and significant challenges involved with developing such underlying estimates.

[10] This is a variant on the "chain reference" problem in social research.

estimates' transfer effectively controls for the most critical factors underlying the estimates. One solid foreign estimate may be sufficient if it can be effectively vetted and agreed upon by stakeholders in the native situation.

Assessment rigor, granularity and uncertainty: High methodological rigor and granularity of estimates' underlying factors does not necessarily mean the estimates are valid, particularly if the source of the estimates (e.g., customers responding to surveys) are in some way biased or highly ignorant and so uncertain. More detail doesn't necessarily translate into greater validity, and so increased transferability, even key underlying factor variability can be controlled for.

Methodological rigor is important, yet the resulting estimates may not be usefully transferable if resulting estimates' underlying factors (e.g., power supply mix, regional climate or regional jobs mix) are not effectively controlled for.

Regulatory treatment: Transferability is affected by how jurisdictions treat NEBs in B/C analyses in terms of NEB estimation methodology, rigor, scope and level of confidence in estimates being considered. One jurisdiction may not require as much rigor, scope or confidence level as another, and so a broader range of NEB estimates may be eligible in that jurisdiction – and so allow transfer of more NEB estimates.

Perfect vs. good: Large validity concerns reasonably exist about the measurement of NEBs regardless of whether the estimates are native or foreign, but such concerns are magnified when considering use of foreign estimates. These include survey bias stemming from customer ignorance or prejudice regarding NEBs they may or may not be experiencing. They include uncertainties associated with technical measurement of such factors as climate change and associated health and welfare. And so on.

It has been asserted that using at least some NEB value, regardless of its uncertainty, is better than excluding NEBs for whatever weaknesses NEB estimates have, because even if program decisions aren't changed given the range of a NEB value, the decision information is relatively improved and the decision is more confident. The concern about this logic, however, is shown by turning the logic on its head: from a practical standpoint, if a NEB value does not change a program decision, the value of incorporating the NEB value actually may be *lessened*, particularly if significant resources and time have been spent trying to incorporate the value, and so why bother trying to incorporate what would seem to be inherently "soft" information in a basic economic assessment when the decision is unaltered by NEB inclusion?[11] This is not a question of excluding NEBs from B/C analyses (vs. using at least some value to reflect NEB), but rather is simply a pragmatic consideration for expediting decisions already apparent in the context of a more traditional analytic framework that does not utilize NEBs. This point extends to transferring foreign NEB values to a native situation and is magnified by the uncertainty associated with using foreign proxies. In other words, utilizing foreign NEB values, like using native values that presumable have greater validity because they are native, becomes even more tenuous in decision making where the decision already is well-supported by traditional B/C analysis. Foreign NEB values can make a difference, however, where traditional B/C analysis does not support implementing a program – assuming the involved stakeholders can agree on a reasonable value range to apply using foreign proxies.

Stakeholder agreement: Whether any of the foregoing issues can be resolved, so that foreign proxies can be well and constructively used, is more a matter of whether stakeholders can agree to some threshold of acceptability, based on mutually agreed acceptance criteria, than it is on the *a priori* veracity of available NEB values. Fundamentally, carefully vetted political compromise is what will ensure how well NEB values from elsewhere can

[11] This, even if the value is large and statistically significant: if the "hard" economics show a program to be beneficial, no further decision information may be necessary, particularly if program budgets (incentives, especially) cannot be bolstered by some portion of the NEB value – and meantime significant costs have been incurred that reduce the net benefit of the program being considered. Nonetheless, there can be substantial value gained from researching the NEB value in question because of the potential for improving EE program marketing effectiveness, mainly by addressing customers' needs on a broader (NEB) basis than just energy savings.

be used by IOUs in Illinois. For example, Skumatz has suggested a set of values for residential weatherization and retrofit programs shown in Table 4 below. For all three economic perspectives shown, there is a very large range of potential values possible despite the asserted consistency in the various "typical" values. Such large uncertainties beg for a better understanding of how the values were estimated and how to control for underlying factors that may vary widely from one region to another. While a rigorous scientific and technical assessment of the estimates and underlying factors is critical and may help improve decision makers' confidence in utilizing some value set, if major stakeholders cannot agree to support at least a more limited range of values to use in sensitivity analyses, decisions will remain hamstrung.

Figure 4: [12] Summary of Ranges and "Typical" Values for NEBs for Weatherization / Retrofit Programs [20]
Note: Relative consistency indicator: ** low variation / relative consistency across programs; * low variation / relative consistency within program types; ~somewhat consistent; Variations by program, target audience, or limited variation by program are noted in the last column.

Subtotals by major categories Weatherization Programs	Dollar NEB Values Range Low-High	Typical Value	Percentage NEB Values Range Low-High	Typical Value	Consis- tency	Varies with Pgm Target Audience, et
UTILITY PERSPECTIVE						
Payment-related	$2.55 - $14.50	$6.40	1% - 14.5%	4.7%	*	Pgm
Added if Low Income subsidies avoided	$3.00 - $25.00	$13.00	4% - 29.0%	16.4%	*	Pgm & target
Service Related	$0.10 - $8.50	$3.25	0.1% - 2.7%	0.8%	*	Pgm
Other Primary Utility	$0.13 - $2.60	$1.40	2.1% - 3.3%	2.4%		
TOTAL UTILITY NEBs	$5.78 - $50.60	$24.05	7.4% - 49.5%	24.4%		
UTILITY NEBs MULTIPLIER	3% - 25%	12%				
SOCIETAL PERSPECTIVE						
Economic Environmental	$8.00 - $340.00	$115.00	3.0% - 237.6%	31.1%	*	Pgm
/ Emissions	$3.00 - $180.00	$60.00	0.7% - 57.9%	7.1%	**	Ltd variation
H&S equipment / fires Health	$0.00 - $0.30	$0.00	0.3% - 0.3%	0.0%		Pgm
Care	$0.00 - $0.00	$0.00	0.0% - 0.0%	0.0%		Pgm
Water / Wastewater infrastructure	$1.00 - $28.00	$15.00	0.9% - 33.1%	17.0%		Pgm
TOTAL SOCIETAL NEBs	$12.00 - $548.30	$190.00	5.0% - 329.0%	55.3%		
SOCIETAL NEBs MULTIPLIER	6% - 274%	95%				
PARTICIPANT PERSPECTIVE						
Water and Other bills	$2.85 - $54.00	$15.00	4.5% - 63.4%	20.0%	*	Pgm
Financial / customer service Economic	$0.27 - $36.70	$3.60	8.7% - 16.4%	3.4%	*	Pgm & target
Dev'p / Hardship Equipment	$0.00 - $115.00	$75.00	26.3% - 55.3%	8.0%		Pgm & target
Operations	$26.00 - $127.00	$82.00	17.1% - 42.7%	28.4%		Pgm
Comfort, Noise, Related	$26.00 - $105.00	$69.00	12.2% - 51.3%	26.6%	*	Pgm
Health / Safety	$3.02 - $100.50	$16.50	1.5% - 59.5%	12.8%	*	Pgm
Control / Education and Contributions	$26.25 - $177.00	$89.75	19.8% - 72.0%	26.2%	*	Pgm
Home Improvements	$10.50 - $77.00	$36.00	8.3% - 38.4%	18.8%	~	Pgm
Special / reliability / other	$0.00 - $4.05	$0.00	0.0% - 4.8%	0.0%		Ltd, target
TOTAL PARTICIPANT NEBs	$94.89 - $796.25	$386.85	98.5% - 403.8%	144.1%		
PARTICIPANT NEBs MULTIPLIER	47% - 398%	193%				
All NEBs Multipliers: **Relative to Bill Savings**						
Utillity	3% - 25%	12%	7% - 49%	24%		
Societal	6% - 274%	95%	5% - 329%	55%		
Participant	47% - 398%	193%	99% - 404%	144%		
ALL Multiplers - relative to bill savings	56% - 698%	300%	111% - 782%	224%		
NOTE: Ltd variation for emissions are for peak / off-peak focused programs.						

[12] Excerpted from ***Considering the Inclusion of NEBs in IL TRM for Single and Multi-family Whole Building Retrofit Programs: The Issue of Measure-Based NEBs***
Work Paper
Prepared by: Lisa A. Skumatz, Ph.D.
Skumatz Economic Research Associates, Inc. (SERA)
Prepared for Chris Neme, Energy Futures Group For NRDC; July 31, 2015

Source: Skumatz, 2014.

[20] *From Skumatz, Lisa A., Ph.D., "Non-Energy Benefits / Non-Energy Impacts (NEBs/NEIs) and their Role & Values in Cost-Effectiveness Tests: State of Maryland", March 2014. Minor edits included here.*

Examples

A few examples help illustrate the problems associated with migrating NEB values across regions and DSM programs.

Employment Impacts: Consider residential weatherization and how weatherization programs affect regional employment in the weatherization industry. Northern-tier states with deep winters traditionally have a well-developed weatherization employment base given how homes are weatherized when built or subsequently, and where associated utility weatherization programs tend to be more ensconced than in milder climates. The employment base associated with weatherization businesses may be relatively more affected by utilities in milder climates instituting or expanding weatherization programs, than the weatherization employment base of regions with mature, aggressive utility programs. Thus, simply assigning a weatherization employment NEB adder from, say, Maryland to Illinois may overstate the NEB effect of Illinois' IOUs' weatherization programs.

Water Impacts: Consider reduced water use due to changes in manufacturing processes brought about by a commercial/industrial custom incentive program that reduces energy use as its primary benefit target. The effect of the custom energy DSM program on water utilization may be far more valued in a desert climate than a climate like Illinois' even if the unit production impact on water usage is equal across the regions. So even if the volumetric impacts can be agreed, the valuation of those impacts locally, and how those values should be adjusted should the water NEB be transferred across regions, is difficult to determine.

O&M Impacts: Operation and maintenance benefits often are cited as side benefits of DSM programs. Reduced lighting maintenance (and, potentially, material costs as LED technology matures) is possible, for example, by substituting LED lamps for less-efficient lamps in lighting fixtures because of LED lamps having far longer lifetimes and so needing less frequent replacement. One might be tempted to assume that maintenance labor cost savings are readily transferable across regions, but are they really? Is the building maintenance labor force in one utility's region equally (even roughly) aware, trained and equipped to achieve the same maintenance savings as the labor force in another region? How does one know if there is a difference – how were the savings estimated in the first region, anyway, and how uncertain are those estimates? How do we know whether any differences one might note are even worth considering, given how much incorporating them may make in deciding a program's future?

Conclusion and Recommendation

My review of the information made available to me, and my own experience in DSM market research, suggest that there is a long row to hoe in migrating NEB values across regions, and even across programs that have common NEB bases. One cannot readily transfer NEB values across regions or programs without due consideration of 1) the uncertainties associated with values' original estimates, including both methodological and statistical uncertainties; 2) the comparability across regions of underlying factors driving the values' estimates; and 3) the confidence that stakeholders have in such uncertainties and comparabilities.

A well-supported stakeholder review process is needed to help stakeholders and decision makers understand and support incorporating (or not incorporating) particular NEBs in DSM B/C analyses, and the range of NEB values to include where a particular NEB is considered significant enough to warrant its inclusion in B/C analysis.

H. OPINION DYNAMICS COMMENTS

To: Jennifer Morris, ICC and Jonathon Jackson, AIC
From: Mary Sutter, Opinion Dynamics
Date: 12/3/15
Re: NEB Questions

On 11/24/15, Jennifer requested that our team respond to the following set of questions regarding Non-Energy Benefits (NEBs). The Technical Advisory Committee (TAC) met on 12/1/15 to discuss NEBs. Due to the holiday week, we provide abbreviated responses to the set of questions posed by Jennifer.

Questions from Jennifer via eMail and our responses

1. For both residential and non-residential NEB proposals, can the evaluation team please verify that the NEBs being proposed are not actually "transfers"?
   We prefer to have Cadmus, as the member of our team involved most closely with the TRC analyses for Ameren, respond to this question.

2. For both residential and non-residential NEB proposals, can the evaluation team please verify that the NEBs being proposed are not double counting other benefits already reflected in the TRC analysis?
   We prefer to have Cadmus, as the member of our team involved most closely with the TRC analyses for Ameren, respond to this question. However, we note that NMR does not recommend including any NEB derived from participant bill savings, as it would be double counting of benefits (page 1.5 in the MA Study).

3. I would like to hear the evaluation teams' thoughts concerning the defensibility of the residential study results in terms of quantification of specific benefits. The questions posed in the residential study appear very complex and the answers appear to be somewhat forced based on the questions (see questions pasted below).

   a. What are the evaluation teams thoughts on the reliability of using the Massachusetts customers responses to these questions for Illinois?
      If the SAG believes that inclusion of NEBs is reasonable, then use of values based on a literature review follows the same practices taken in Illinois for Net-to-Gross values (where many of the early NTG values were based on secondary data collection).

   b. If Illinois customers had provided responses to these questions, would the evaluation team consider those reliable for quantification of benefits in Illinois?
      We believe that a set of cognitive interviews should occur prior to primary data collection via a survey[13]. NEBs are a difficult concept to measure. The set of questions used for recent NEBs have construct validity in that a reasonable person can see how the underlying construct of a specific NEB could derive from the question. However, responding to the questions for a typical person on the phone could be a struggle due to the complexity of the concept and the need to monetize the data. Cognitive interviews allow a researcher to determine if the respondent understands the question, which can help point to reliability and validity of the data collection instrument.

   c. Further the residential questions are “anchored” by an average estimate of energy savings per year, which the study indicates has the potential to bias the NEB estimates toward the savings

[13] This assumes that no cognitive interviews have already occurred during previous primary data collection on NEBs. We know of none, but that does not mean that it has not occurred.

assumed in the Massachusetts programs. (see, 2011 NMR/Tetra Tech Study, p. 5-8.) Is this "anchoring" technique in general or anchoring by the Massachusetts average savings a defensible method for use in quantifying Illinois-specific NEBs (e.g., given whole home billing analysis and thermostat billing analysis in Illinois likely result in different average savings than those assumed in Massachusetts)?
The use of anchoring appears to have the potential to bias a NEB estimate, but the extent to which this bias occurs would take more analysis than we have the ability to perform at this point. Additionally, to estimate the bias may be more effort than it is worth until the SAG has decided that pursuing NEB values is reasonable.

4. Example of very complex residential questions for comfort NEBs. Does the evaluation team believe these would be appropriate questions to include in Illinois study of NEBs? In not, what are specific concerns?:
Please see our response to 3b, above.

   a. Example Questions:

      C2 [IF C1=1 (MORE COMFORTABLE)] **A home with the type of energy efficiency improvements you installed typically saves $XX annually on energy bills. Compared to the typical energy savings of $XX per year, how much would you say this increased comfort adds to the value of living in your home each year, either in dollars or as a percentage of energy savings?**

      1 $____ / year [SKIP TO N1]
      2 _____% of annual energy savings [SKIP TO N1]
      D Don't know [GO TO C2A]

      [IF REPONDENT SAYS THEY HAVE NOT REALIZED ENERGY SAVINGS: The annual energy bill savings are an estimate based on the type of energy efficiency improvements made to your home. Please try to estimate the value of the increased comfort in terms of this estimate of bill savings.]

      C2A [IF C1=1 & C2=DON'T KNOW] Compared to the typical energy bill savings of $x, would you say the increased comfort is worth…

      [READ RESPONSES]

      1 Nothing
      2 About one-fourth of typical annual energy bill savings
      3 About one-half of typical annual energy bill savings
      4 About three-fourths of typical annual energy bill savings
      5 About equal to the typical annual energy bill savings
      6 More than energy bill savings [GO TO C2AX]
      7 Other [GO TO C2AX]
      8 DO NOT READ: Have not noticed any increased comfort
      D Don't know

      C2AX [IF C2A=6 OR 7] How much in total?

      [IF C2A=6, $/year must be higher than $XX, or % must be greater than 100]
      1 $___ / year
      2 ____% of annual energy savings

      C3 [IF C1=2 (LESS COMFORTABLE)] A home with the type of energy efficiency improvements you installed typically saves $XX annually on energy bills. Assuming you're saving $XX per year on

energy, how much would you say the decreased comfort takes away from the value of living in your home each year, either in dollars or as a percentage of energy savings?

1 $____ / year [SKIP TO N1]
2 _____% of annual energy savings [SKIP TO N1]
D Don't know [GO TO C3A]

[IF REPONDENT SAYS THEY HAVE NOT REALIZED ENERGY SAVINGS: The annual energy bill savings are an estimate based on the type of energy efficiency improvements made to your home. Please try to estimate the value of the decreased comfort in terms of this estimate of bill savings.]

C3A [IF C1=1 & C3=DON'T KNOW] In terms of energy bill savings, which of the following is closest to the value that the decreased comfort takes away from living in your home?

[READ RESPONSES]
1 Nothing
2 About one-fourth of typical annual energy bill savings
3 About one-half of typical annual energy bill savings
4 About three-fourths of typical annual energy bill savings
5 About equal to the typical annual energy bill savings
6 More than energy bill savings [GO TO C3AX]
7 Other [GO TO C3AX]
8 DO NOT READ: Have not noticed any decreased comfort
D Don't know

C3AX [IF C3A=6 OR 7] How much in total?
[IF C3A=6, $/year must be higher than $XX, or % must be greater than 100]
1 $___ / year
2 ____% of annual energy savings

5. While the C&I KEMA study questions seem less complex than the residential study questions based on a quick review, can the evaluation team confirm that there is no potential for double counting of NEBs depending on how they classify particular NEBs into categories? For example, based on current IL O&M savings in IL-TRM for particular measures, is it possible that the admin % NEBs (or other NEB % categories) in the KEMA report really are already reflected in the IL O&M savings?
We prefer to have Cadmus, as the member of our team involved most closely with the TRC analyses for Ameren, respond to this question.

6. (Below are a few errors/problems that I noticed, please let me know if the evaluation team agrees/disagrees with these:

    a. For C&I, it appears there is an error in the CHP NEBs in the attachment as it should be negative based on the KEMA study, but the attachment B indicates it is positive.
    We agree that the CHP NEB in the DNV_KEMA study is negative, yet Figure 4 in the Attachment B is positive. The value in Attachment B should be negative (reflecting the increased preventative maintenance and administrative costs from the CHP).

    b. In addition, "Other" and "Custom" listed in attachment B tables seem inappropriate, as they are undefined and there is no clear link that measures comprising those categories in study correspond to IL Program Administrator Categorization. For example, Figure 4 lists "Custom" measure/end use for gas C&I Large Retrofit as a NEB of $0.25. Table 1-2 in the KEMA Report shows that for Custom Gas measures such as water heaters and "Other", the NEBs are not statistically different from zero (the 90% confidence interval bounds range from negative NEBs to

positive NEBs). The way it is listed in Figure 4, the "Custom" could be interpreted to mean that all custom gas projects should apply a $0.25 NEB, which if applied to Water Heaters in a custom project would clearly be inappropriate given the study upon which the NEBs were based at least shows no statistically significant NEB for custom water heaters.)

We agree with your analysis above. Attachment B should remove the two end uses of 'other' and 'custom' as individual end uses. Additionally, the DNV_KEMA study applies an NEB of $1.35/therm for HVAC measures. In this MA study, the HVAC measures are gas boilers, furnaces, and chillers. Applying that value to the smaller measures of boiler reset controls, thermostats, duct insulation, and steam traps appears to stretch the use of the NEB for gas farther than prudent as the energy savings from measures across the two studies can be very different. Since these measures (i.e., steam traps, et. al) are not part of the DNV_KEMA study, we are unsure how they came to be included in Figure 4 of Attachment B. The removals suggested above take away all gas NEBs for C&I. However, the gas measures within the IL TRM and the measures included in the literature appear sufficiently different to warrant the removals. If primary data collection on NEBs moves forward, gas measures for C&I may be a high priority area.