CONSIDERING NON-ENERGY BENEFITS IN PUC DECISION MAKING: WHAT COUNTS?

NARUC CENTER FOR PARTNERSHIPS & INNOVATION
WEBINAR SERIES

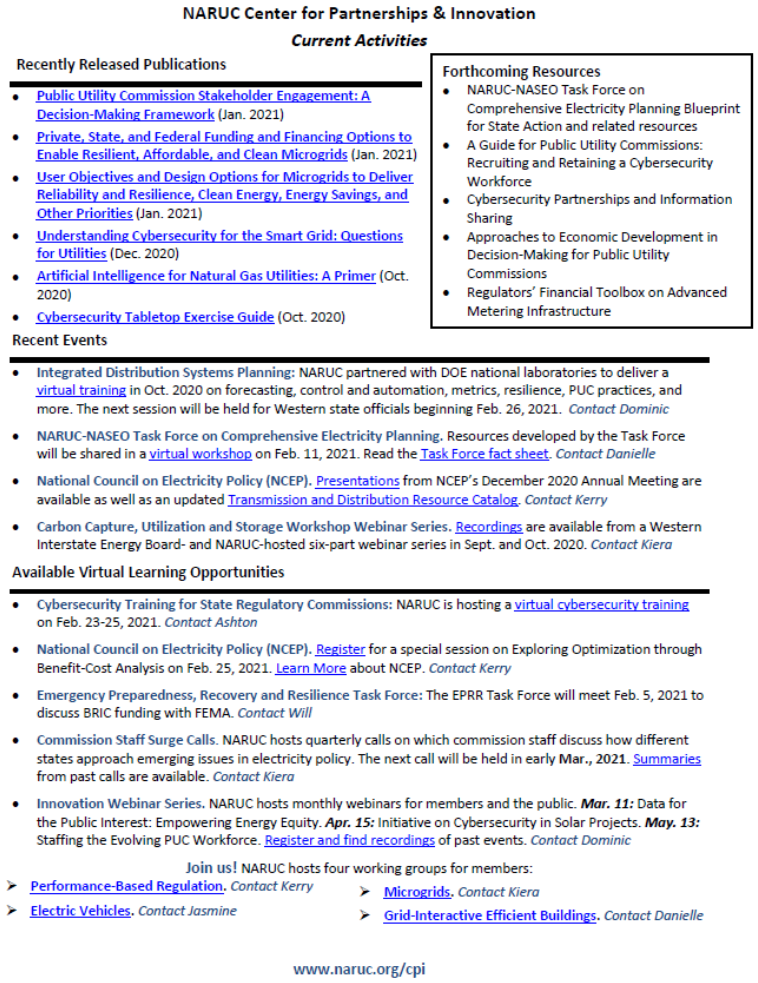
JANUARY 20, 2022

ABOUT NARUC

- The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889.
- Our Members are the state utility regulatory Commissioners in all 50 states & the territories. FERC & FCC Commissioners are also members. NARUC has Associate Members in over 20 other countries.
- NARUC member agencies regulate electricity, natural gas, telecommunications, and water utilities.

ABOUT NARUC'S CENTER FOR PARTNERSHIPS & INNOVATION

- Grant-funded team dedicated to providing technical assistance to members.
- CPI identifies emerging challenges and connects state commissions with expertise and strategies to inform their decision making.
- CPI builds relationships, develops resources, and delivers trainings.



NARUC Center for Partnerships & Innovation

Current Activities

Recently Released Publications

- Public Utility Commission Stakeholder Engagement: A Decision-Making Framework (Jan. 2021)
- Private, State, and Federal Funding and Financing Options to Enable Resilient, Affordable, and Clean Microgrids (Jan. 2021)
- User Objectives and Design Options for Microgrids to Deliver Reliability and Resilience, Clean Energy, Energy Savings, and Other Priorities (Jan. 2021)
- Understanding Cybersecurity for the Smart Grid: Questions for Utilities (Dec. 2020)
- Artificial Intelligence for Natural Gas Utilities: A Primer (Oct. 2020)
- Cybersecurity Tabletop Exercise Guide (Oct. 2020)

Forthcoming Resources

- NARUC-NASEO Task Force on Comprehensive Electricity Planning Blueprint for State Action and related resources
- A Guide for Public Utility Commissions: Recruiting and Retaining a Cybersecurity Workforce
- Cybersecurity Partnerships and Information Sharing
- Approaches to Economic Development in Decision-Making for Public Utility Commissions
- Regulators' Financial Toolbox on Advanced Metering Infrastructure

Recent Events

- **Integrated Distribution Systems Planning:** NARUC partnered with DOE national laboratories to deliver a virtual training in Oct. 2020 on forecasting, control and automation, metrics, resilience, PUC practices, and more. The next session will be held for Western state officials beginning Feb. 26, 2021. *Contact Dominic*
- **NARUC-NASEO Task Force on Comprehensive Electricity Planning.** Resources developed by the Task Force will be shared in a virtual workshop on Feb. 11, 2021. Read the Task Force fact sheet. *Contact Danielle*
- **National Council on Electricity Policy (NCEP).** Presentations from NCEP's December 2020 Annual Meeting are available as well as an updated Transmission and Distribution Resource Catalog. *Contact Kerry*
- **Carbon Capture, Utilization and Storage Workshop Webinar Series.** Recordings are available from a Western Interstate Energy Board- and NARUC-hosted six-part webinar series in Sept. and Oct. 2020. *Contact Kiera*

Available Virtual Learning Opportunities

- **Cybersecurity Training for State Regulatory Commissions:** NARUC is hosting a virtual cybersecurity training on Feb. 23-25, 2021. *Contact Ashton*
- **National Council on Electricity Policy (NCEP).** Register for a special session on Exploring Optimization through Benefit-Cost Analysis on Feb. 25, 2021. Learn More about NCEP. *Contact Kerry*
- **Emergency Preparedness, Recovery and Resilience Task Force:** The EPRR Task Force will meet Feb. 5, 2021 to discuss BRIC funding with FEMA. *Contact Will*
- **Commission Staff Surge Calls.** NARUC hosts quarterly calls on which commission staff discuss how different states approach emerging issues in electricity policy. The next call will be held in early **Mar., 2021**. Summaries from past calls are available. *Contact Kiera*
- **Innovation Webinar Series.** NARUC hosts monthly webinars for members and the public. ***Mar. 11:*** Data for the Public Interest: Empowering Energy Equity. ***Apr. 15:*** Initiative on Cybersecurity in Solar Projects. ***May. 13:*** Staffing the Evolving PUC Workforce. Register and find recordings of past events. *Contact Dominic*

Join us! NARUC hosts four working groups for members:

- Performance-Based Regulation. *Contact Kerry*
- Electric Vehicles. *Contact Jasmine*
- Microgrids. *Contact Kiera*
- Grid-Interactive Efficient Buildings. *Contact Danielle*

www.naruc.org/cpi

Regularly updated CPI fact sheet with recent publications & upcoming events under Quick Links at:

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Considering Non-Energy Impacts for Policies and Programs:

Renewables, Efficiency, and Distributed Energy Resources

Presented by Steve Schiller

Berkeley Lab Senior Advisor/Affiliate

NARUC Innovation Webinar

January 20, 2022

This work was funded by the U.S. Department of Energy, Building Technologies Office and Office of Electricity, under Contract No. DE-AC02-05CH11231.

Berkeley Lab – Electricity Markets and Policy Department

Informing public and private decision-making through through independent, interdisciplinary analysis of critical electricity policy and market issues

Free Technical Assistance to PUCs

- Berkeley Lab provides technical assistance to PUCs at no charge with funding from the U.S. Department of Energy.
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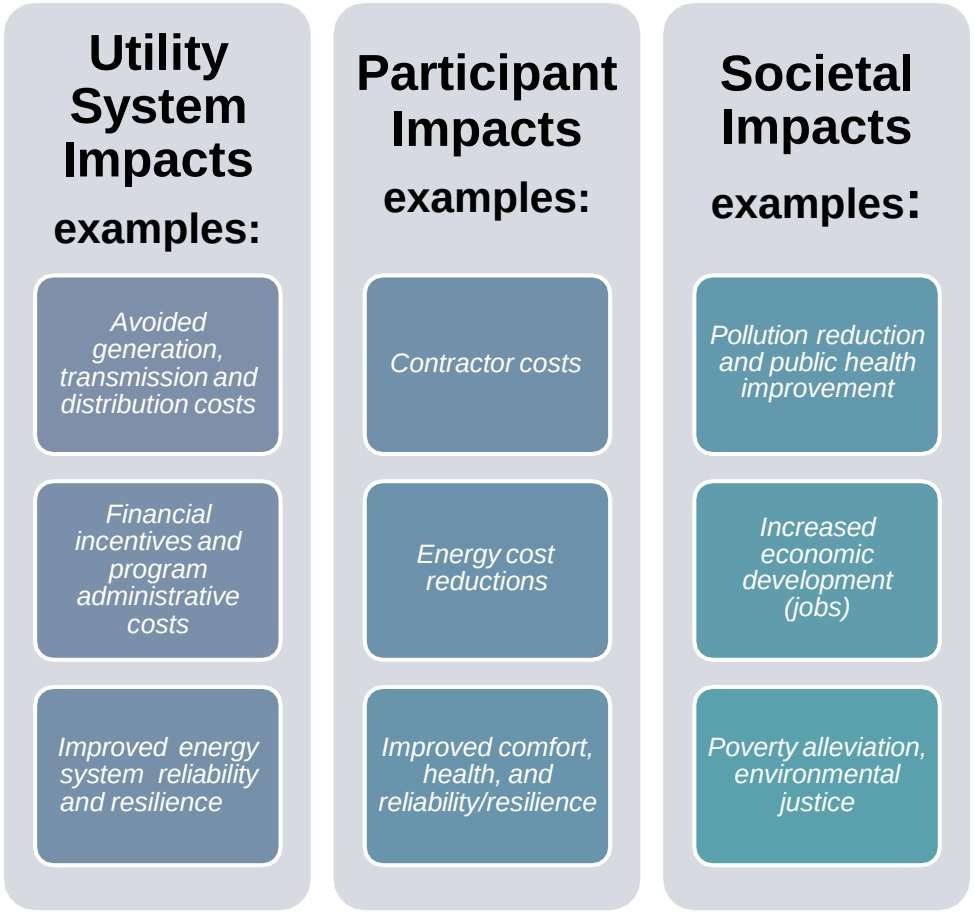
Topics

- Defining Non-Energy Impacts (NEIs)
- NEI categories and their use in program analysis
- Importance of NEIs for regulators
- Determining NEI values

Policy and Program Impacts - Overall Context for NEIs

- Regulators support utility programs that:
  - Align with their jurisdiction's policies, goals and regulations
  - Are considered cost-effective investments
- Various analysis methods are used to determine cost-effectiveness, but the basic concept is to compare impacts of different options – e.g., using benefit-cost analysis
- Traditionally, policy and program impacts have been categorized into three groupings of costs and benefits: **Utility System, Participant**, and **Societal**



Defining Non-Energy Impacts

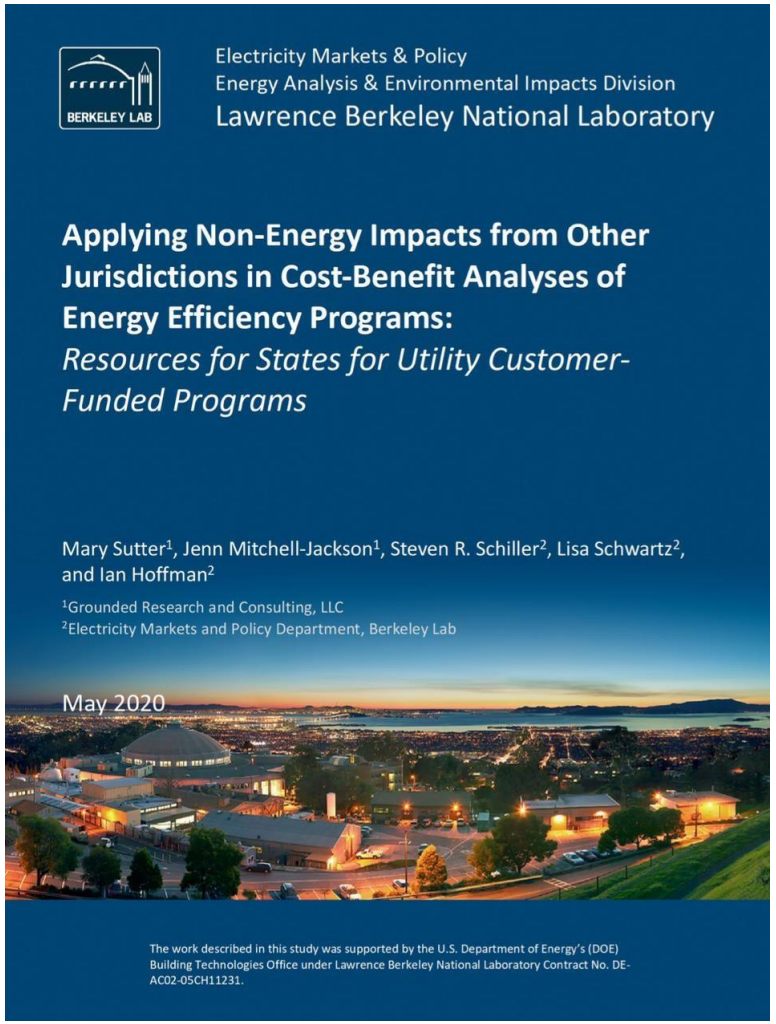
- **NEIs is a broad term for a wide range of costs and benefits that are not clearly associated with energy generation, transmission, and distribution (GT&D).**
- NEIs can be defined as:
  - *Costs* - All costs beyond those associated with directly implementing energy programs
  - *Benefits* - All utility system, participant, and societal benefits beyond those directly associated with the utility system's provision of GT&D
- In practice, definitions of specific NEIs vary, in part depending on context, with some potential for overlap between energy and non-energy impacts
- What is most important is not necessarily getting impacts into the right "bucket," but considering all substantive impacts as long as they are:
  - Connected to a jurisdiction's policies or regulations
  - Relevant to cost-effectiveness analyses

NEI Resources

- Berkeley Lab reviewed how 30 jurisdictions calculate and use NEIs

  https://emp.lbl.gov/publications/applying-non-energy-impacts-other
- We looked at 16 categories of NEIs
  - Focused on methods to calculate NEIs for energy efficiency programs, particularly use of other jurisdictions' values
  - Documented multiple resources with NEI calculations and values
  - Did not cover low-income NEIs – these have been well studied by others (see references in our report)
- Julie Michals (next presentation) will describe another resource:

  https://www.nationalenergyscreeningproject.org/state-database-dsp/



Commonly Applied NEIs (1)

– from 2020 Berkeley Lab Report

Percent of Jurisdictions Using NEI *(N=30)*	Non-Energy Impact Category	Definition
60%	**Water resource costs and benefits *(participant benefit)***	Costs and benefits associated with changes in water consumption and wastewater treatment resulting from efficiency resources
53%	**Other fuels costs and benefits *(participant benefit)***	Costs and benefits resulting from reduced consumption of electricity and non-electric energy sources, or from increased consumption of other fuels, resulting from energy efficiency
47%	**Avoided environmental compliance costs *(utility impact)***	Reduction in future costs of complying with environmental regulations from efficiency, which reduces the amount of energy that needs to be generated
43%	**Environmental impacts *(societal impact)***	The range of environmental costs and benefits that result from efficiency resources
37%	**Productivity *(participant impact)***	Includes changes in labor costs and productivity, waste streams, spoilage/defects, operations and maintenance, and changes in product sales as a result of changes in aesthetics, comfort, etc.
33%	**Health and safety *(participant impact)***	Includes improved "well-being" due to reduced incidence of illness, medical costs, sick days, deaths, and insurance costs (e.g., from reduced fire risk)
30%	**Asset value *(participant benefit)***	Includes equipment functionality/performance improvement, equipment life extension, change in building value, change in ease of selling building
30%	**Energy and/or capacity price suppression effects *(utility impact)***	Reduced market clearing prices resulting from efficiency resources; may extend outside service territory because of regional nature of wholesale markets

Commonly Applied NEIs (2)

Percent of Jurisdictions Using NEI *(N=30)*	Non-Energy Impact Category	Definition
27%	**Avoided costs of compliance with RPS requirements *(utility impact)***	Reduction in absolute amount of renewable resources that must be purchased resulting from efficiency
23%	**Avoided credit and collection costs *(utility impact)***	Value of reduced probability of customers falling behind or defaulting on bill payment obligations as a result of lowered energy use and customer energy bills from efficiency programs
23%	**Avoided ancillary services *(utility impact)***	Value of reduction in services required to maintain electric grid stability and security
23%	***Comfort (participant impact)***	*Includes thermal comfort, noise reduction, improved light quality*
20%	**Economic development and job impacts *(societal impact)***	The economic development and jobs that are associated with investment in energy efficiency including job creation and increases in disposable income resulting from energy bill savings for customers
13%	**Public health impacts *(societal impact)***	The range of public health impacts resulting from efficiency resources
10%	**Energy security impacts *(societal impact)***	The impacts on energy security and energy independence resulting from energy efficiency investments
7%	**Increased reliability *(utility impact)***	Value of reduced probability and/or likely duration of customer service interruptions from efficiency, which lowers loads on the grid

Can NEIs Move the Needle in Cost-Effectiveness Analysis? Yes!

- NEIs can be positive (reduce costs/increase benefits) or negative (increase costs/reduce benefits).
- **However, virtually all recognized NEIs for distributed energy resources (DERs) provide positive impacts (i.e., benefits).**
- Specific NEI values vary substantially between types of NEIs and from one jurisdiction to another.
- **Reviewed studies indicate that NEIs can have negligible to substantial effects on cost-effectiveness calculations.**
- For example, for energy efficiency, the national average cost to save a kilowatt-hour (kWh) is about 2.5 cents, according to the most recent Berkeley Lab study.
  - In some jurisdictions, the value of an individual NEI can offset close to half of that cost (e.g., one study showed about 1 cent/kWh for public health or increased reliability benefits).
  - Or an individual NEI may have minimal value for a jurisdiction (e.g., about 0.05 cent/kWh for Renewable Portfolio Standard compliance in another study).

NEIs Are Important for Regulators

- We typically focus on energy and cost savings in assessment of projects and programs.
- However, regulators (and policy makers, utilities and consumers) often consider NEIs in decisions to pursue program investments because they can meet a variety of goals and objectives beyond pure energy concerns—for example, economic development, environmental management, public infrastructure reliability/resilience, and social/economic equity goals.
- Thus, cost-effectiveness tests — and use of NEIs — should:
  - ✓ Account for a jurisdiction's applicable policy goals and objectives
  - ✓ Avoid bias by treating benefits and costs symmetrically for any given type of impact (for example, include consumer benefits if including consumer costs)
  - ✓ Include all relevant material impacts, including those that are difficult to quantify or monetize
- In addition, understanding and quantifying NEIs supports program design and marketing of efficiency and other DER programs by addressing the non-energy interests of participants, utilities and others – which can often be stronger motivators than energy cost savings alone.

Determining NEI Values

- Benefits and costs of DER investments may be estimated with:
  - Monetary or non-monetary quantitative terms, or
  - Qualitative values.
- Using current, monetary values that are specific to the given jurisdiction are the best approach, providing for accurate and consist comparison of options.
- However, some impacts are hard to monetize, and jurisdictions can face constraints to conducting rigorous jurisdiction-specific impact studies.
- Thus, some jurisdictions choose to apply other approaches – such as applying values from other jurisdictions, using broad adders applied to energy benefits, or taking into consideration qualitative factors.
- While many of these approaches represent approximations and include some uncertainties, it is better to use the best available approximation for a material impact than to assume it does not exist or that its value is zero.

Five Approaches to Valuing NEIs

The National Standard Practice Manual (NSPM) defines five approaches to account for relevant impacts, including approaches for hard-to-monetize NEIs.

Monetary Approaches	
Jurisdiction-specific studies	Rigorous jurisdiction-specific studies on DER impacts offer the potentially most accurate approach for estimating and monetizing relevant impacts.
Studies from other jurisdictions	If jurisdiction-specific studies are not available, studies from other jurisdictions or regions, or national studies, can be used for estimating and monetizing impacts.
Proxies	If monetized impacts are not available, well-informed and well-designed proxies can be used as a simple substitute (e.g., % adders).
Non-Monetary Approaches	
Alternative thresholds	Pre-determined thresholds — e.g., benefit-cost ratios that are different from one (1.0) — can be used as a simple way to account for relevant impacts that are not otherwise included.
Qualitative values	Relevant qualitative information can be used to estimate impacts that cannot be monetized.

Using Alternative Benchmarks and Proxies

- Alternative thresholds allow DERs to be considered cost-effective at pre-determined benefit-cost ratios that are different from one (1.0).
- Applying a proxy value can essentially have the same effect as using alternative benchmarks.
- Several types of proxies can be used to account for impacts.
  - *Percentage "Blanket" Adder:* A percentage adder approximates the value of non-monetized impacts by scaling up all impacts that are monetized. This type of proxy is the simplest and easiest to apply, but is a blunt tool. Several states apply this approach.
  - *Energy Savings Multiplier ($/MWh or $/MMBtu or X%):* A savings multiplier approximates the value of non-monetized benefits or costs relative to the quantity of energy savings. For example, increasing value of benefits by 50 cents per MWh saved or by 10% of the value of the energy savings.
  - *Customer Adder ($/customer):* A customer adder (or subtraction) approximates the value of non-monetized benefits relative to the number of customers served by a program.
  - *Measure Multiplier ($/measure):* A fixed dollar amount adder — for example, $X.X per PV system

Considering Qualitative Values

- Distinguish between whether and how to include an an impact.
  - First decide *whether* to include impacts in cost-effectiveness tests based on the relevant policies, goals, regulations, and relevance of specific NEIs. Then decide separately *how* to value or otherwise account for the impacts.
  - Provide as much quantitative evidence as possible.
  - Establish metrics to create quantitative data for future analyses that can result in quantitative values.
  - Provide as much qualitative evidence as practical.
- Decide on the implications of the quantitative and qualitative evidence.
  - Non-monetized impacts are presented alongside monetary impacts so regulators can compare the monetized, quantitative, and qualitative factors and evidence to decide whether a program is appropriate.
  - Document and justify the decision.

NEIs — Summary

- Non-energy impacts of energy efficiency are impacts not directly, or commonly recognized as, associated with energy production, transmission, and distribution.
- While often more difficult to quantify than direct energy impacts, there are multiple sources and methods for determining NEI values.
- On balance, researchers have found that NEIs have positive impacts for utility systems, consumers, and society, sometimes representing substantial benefits — for example, with respect to air quality and public health.
- Considering whether and how to include NEIs is an important component of cost-benefit analyses, potentially leading to acquisition of more cost-effective energy choices than otherwise would be achieved.
- It is better to use the best available approximation for a material impact than to assume it does not exist or that its value is zero.

BERKELEY LAB

Thank You

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State Consideration of Non-Energy Impacts in Cost-Effectiveness Testing

NARUC Center for Policy Innovation
Webinar

Julie Michals – E4TheFuture
January 20, 2022

About NESP

The National Energy Screening Project (NESP) is a stakeholder organization that is open to all organizations and individuals with an interest in working collaboratively to improve cost-effectiveness screening practices for energy efficiency (EE) and other distributed energy resources (DERs).

Products include:

- NSPM for EE (2017)
- NSPM for DERs (2020)
- Database of Screening Practices (DSP)

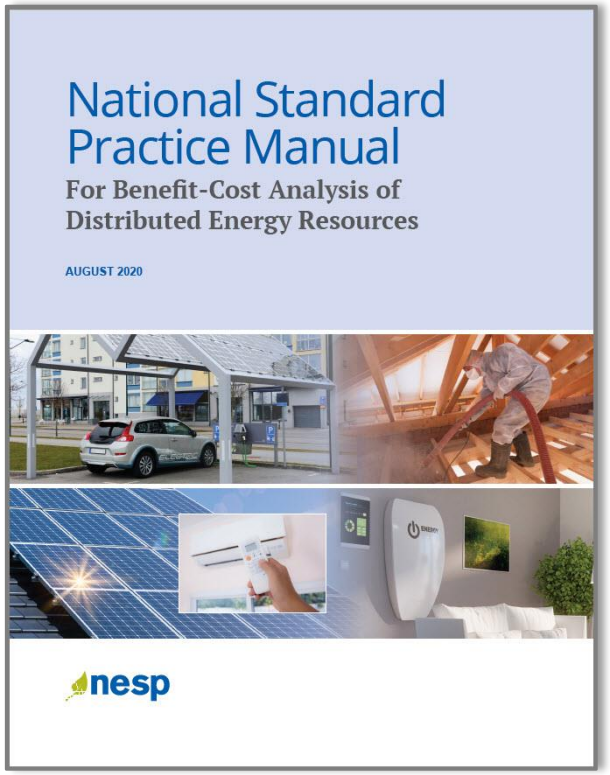
NESP work is managed by E4TheFuture, with coordinated state outreach via key partners.

NESP work is funded by E4TheFuture and in part by US DOE.

https://nationalenergyscreeningproject.org/

NSPM for DERs Principles
(and why they matter in context of NEIs…)

1. Recognize that DERs can provide energy/power system needs and should be compared with other energy resources and treated consistently for BCA.
2. Align primary test with jurisdiction's applicable policy goals.
3. Ensure symmetry across costs and benefits.
4. Account for all relevant, material impacts (based on applicable policies), even if hard to quantify.
5. Conduct a forward-looking, long-term analysis that captures incremental impacts of DER investments.
6. Avoid double-counting through clearly defined impacts.
7. Ensure transparency in presenting the benefit-cost analysis and results.
8. Conduct BCA separate from Rate Impact Analyses because they answer different questions.



Host Customer Impacts

Does policy require that you account for Host Customer Impacts? If so, is there symmetry in treatment of benefits and costs?

Host Customer Impact	Description
Host portion of DER costs	Costs incurred to install and operate DERs
Interconnection fees	Costs paid by host customer to interconnect DERs to the grid
Risk	Uncertainty including price volatility, power quality, outages, and operational risk related to failure of installed DER equipment and user error; this type of risk can depend on the type of DER
Reliability	The ability to prevent or reduce the duration of host customer outages
Resilience	The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions
Tax incentives	Federal, state, and local tax incentives provided to host customers to defray the costs of some DERs
Non-energy Impacts (NEIs)	Benefits and costs of DERs that are separate from energy-related impacts -- low- or limited-income customers -- market rate customers

Host Customer NEI	Description
Transaction costs	Costs incurred to adopt DERs, beyond those related to installing or operating the DER itself (e.g., application fees, customer time spent researching DERs, paperwork, etc.)
Asset value	Changes in the value of a home or business as a result of the DER (e.g., increased building value, improved equipment value, extended equipment life)
Productivity	Changes in a customer's productivity (e.g., in labor costs, operational flexibility, reduced waste streams, reduced spoilage)
O&M	Changes in O&M costs (e.g., less frequent change out of light bulbs, lower O&M for EVs relative to combustion engine vehicles, etc.)
Economic well-being	Economic impacts beyond bill savings (e.g., reduced complaints about bills, reduced terminations and reconnections, reduced foreclosures—especially for low-income customers)
Comfort	Changes in comfort level (e.g., thermal, noise, and lighting impacts)
Health & safety	Changes in customer health or safety (e.g., fewer sick days from work, reduced medical costs, improved indoor air quality, reduced deaths)
Empowerment & control	Ability to control one's energy consumption and energy bill
Satisfaction & pride	Satisfaction of helping to reduce environmental impacts (e.g., key reason why residential customers install rooftop PV)
Power/ Quality	Ability of electrical equipment to consume the energy being supplied to it e.g., improved electrical harmonics, power factor, voltage instability and efficiency of equipment.
DER Integration	Ability to add current and future DERs to the existing electric energy grid.
Reduced Utility Bills	Only relevant if using a *Participant Cost Test*

Accounting for Host Customer NEIs
(and Symmetry Challenge)

Database of Screening Practices (DSP) - Energy Efficiency

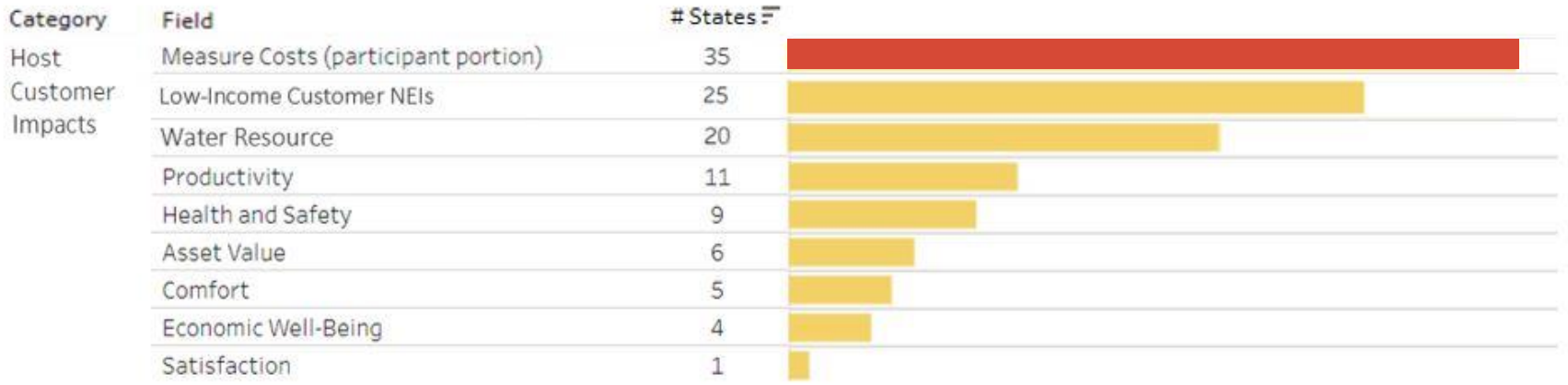
tates | Single State | Test & Application | Utility System Impacts | Non-Utility System Impacts | **Impacts Summary** | Impact Methods

View electric or natural gas?
- (•) Electric
- ( ) Natural Gas

Filter by primary test: (All)

Note: Increased resilience does not appear on this chart because it is not currently included in any state primary tests.

Select Impact: (Multiple values)

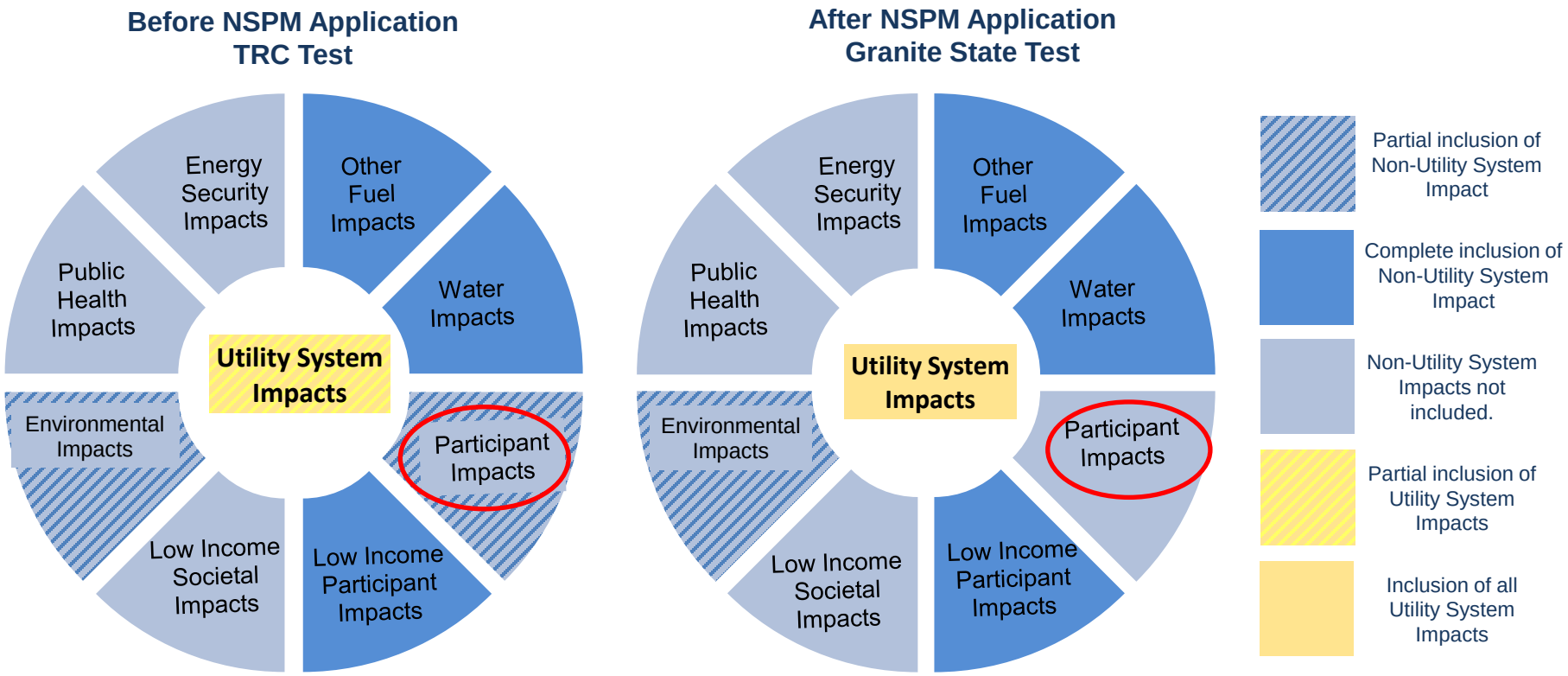


Source: [Database of Screening Practices]

Example States Using Proxy/Adders for Host Customer NEIs (EE)

Non-Low Income	Low Income
Colorado: 20% adder Illinois: 10% electric, 7.5% gas Iowa: 10% electric, 7.5% gas Nevada: 15% adder D.C.: 10% adder New Jersey: 5% adder	Colorado: 50% adder Nevada: 25% adder New Mexico: 20% adder Vermont: 15% adder New Jersey: 10% adder
Health & Safety	
Massachusetts: Monetizes health benefits for low income programs **Delaware:** $182 per home (annual) applied to low-income weatherization programs. **Idaho:** Utilities can claim $1 of nonenergy benefits for each dollar of federal funds invested in health, safety, and repair measures. **New Hampshire:** Part of 10% adder includes improved health benefits for participants.	
Sources: https://www.aceee.org/toolkit/2021/04/supporting-low-income-energy-efficiency-guide-utility-regulators https://www.bpu.state.nj.us/bpu/pdf/boardorders/2020/20200824/8A%20-%20ORDER%20New%20Jersey%20Cost%20Test.pdf https://www.aceee.org/sites/default/files/he-ce-tests-121318.pdf NESP Database of Screening Practices	

Another way to achieve symmetry:
New Hampshire's Granite State Test*

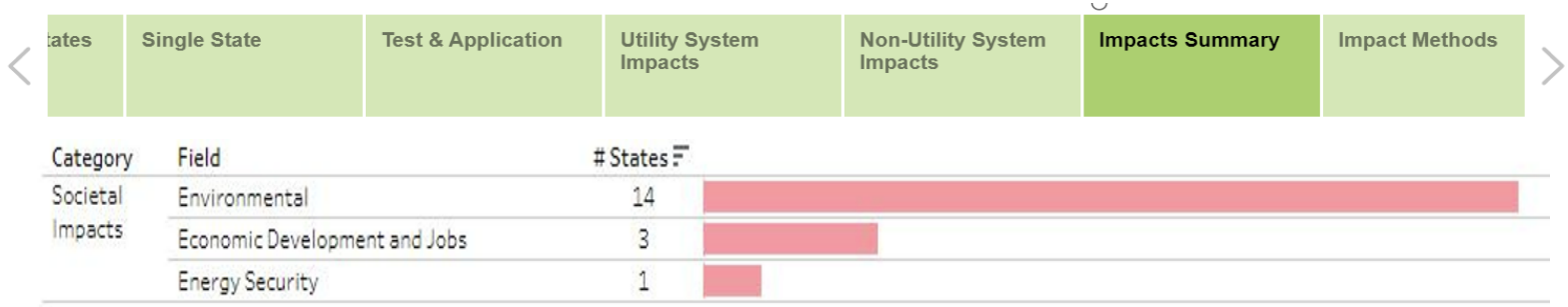


*NH Granite State Test developed using the NSPM BCA Framework – approved by NH PUC in 2020 but then PUC rejected 3-year EE settlement plan (now being contested)

Accounting for Societal Impacts

Does policy articulate specific societal goals with investing in DER(s)? If so, they should be accounted for, even if hard to quantify.

Societal Impact	Description
Resilience	Resilience impacts beyond those experienced by utilities or host customers
GHG Emissions	GHG emissions created by fossil-fueled energy resources (beyond GHG compliance costs accounted for as utility system impact)
Other Environmental	Other air emissions, solid waste, land, water, and other environmental impacts
Economic and Jobs	Economic development and job impacts (direct/indirect, net)
Public Health	Health impacts, medical costs, and productivity affected by health
Low Income or Vulnerable Populations: Society	Poverty alleviation, environmental justice, reduced home foreclosures, etc.
Energy Security	Energy imports and energy independence



Accounting for GHG Emission Impacts

Are *existing* and *anticipated* compliance costs accounted for?

Are the jurisdiction's (or utility) carbon reduction goals accounted for (beyond compliance)?

Discount rate matters (a lot)!

State	Does state account for cost of carbon in its CE test?	
	Environmental Compliance As Avoided Utility System Cost	Societal Benefit or Externality (beyond compliance costs)
CA	Yes (cap and trade)	Yes – using GHG adder
CO	No (set at $0)	Yes in sensitivity analysis of BCA
CT	Yes RGGI compliance	Yes – but in secondary test only
IL	Yes	Yes
MD	Yes RGGI compliance	Yes – but in secondary test only
MA	Yes RGGI compliance and DEP regs	Yes
MN	No	Yes
NV	Yes	Yes
NH	Yes RGGI compliance	Yes – but in secondary test only
NJ	Yes RGGI compliance	Yes
NY	Yes RGGI compliance	Yes
RI	Yes RGGI Compliance	Yes
VT	Yes RGGI compliance	Yes
VA	Yes	No
WA	Yes	No

Source: E4TheFuture – July 2021

Accounting for GHG Emission Impacts - cont.
Discount rates matter (a lot!)

Table ES-1: Social Cost of CO_2, 2020 – 2050 (in 2020 dollars per metric ton of CO_2)[3]

Emissions Year	Discount Rate and Statistic			
	5% Average	3% Average	2.5% Average	3% 95th Percentile
2020	14	51	76	152
2025	17	56	83	169
2030	19	62	89	187
2035	22	67	96	206
2040	25	73	103	225
2045	28	79	110	242
2050	32	85	116	260

Source: Interim Estimates under Executive Order 13990 Interagency Working Group (IWG) on Social Cost of Greenhouse Gases, US Government

MA Example:

Social Cost of Carbon used from 2021 AESC = **$128/ton** for 15-year levelized using 2% discount rate.

New recommendation for utility 3-year EE plans uses 1% discount rate = **$393/ton**

See: https://www.synapse-energy.com/project/aesc-2021-supplemental-study-update-social-cost-carbon-recommendation

Public Health Benefits

- Often articulated as a policy goal for EE and other DER investments
- EPA Benefits per KWH (BPK) Tool
  - Based on AVERT and COBRA models
  - Example: IL Societal Health NEIs report (Revised April 2021) - Ameren

Table 2. AIC 2018 Energy Efficiency Portfolio Lifetime Societal Health Benefits

Sector	Verified Savings (GWh)	Verified Savings (Thousand Therms)	National Health Benefits (Million 2018 $)		Illinois Only Health Benefits (Million 2018 $)	
			Low	High	Low	High
Electric	*3,571*	*NA*	$89.53	$201.86	*$11.83*	*$26.65*
Residential Gas	NA	13,819	$0.56	$1.26	$0.19	$0.42
Nonresidential Gas	NA	35,417	$1.64	$3.71	$0.55	$1.23
Gas Subtotal	*NA*	*49,236*	*$2.20*	*$4.97*	*$0.73*	*$1.65*
Portfolio Total	**3,571**	**49,236**	**$91.73**	**$206.82**	**$12.56**	**$28.30**

- Emission rates behind models can make a difference: marginal (short-term vs long-term) or average emission rates?
  - AVERT Model uses marginal short-term rate
  - Cambium Model (NREL) uses marginal long-term rate

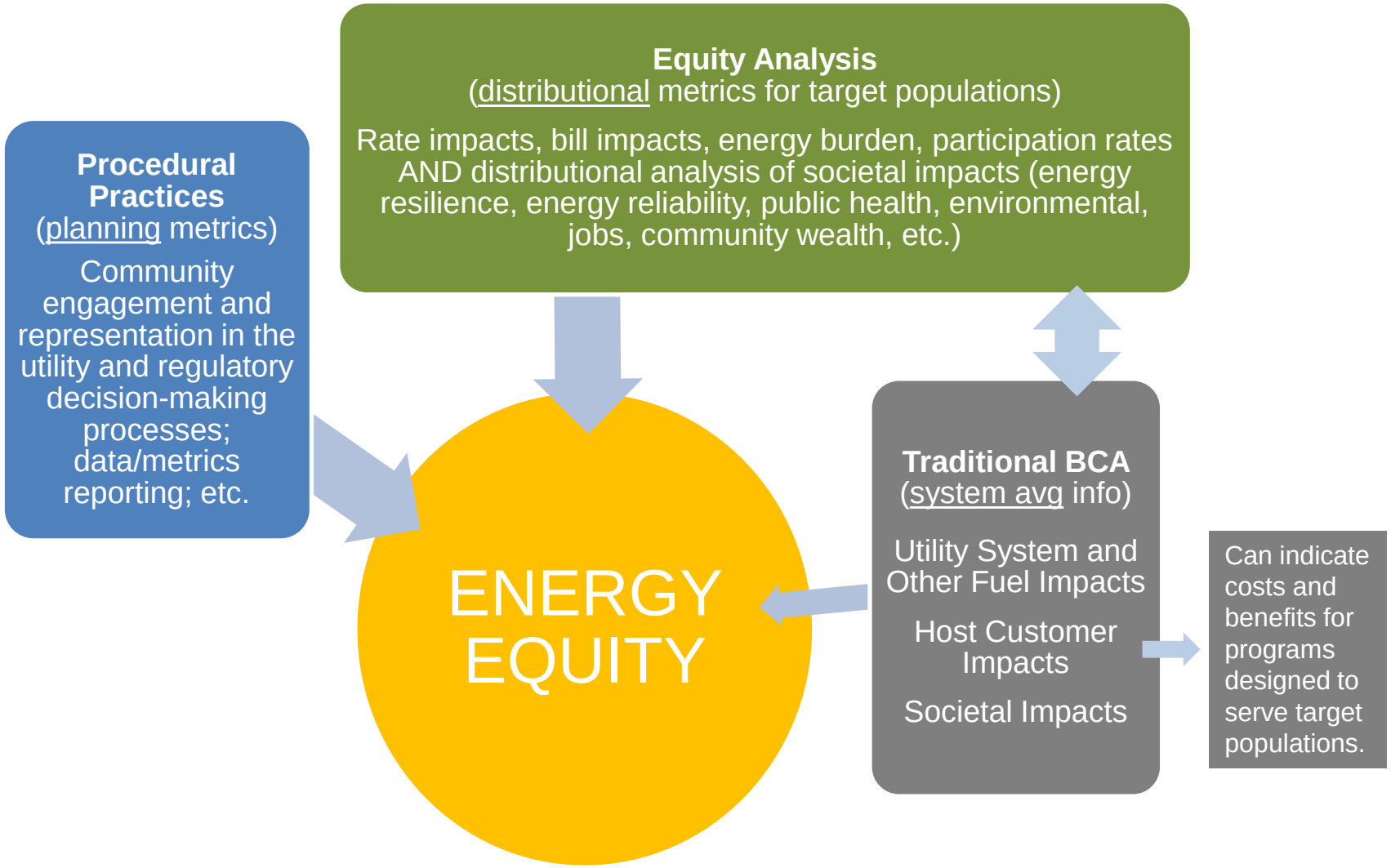
Other Key Societal Impacts

Other NEIs are often articulated in state policy goals but not accounted for in BCA. For example:

- Economic development – not monetized in BCA but separate quantitative analysis that can be part of decision-making process:
  - 3 jurisdictions: NV, DC and RI quantify impacts using either proxies (e.g., adders), multipliers, or input-output models (or some combination thereof).
  - See ACEEE report: Guidance On Developing Economic Benefits for Energy Efficiency
- Resilience (societal) – qualitative assessment?
- Energy security – qualitative assessment?

NSPM Principle: *If impact is an applicable goal, but hard to quantify, even some level of qualitative assessment is important to consider in decision-making, because the impact* ***value is not zero***

Accounting for Energy Equity



NEIs – Across different DERs

Impact can be a benefit or cost or will 'depend' on key factors

Type	Host Customer Impact	EE	DR	DG	Storage	Electrification
Host Customer	Host portion of DER costs	●	●	●	●	●
	Interconnection fees	○	○	●	●	○
	Risk	●	○	●	●	●
	Reliability	●	●	●	●	●
	Resilience	●	●	●	●	●
	Tax Incentives	●	●	●	●	●
	Host Customer NEIs	●	●	●	●	●
	Low-income NEIs	●	●	●	●	●

Type	Societal Impact	EE	DR	DG	Storage	Electrification
Societal	Resilience	●	●	●	●	●
	GHG Emissions	●	●	●	●	●
	Other Environmental	●	●	●	●	●
	Economic and Jobs	●	●	●	●	●
	Public Health	●	●	●	●	●
	Low Income: Society	●	●	●	●	●
	Energy Security	●	●	●	●	●

● = typically a benefit for this resource type; ● = typically a cost for this resource type; ● = either a benefit or cost for this resource type, depending upon the application of the resource; ○ = not relevant for this resource type

NEW Methods, Tools & Resources

A Handbook for Quantifying DER Impacts for BCA

Coming February 2022 – The MTR Handbook is a companion resource to the NSPM, providing guidance on methods for calculating:

- Full range of utility system impacts (electric, gas, and other fuels)
- Non-utility system impacts (host customer and societal)
- Risk and uncertainty
- Reliability and resilience
- Developing DER Load Impact/Operating Profiles
- Offers pros and cons of different methodological approaches;
- Provides public resources to develop BCA inputs

Thank you!

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Visit www.nationalenergyscreeningproject.org

Maryland Electric Vehicle Benefit/Cost Framework: An Example Of Non-Energy Impact Consideration

January 20, 2022

Mark Warner
Vice President
Advanced Energy Solutions
Gabel Associates, Inc.

NARUC Innovation Webinar: Background

- **The State Of Maryland Has Set Aggressive Goals For Electric Vehicle (EV) Adoption**
- **Multiple Utilities In Maryland Offer Specialized Programs To Support EV Market Growth**

- **The Maryland Public Service Commission (PSC) Requires Formal Benefit/Cost Analysis For EV Program Filings; In 2019/2020, Several Utilities Including BCA In Their Multi-Year Filings**

- **In December 2020, The PSC Chartered A Year-Long Stakeholder Group To Define A Formal BCA Methodology Specifically For Utility EV Programs (Order 89678)**

- **Working Group Considered Multiple Sources: Prior Testimony, EV-BCA Examples From Other Jurisdictions, MD-EmPower Program, National Standards Practice Manual (NSPM)**

- **The Working Group Achieved Consensus On A Comprehensive EV-BCA Framework, Which Was Approved Unanimously By The PSC On January 12, 2022 (Case #9478)**

- **The EV-BCA Framework Has Been Described In Detail In A Whitepaper That Will Be Available As Part Of This Webinar**

- **The MD EV-BCA Framework Incorporates Detailed Consideration Of "Non-Energy Impacts" (NEIs) Since These Impacts Are A Primary Motivation For Widespread EV Adoption.**

NARUC Innovation Webinar: EV-BCA Considerations

- **The EV-BCA Framework Defines Methodology At THREE LEVELS:**
  - **An Overall Assessment Strategy (which assessments are used, and why)**
  - **High Level Inventory Of Benefits and Costs (at a generic level)**
  - **Detailed Calculation Methods And Sources Specific To EV Impacts (detailed offer maps)**

- **Ensuring Fair Consideration Of EV-Specific Impacts**
  - **Net Changes In Emissions (societal impacts: both Climate Change and Public Health)**
  - **Net Changes In Economics For EV-Owners (participant impacts)**
  - **Net Changes In Aggregate Load And Utility Costs (utility impacts)**

- **The Nature Of EV-Impacts:**
  - **Inherently A Fuel-Switching Strategy (displaces vehicle-fuel use with electricity use)**
  - **Increases electricity use (but increases overall efficiency of primary fuel use)**
  - **Can Have Significant, But Potentially Managed, Impact On Load**

- **The Framework Informs Multiple Stakeholder Groups:**
  - **Guides Utility Program Design**
  - **Quantifies "Cost Effectiveness" In A Rigorous Way**
  - **ALSO Addresses Ratepayer Impacts**

All Three Perspectives Are Of Interest To Policy Decision-Makers

- **Significant "Boundary Condition" Assumptions Needed For All Impacts, Especially NEIs**

NARUC Innovation Webinar: EV-BCA Framework

Five-Part Framework To Provide Multiple Policy-Perspectives:

Primary Test: MD-EV-JST

- Societal scope
- Considers only impacts induced by the proposed utility programs
- Based on a standard NPV of benefits divided by the NPV of costs
- Two variations: a BCA for each individual utility program, and the aggregate impact of the program portfolio

Secondary Test (MW): Market-Wide Societal Impact

- Societal scope, similar to a standard SCT (although not exactly the same)
- Considers full market impacts (all vehicle on the road), including the proposed utility programs (as a portfolio)
- Three variations: full natural charging, full managed charging, likely charging outcome

Secondary Assessment (ANRI-All): Ratepayer Impacts – All Impacts

- A customized test (ANRI) that quantifies aggregate net impact on **non-participating ratepayers**
- Based on NPV of ratepayer cost increases and decreases
- Considers both "changes on the utility bill" and externalities such as climate change and public health
- Two variations: an assessment for each individual utility program, and the aggregate impact of the program portfolio
- Express all ANRI results in two forms: total net NPV (positive or negative), and an illustrative "monthly impact per residential customer" indicator.

Secondary Assessment (ANRI-Bill Only): Ratepayer Impacts – Bill Impacts Only

- Same as above, but considers economized impacts on the bill only

Other Strategic Considerations

- A qualitative inventory of relevant impacts that are important, but hard to quantify credibly

NARUC Innovation Webinar: Impact Portfolio

An "Impact" Could Be A Benefit Or A Cost (for SCT-Style Tests), Or Drive An Increase OR A Decrease In Net Utility Costs (for ANRI Tests).

Impact-Factor	MD EV-JST	MW-Test	ANRI (All)	ANRI (Bills Only)
Utility (and Power Sector) Impacts				
Utility Program Administration Costs	Cost	Cost	Increase	Increase
Utility Program Implementation Costs	Cost	Cost	Increase	Increase
Impacts On Capacity Costs	Cost or Benefit	Cost or Benefit	Increase or Decrease	Increase or Decrease
Impacts On Transmission Costs	Cost or Benefit	Cost or Benefit	Increase or Decrease	Increase or Decrease
Wholesale Energy Cost Impacts	Cost or Benefit	Cost or Benefit	Increase or Decrease	Increase or Decrease
Increased Supply Costs (for EV charging)	Cost	Cost	Increase	Increase
Impacts on Grid Reinforcement	Cost or Benefit	Cost or Benefit	Increase or Decrease	Increase or Decrease
Utility-Owned EV Chargers - Costs	Cost	Cost	Increase	Increase
Utility-Owned EV Chargers - Usage $ From EV Drivers	Transfer	Transfer	Decrease	Decrease
Increased RPS Compliance Costs	Cost	Cost	Increase	Increase
T&D Losses	Cost or Benefit	Cost or Benefit	Increase or Decrease	Increase or Decrease
Utility Equipment Incentives	Transfer	Transfer	Increase	Increase
Utility Rate Incentives	Transfer	Transfer	Increase	Increase
Increased Utility Revenues	Transfer	Transfer	Decrease	Decrease
Participant Impacts(from EV Driver Perspective)				
Incremental EV Purchase Costs	Cost	Cost	N/A	N/A
EV Charger Costs (equipment and installation)	Cost	Cost	N/A	N/A
Savings From Avoided Vehicle Fuel Use	Benefit	Benefit	N/A	N/A
Savings From Decreased Vehicle Maintenance	Benefit	Benefit	N/A	N/A
Federal Tax Incentive (EV purchase)	Benefit	Benefit	N/A	N/A
Societal Costs or Benefits (from Society's Perspective)				
Value Of Reduced GHG Emissions	Benefit	Benefit	Decrease	N/A
Public Health Value Of Reduced/Shifted Emissions	Benefit	Benefit	Decrease	N/A

NARUC Innovation Webinar: Offer Map – Societal Tests

Impact-Factor	MD EV-JST (UO-1): Residential Managed Charging	MD EV-JST (UO-2): Multi-Family Charging	MD EV-JST (UO-3): Utility Owned Public Chargers	Market-Wide Test
Computation Scope:	**Induced Charging Behavior**	**Induced Adoption**	**Induced Adoption**	**All EVs On The Road**
Baseline:	**EV Owner, Nat-Chrging**	**No EV Adoption**	**Pull-Through Adoption**	**Depends on Scenario**
Utility (and Power Sector) Impacts				
Utility Program Administration Costs	Cost	Cost	Cost	Cost
Utility Program Implementation Costs	Cost	Cost	Cost	Cost
Impacts On Capacity Costs	Benefit	Cost	Cost	Cost or Benefit
Impacts On Transmission Costs	Benefit	Cost	Cost	Cost or Benefit
Wholesale Energy Cost Impacts	Benefit	Cost or Benefit	Cost or Benefit	Cost or Benefit
Increased Supply Costs (for EV charging)	N/A	Cost	Cost	Cost
Impacts on Grid Reinforcement	Benefit	Cost	Cost	Cost
Utility-Owned EV Chargers - Costs	N/A	N/A	Cost	Cost
Utility-Owned EV Chargers - Usage $ From EV Drivers	N/A	N/A	Transfer	Transfer
Increased RPS Compliance Costs	N/A	Cost	Cost	Cost
T&D Losses	Benefit	Cost	Cost	Cost
Utility Equipment Incentives	Transfer	Transfer	Transfer	Transfer
Utility Rate Incentives	Transfer	Transfer	Transfer	Transfer
Increased Utility Revenues	Transfer	Transfer	Transfer	Transfer
Participant Impacts(from EV Driver Perspective)				
Incremental EV Purchase Costs	N/A	Cost	Cost	Cost
EV Charger Costs (equipment and installation)	N/A	Cost	Cost	Cost
Savings From Avoided Vehicle Fuel Use	N/A	Benefit	Benefit	Benefit
Savings From Decreased Vehicle Maintenance	N/A	Benefit	Benefit	Benefit
Federal Tax Incentive (EV purchase)	N/A	Benefit	Benefit	Benefit
Societal Costs or Benefits (from Society's Perspective)				
Value Of Reduced GHG Emissions	N/A	Benefit	Benefit	Benefit
Public Health Value Of Reduced/Shifted Emissions	N/A	Benefit	Benefit	Benefit

NARUC Innovation Webinar: Offer Map – ANRI Tests

Impact-Factor	UO-1: Residential Managed Charging	UO-2: Multi-Family Charging	UO-3: Utility Owned Public Chargers
Computation Scope:	**Induced Charging Behavior**	**Induced Adoption**	**Induced Adoption**
Baseline:	**EV Owner, Nat-Chrging**	**No EV Adoption**	**Pull-Through Adoption**
Utility (and Power Sector) Impacts			
Utility Program Administration Costs	Increase	Increase	Increase
Utility Program Implementation Costs	Increase	Increase	Increase
Impacts On Capacity Costs	Decrease	Increase	Increase
Impacts On Transmission Costs	Decrease	Increase	Increase
Wholesale Energy Cost Impacts	Decrease	Increase or Decrease	Increase or Decrease
Increased Electricity (KWHr) Costs (for EV charging)	Increase	Increase	Increase
Impacts on Grid Reinforcement	Decrease	Increase	Increase
Utility-Owned EV Chargers - Costs	N/A	N/A	Increase
Utility-Owned EV Chargers - Usage $ From EV Drivers	N/A	N/A	Decrease
Increased RPS Compliance Costs	Increase	Increase	Increase
T&D Losses	Decrease	Increase	Increase
Utility Equipment Incentives	Increase	Increase	Increase
Utility Rate Incentives	Increase	Increase	Increase
Increased Utility Revenues	Decrease	Decrease	Decrease
Participant Impacts(from EV Driver Perspective)			
Incremental EV Purchase Costs	N/A	N/A	N/A
EV Charger Costs (equipment and installation)	N/A	N/A	N/A
Avoided Vehicle Fuel Costs	N/A	N/A	N/A
Savings From Decreased Vehicle Maintenance	N/A	N/A	N/A
Federal Tax Incentive (EV purchase)	N/A	N/A	N/A
Societal Costs or Benefits (from Society's Perspective)			
Value Of Reduced GHG Emissions	N/A	"All" Case Only	"All" Case Only
Public Health Value Of Reduced/Shifted Emissions	N/A	"All" Case Only	"All" Case Only

NARUC Innovation Webinar: Including NEIs

- **Including NEIs Was CRITICAL To Fairly Representing EV-BCA Outcomes:**
  - Achieving Non-Energy Net-Benefit Are Part Of Maryland Policy Goals
  - They Are An Essential Part Of Representing EV-Impacts Fairly

- **Innovations In The Framework To Make Sure NEIs Are Properly Represented:**
  - Jurisdiction Specific Test (JST) Is Societal In Scope (some externalities considered)
  - Market-Wide SCT Assessment (considers potential full market impacts)
  - Non-Participating Ratepayer Impact With Externalities (climate change, public health)

- **NEIs Included In EV-BCA:**
  - Impacts Due To Changes In Load Shape (and clearing prices)
  - Changes in RPS-compliance costs
  - Emissions Reductions (including both climate change and public health reasons)
  - Changes in participant economics

- **Other NEIs Considered, But Not Included (Challenges With Computational Methods)**
  - Strategic Value Of Reduced Petroleum Use
  - Changes In Risk
  - Changes In Resilience (& Reliability)
  - Changes In Security
  - Impact On Water Use
  - Impact On Attainment Of MD-Policy Goals

Others Possible, But Not Considered:

1) Equity Impacts
2) Economic Development
3) Changes in Safety
4) Power Quality

NARUC Innovation Webinar: Thank You

- **Contact**
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