

Benefit-Cost Analysis: What it Can and Cannot Tell us About Distributional Equity of DERs

ACEEE Summer Study 2022

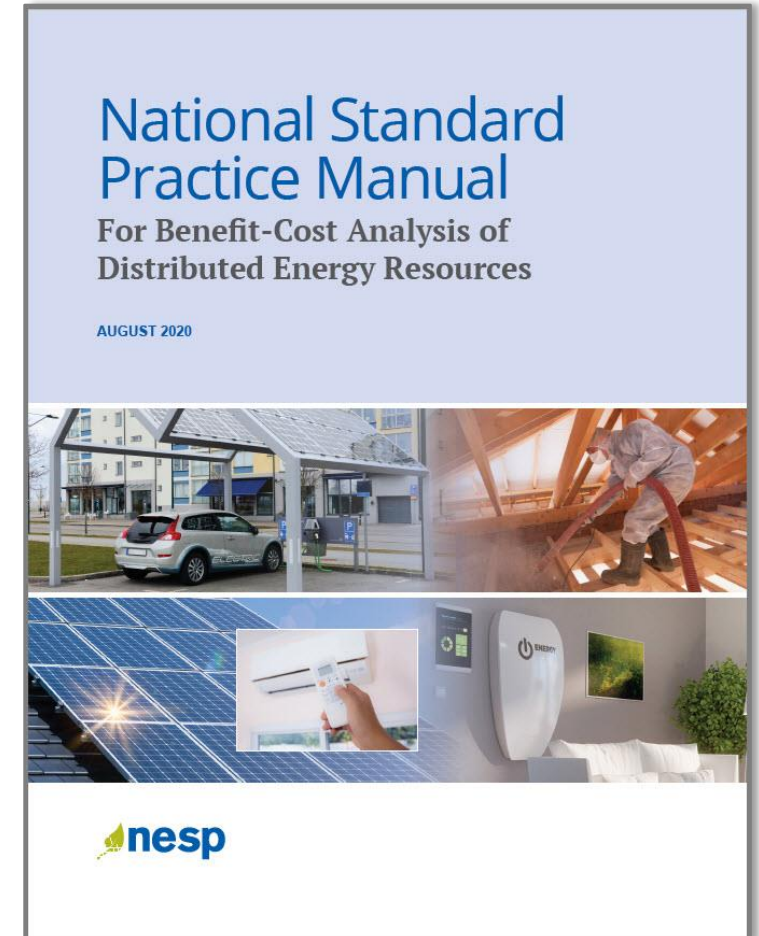
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About NESP

National Energy Screening Project (NESP) – stakeholder organization that works to improve cost-effectiveness screening practices for distributed energy resources (DERs).

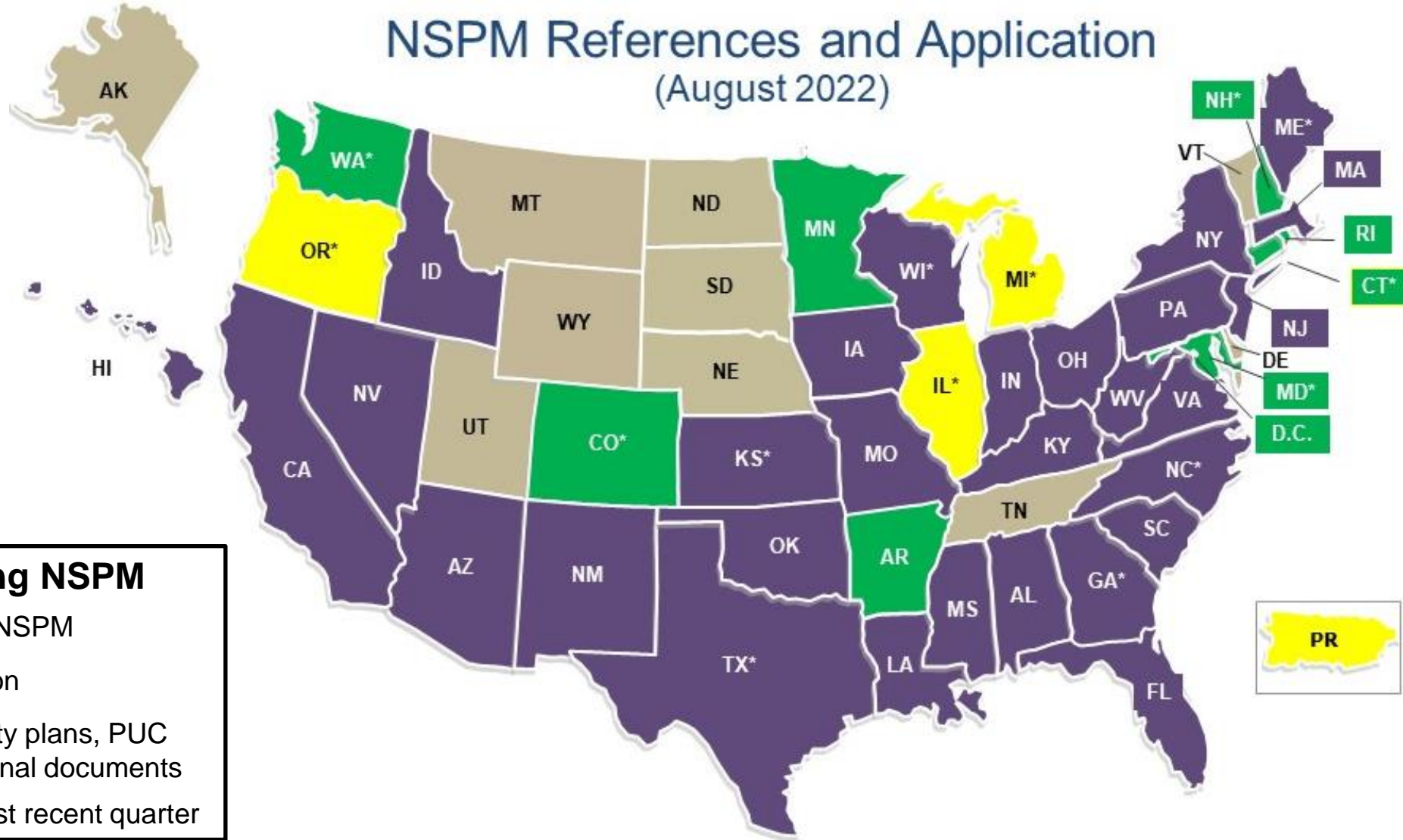
NESP's main products are:

- National Standard Practice Manual for DERs (NSPM for DERs)
- Methods, Tools and Resources Handbook for Quantifying DER Impacts for Benefit-Cost Analysis (MTR handbook)
- Database of Screening Practices (DSP)



NSPM Application

NSPM References and Application (August 2022)



States Referencing/Applying NSPM

- 9 Has applied or is applying the NSPM
- 4 NSPM under PUC consideration
- 28 NSPM references made in utility plans, PUC dockets, and/or other jurisdictional documents

* NSPM references made in most recent quarter

Energy Equity

An equitable energy system is one where the economic, health, and social benefits of participation extend to all levels of society, regardless of ability, race, or socioeconomic status.

Achieving energy equity requires intentionally designing systems, technology, procedures, and policies that lead to the fair and just distribution of benefits in the energy system. - PNNL 2021

Structural

Recognize the of the historical, cultural, and institutional dynamics and structures that have led to energy inequities

Procedural

Ensure inclusive, accessible, authentic engagement and representation when developing and implementing programs

Distributional

Ensure the fair distribution of benefits and burdens across all segments of a community and across generations

Agenda Today

- Benefit-cost analysis (BCA) – assesses program cost-effectiveness, but is not able to fully assess energy equity
 - Cannot account for structural or procedural equity, does not fully address distributional equity
- Conceptual distributional equity analysis (DEA) framework:
 - Conducted in addition to BCA
 - Provides insight on the distributional equity of DER programs

Energy Equity – State Goals

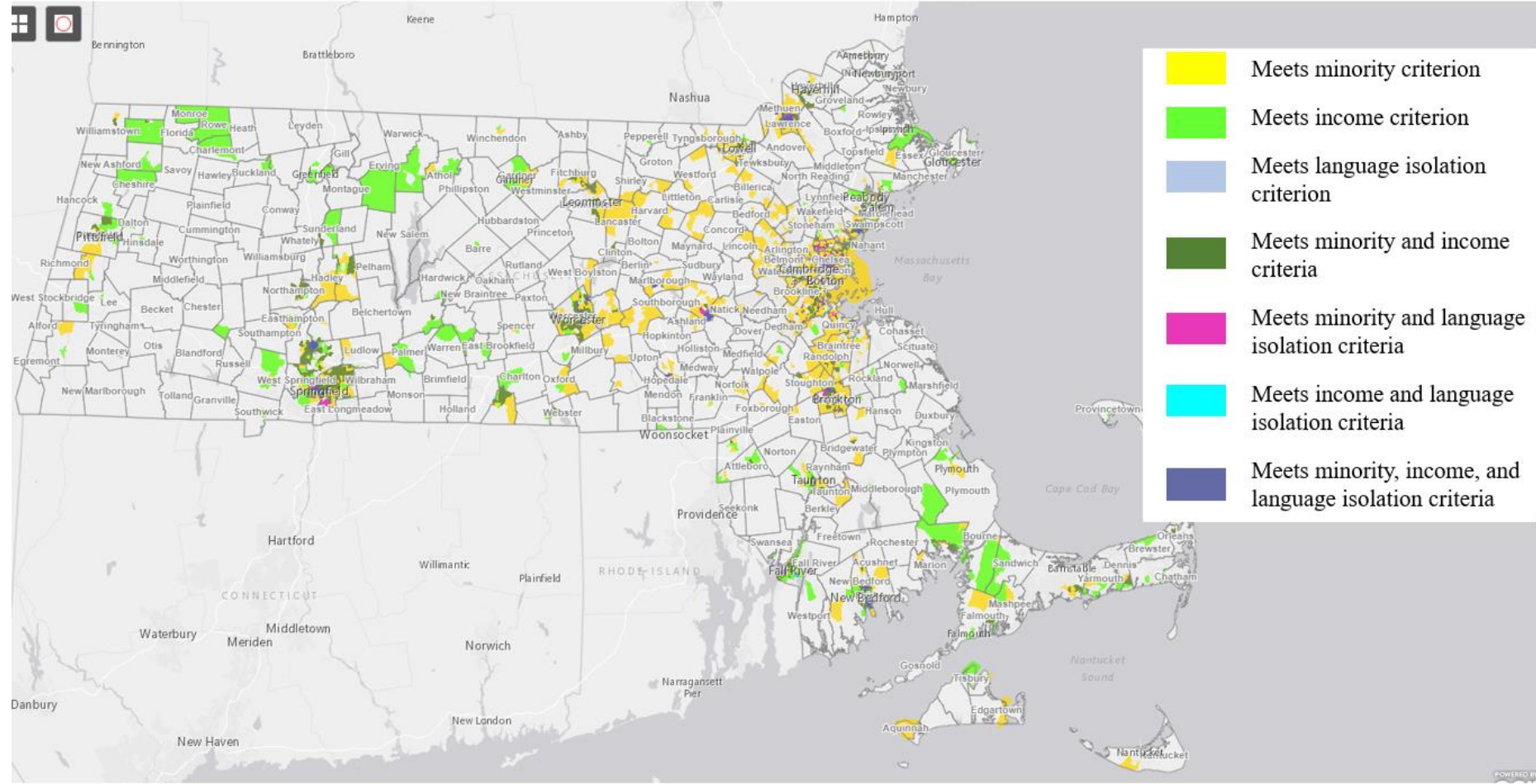
- States like CA, WA, OR, and MA are leading the way:
 - Developing clear energy equity goals for DER programs:
 - Increase program participation, trade ally diversity, community engagement, etc.
 - Identifying priority communities for energy equity purposes (“target populations”):
 - Environmental justice communities, renters, linguistically isolated communities, limited-income communities, etc.



Target Populations – MA Example

MA environmental justice neighborhoods:

- Median income,
- Minority population,
- English proficiency, or
- Combination of minority population and income



Source: Massachusetts Executive Office of Energy and Environmental Affairs

Benefit Cost Analysis (BCA)

- Most jurisdictions use BCA to assess the cost-effectiveness of DER programs
- BCAs compare the net present value (NPV) of a DER's benefits with the NPV of its costs to create a benefit-cost ratio (BCR).
 - The DER is cost-effective if $BCR \geq 1.0$
- BCAs measure impacts on average across utility system
 - Avoided costs (i.e., benefits) - typically a blend of avoided costs experienced by all customers



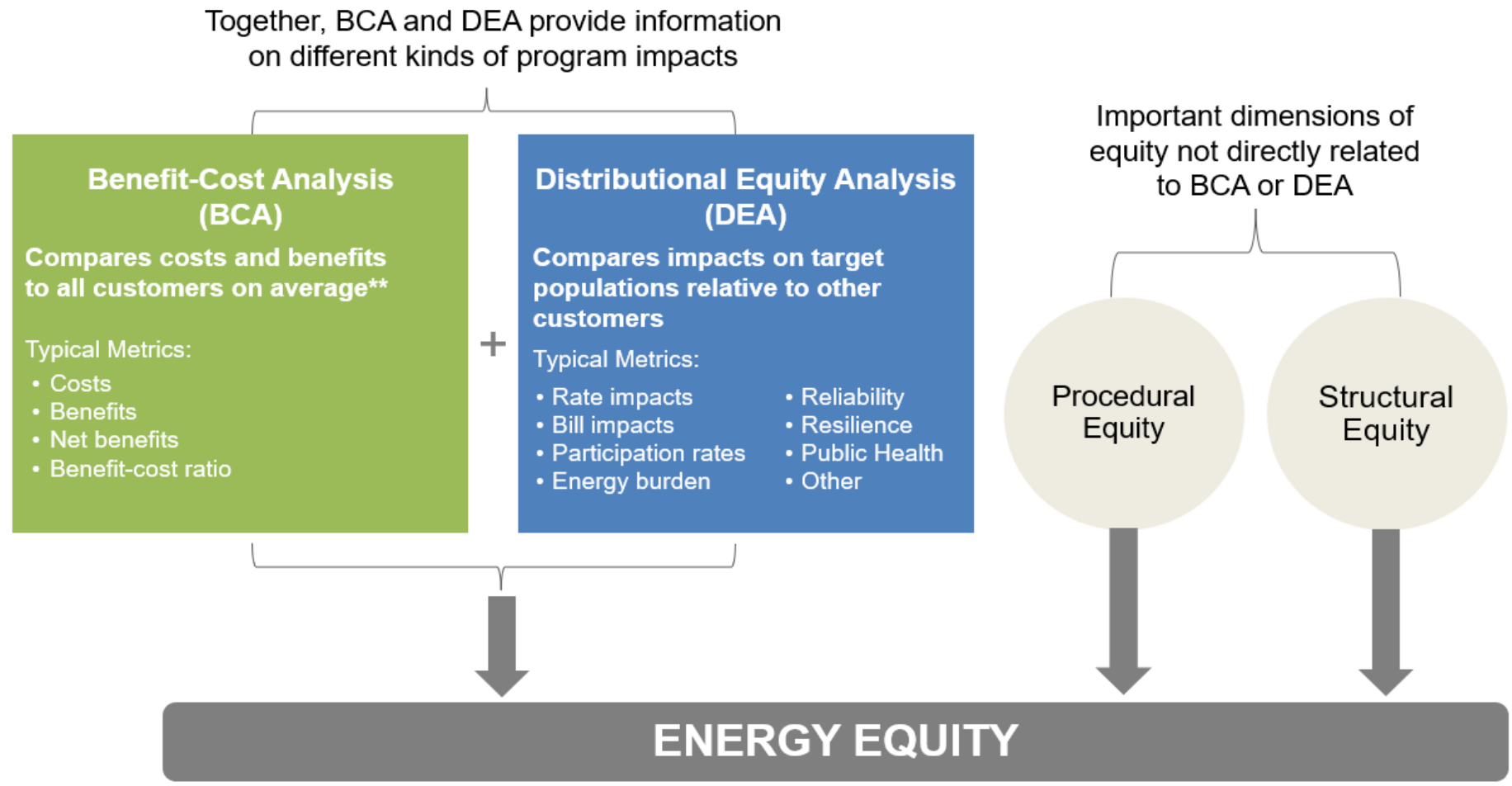
Equity Considerations in BCA To Date

- Jurisdictions use several practices to partly address energy equity in BCAs, including:
 - Alternative thresholds
 - Include societal impacts
 - Discount rates
- Some jurisdictions also conduct rate, bill, and/or participation impact analyses
 - Analyzes the distribution of rates, bills, participation across participants and non-participants

BCA and Energy Equity – Limitations

- BCAs do not directly address structural or procedural equity
 - Community engagement, participation, etc.
- BCAs do not and should not account for rate, bill, or participation impacts
 - Answer different questions
 - The Rate Impact Measure (RIM) Test combines the analyses – making it difficult to answer either question
- Distributional equity – *which* customers experience the costs and benefits
 - BCAs cannot distinguish impacts to target populations
 - One limited exception: income-qualified programs

BCA/DEA Decision-Making Framework



**Non-utility system impacts can be accounted for in BCAs if consistent with the jurisdiction's policy goals, but inclusion of these impacts in BCA does not provide a measure of equity across target populations.

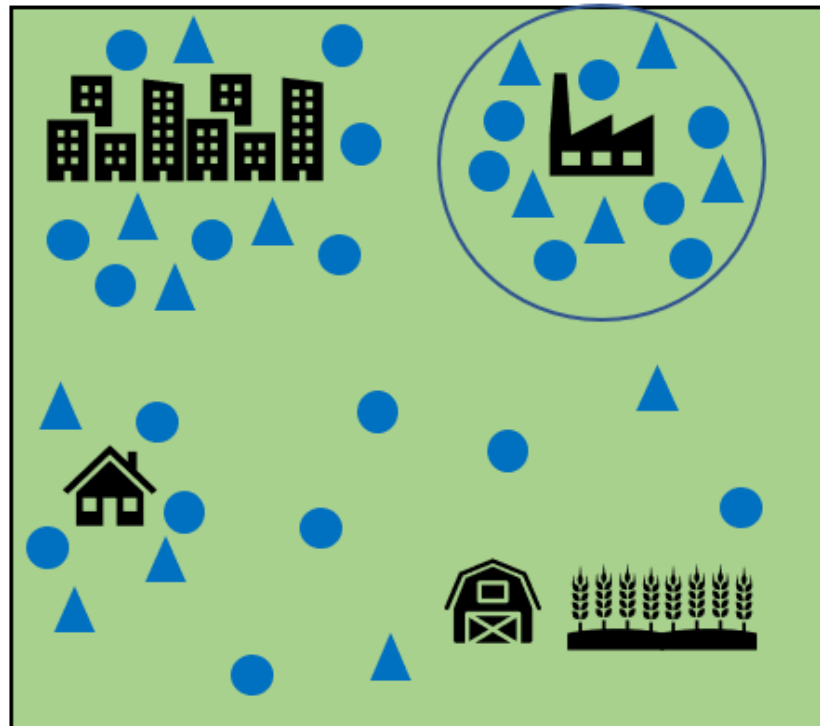
BCA and DEA Comparison

	Benefit Cost Analyses (BCA)	Distributional Equity Analyses (DEA)
Purpose	To identify which DER programs utilities should invest in or support	To identify how DER programs impact target populations relative to other customers
Questions Answered	What are the costs and benefits of a DER program across all customers?	How will DER impacts accrue to target populations compared to other customers?
Impacts Analyzed	<ul style="list-style-type: none"> • Utility system impacts • Participant impacts • Societal impacts 	<ul style="list-style-type: none"> • Participant and societal impacts • Rate, bill, and participation impacts • Distributional equity metrics
Example Metrics	<ul style="list-style-type: none"> • Costs (PV\$) • Benefits (PV\$) • NPV • BCR 	Disaggregated for target populations and other customers: <ul style="list-style-type: none"> • Rates (\$/kWh) • Bills (\$/month) • Participation rates (% of eligible) • Energy burden (% of income on energy bills) Additional metrics of health (ER visits), environmental impacts (PM 2.5), economic development (# of jobs), etc.
Scope	A single BCA to assess absolute DER program impacts	One analysis for target population and another for other customers to compare impacts across groups

BCA and DEA – Hypothetical Example

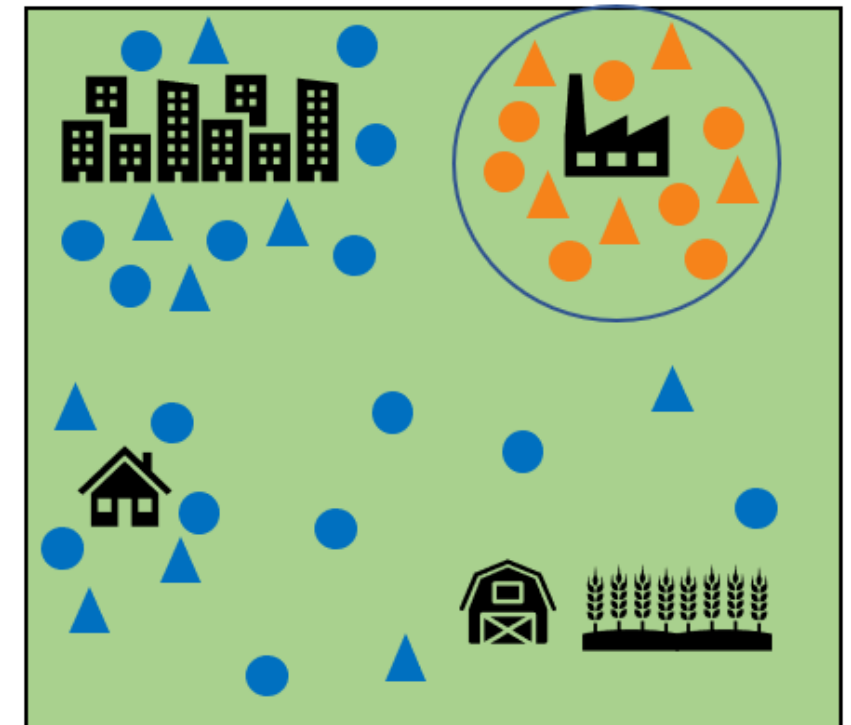
BCA - Measures benefits and costs on average for entire customer base, i.e., *absolute* impacts

- Metrics: NPV, BCR



DEA - Compares impact on target population to other customers, i.e., *relative* impacts

- Metrics: emissions impact on target population vs. other customers



- Target population
- All/Other customers
- △ Participant
- Non-participant

Steps to Conduct DEA

1. Define the target population(s)
2. Identify distributional equity metrics
3. Analyze rate, bill, and participation impacts between participants and non-participants; similarly analyze target populations and other customers
4. Estimate how target populations will be affected in terms of the equity metrics
5. Present results to allow stakeholders and regulators to compare the results of the BCA and the DEA together

DEA Results - Example

Analysis	Impact of Energy Efficiency Portfolio	Results	
Benefit Cost Analysis (BCA)		All Customers on Average	
	Cumulative Costs (million PV\$)	200	
	Cumulative Benefits (million PV\$)	300	
	Cumulative Net Benefits (million PV\$)	100	
	Benefit-Cost Ratio	1.5	
Distributional Equity Analysis (DEA)		Target Population	Other Customers
	Participation (% of eligible population)	15	28
	Rates (% change)	1.4	1.4
	Participant Bills (% change)	-5.6	-4.5
	Participant Energy Burden (% change)	-5.6	-4.5
	Non-Participant Bills (% change)	1.4	1.4
	Non-Participant Energy Burden (% change)	1.4	1.4
	Criteria Air Pollution Emissions (% change)	-9	-2
	Asthma Emergency Room Visits (% change)	-11	-2
	Reliability (% change in system average interruption frequency index (SAIFI))	-4	-8

DEA Challenges

Several challenges must be addressed before this framework can be implemented, including:

- No standardized methodology:
 - Academic and federal examples appear limited
 - No examples in the context of the utility industry
- Using DEA results in decision-making:
 - DEAs are composed of several metrics that do not roll up into a single number
 - DEA and BCA can provide conflicting results

DEA Challenges (continued)

- Data access and availability
 - DEAs analyze highly specific target populations
 - High level of data granularity
 - Data requirements dependent on definition of target population
 - Geographic vs. demographic definitions
 - Some data may not map directly onto the target populations
 - Circuits, accounts, and zip codes may not align
 - Utilities may not have sufficient data or may be reluctant to provide data

Conclusion and Next Steps

- BCA a key tool, but it alone cannot address distributional equity of programs
- Develop further guidance in collaboration with a diverse group of stakeholders
- Key questions to be addressed in developing DEA guidance:
 - Which energy equity metrics and DER impacts should be used in conducting DEAs?
 - How can jurisdictions use BCAs and DEAs to illuminate the cost of underinvesting in target populations?
 - How should DEAs be used to influence DER program design?

Thank you!

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For more information on NESP's work on Energy Equity,
please visit: bit.ly/BCA-equity

Check out [NESP Events](#) for NSPM and BCA webinars
Stay informed with the [NESP Quarterly Newsletter](#)