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

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ABSTRACT

An increasing number of states are centering energy equity in their utility planning to ensure underserved populations are not left behind in the clean energy transition. These states are developing metrics and creating energy equity goals that address distributional, procedural, and structural equity in all aspects of their distributed energy resource (DER) programs. This requires affirming equity in decision-making tools like benefit-cost analyses (BCAs).

BCAs are widely used by utilities to assess the cost-effectiveness of their DER programs and portfolios and typically measure the monetary costs and benefits of DERs across all customers on average. BCAs are not able to address procedural or structural equity and are not intended to address distributional equity on their own. Some economists argue that BCAs may address distributional equity through social welfare functions or weighting schemes, however, these are difficult to execute and have not been conducted in this context.

This paper outlines a conceptual framework that proposes a complementary distributional equity analysis (DEA) that could be conducted alongside a BCA to ensure decision-makers have information on a DER's cost-effectiveness and distributional impacts. This is an evolving framework, with key considerations, challenges, and questions remaining about the practical development and application of DEAs in regulatory decision-making.

Introduction

The ongoing climate challenge sheds light on the systemic inequities faced by underserved communities within the energy system. Ratepayer-funded distributed energy resource (DER) programs often leave low-income households, environmental justice communities, and communities of color behind in the energy transition. However, utilities, regulators, consumer advocates and other key stakeholders (e.g., non-governmental organizations) across the country recognize that inequities exist within their jurisdictions and are taking steps to remediate them.

Although the term "energy equity" has several definitions, it is widely thought of as "the fair and just distribution of benefits and costs within the energy system" (PNNL 2021). Energy equity is comprised of three interrelated dimensions: structural (also known as restorative), procedural, and distributional, as outlined in Figure 1 below.[1] Each dimension is essential to ensuring ratepayer-funded DER programs result in equitable outcomes.

[1] A fourth dimension, intergenerational equity, is often cited alongside structural, procedural, and distributional equity. However, we view intergenerational equity as a subset of distributional equity and thus include it in our definition of distributional equity.

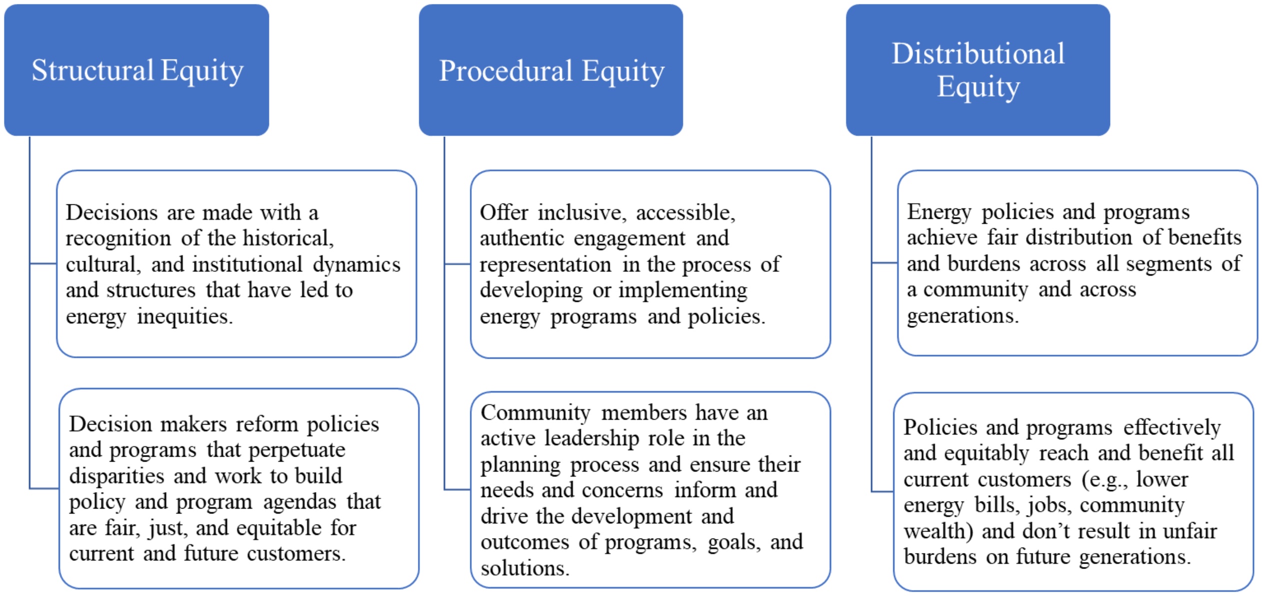

Figure 1. Dimensions of Energy Equity. *Source*: ACEEE 2021, Park 2014

To center equity in the energy system, equity must be accounted for in the tools stakeholders use to make decisions about DER investments, including benefit-cost analyses (BCAs). BCAs involve a systematic approach for assessing the cost-effectiveness of DER investments by consistently and comprehensively comparing the benefits and costs of individual or multiple types of DERs with each other and with alternative energy resources (NESP 2020). A BCA compares the net present value (NPV) of a DER's benefits with the NPV of its costs to create a benefit-cost ratio (BCR). If the BCR is greater than 1.0, the DER is cost-effective and will result in net benefits.

BCAs, however, are not the appropriate tool for assessing structural or procedural equity,[2] and only to a limited extent do BCAs address distributional equity. While BCAs can analyze the benefits and costs of a DER to the utility system generally, or to specific program participants, *they do not provide information on how those impacts are distributed among "target" populations and others.* This is a key aspect of distributional equity.

To account for distributional equity, jurisdictions should supplement BCAs with distributional equity analyses (DEAs) to ensure stakeholders have a full understanding of how DER impacts (benefits and costs) will affect different populations to determine if any one population experiences a disproportionate burden as a result of the program. Essentially, a DEA disaggregates the DER benefits and costs for different populations. This paper summarizes current state energy equity practices, outlines why BCAs do not fully address energy equity, and summarizes our conceptual framework for DEAs.

[2] BCAs should be conducted in a way that does not further exacerbate structural or procedural inequity e.g., BCA processes should ensure meaningful target population representation and input.

Measuring Energy Equity

Target Populations

Energy equity is an increasingly important priority for jurisdictions across the country. Overall, 27% of public utilities commissions (PUCs) are mandated to directly consider economic equity in their major decisions — or are directed to address economic equity by creating specific programs (Klee 2021).[3] Jurisdictions are beginning to identify traditionally underserved groups, including renters, disadvantaged communities, environmental justice communities, linguistically isolated people, and others for specific energy equity goals, as detailed below (Tarekegne 2021). Because jurisdictions identify and define different groups for energy equity purposes, we refer to these groups collectively as a jurisdiction's "target" population. Target populations are any group a jurisdiction has defined for energy equity purposes.

For example, Massachusetts identified specific goals for environmental justice neighborhoods in its 2022-2024 Three Year Energy Efficiency Plan. Massachusetts defines environmental justice neighborhoods as those that meet one or more of the following criteria:

1. The annual median household income is not more than 65% of the statewide annual median household income;
2. Minorities comprise 40% or more of the population;
3. 25% or more of households lack English language proficiency; or
4. Minorities comprise 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.

To easily identify these communities for energy equity programs, the state developed an interactive mapping tool that allows users to see each neighborhood in the state based on the criteria the neighborhood fulfils. Figure 2 below includes a screenshot of the tool, where yellow shaded areas meet the second or fourth criteria (minority), light green shaded areas meet the first criterion (income), and light blue shaded areas meet the third criterion (language isolation). (See image for full legend.) For the purposes of this paper, this example illustrates how one jurisdiction defines its target populations. The definition of target populations will differ by jurisdiction based on unique demographics and policy goals.

[3] These directives are "usually expressed as a commitment to account for the needs of low-income customers and make accommodations for them." Directives can take several forms, including mandates to consider equity in all of the PUC's actions, energy equity funding, and addressing disproportionate impacts as a result of PUC actions (Klee 2021).

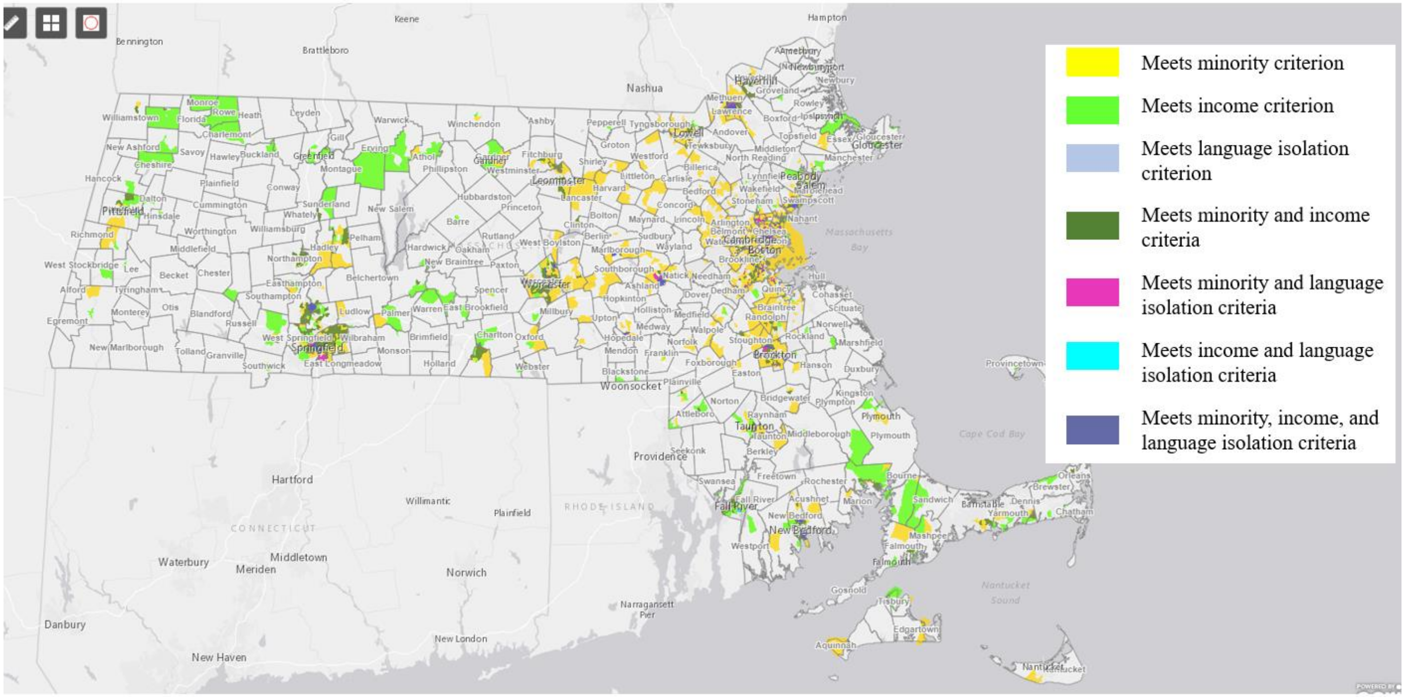

Figure 2. Massachusetts Environmental Justice Neighborhoods. *Source*: Massachusetts Executive Office of Energy and Environmental Affairs.

Energy Equity Goals and Metrics

Several states alongside Massachusetts are prioritizing energy equity in utility planning, including California, Oregon, and Washington. These states, among a growing number of others, have developed goals and metrics for energy equity that focus largely on procedural and distributional equity (Farley 2021).[4] Examples include:

- **Massachusetts**[5]: increase renter unit participation, increase the number of weatherization projects among moderate-income and small business customers, increase program participants who receive materials in Spanish or Portuguese.
- **California**[6]: raise number of participants in the equity program, bill and energy savings, count of community engagement activities targeted to hard-to-reach communities, and combined total benefits to participants and society as a whole (including energy and climate benefits, health, comfort, safety, and other non-energy benefits).
- **Oregon**[7]: increase participation in energy efficiency and renewable energy programs by all underserved populations, increase participation in the Trade Ally network and the number of projects completed by minority-owned and women-owned trade allies,

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[4] For a review of energy equity practices in additional states, see Farley 2021

[5] Massachusetts Energy Efficiency Advisory Council Equity Working Group: https://ma-eeac.org/wp-content/uploads/Attachment-B-Equity-Targets-Framework-Final.pdf

[6] California Energy Efficiency Coordinating Committee, Energy Metrics Working Group: https://www.caeecc.org/equity-metrics-working-group-meeting

[7] Energy Trust of Oregon, Diversity, Equity and Inclusion goals: https://energytrust.org/about/explore-energy-trust/diversity-equity-and-inclusion/

increase marketing awareness and understanding of underserved populations by developing and deepening relationships with community-based organizations, increase transparency and community engagement.

- **Washington**[8]: monitor indicators including total dollars spent toward energy-burdened customers, indoor air quality, outreach to targeted communities, number of outages in utility census tracts, and distribution of program participation and incentive dollars across customer types (not an exhaustive list).

The metrics above largely focus on increasing participation, addressing rates and energy burden, and increasing program access via program design and outreach. This is consistent with metrics outlined in literature reviews conducted by the Vermont Energy Investment Corporation (VEIC), the Pacific Northwest National Laboratory (PNNL), and the Initiative for Energy Justice, which reveal common energy equity metrics used throughout the energy industry, both procedural and distributional (Levin 2019, Tarekegne 2021, Lanckton 2021). While many of the metrics and goals presented above are key to ensuring energy equity in DER programs, BCAs are not well-suited to incorporate them, as explained further below.

Equity Considerations in BCA and Other Analyses to Date

To date, most — if not all — jurisdictions have provided low-income programs as part of their energy efficiency program portfolios to help address equitable allocation of efficiency funds and to alleviate energy burdens. In these cases, jurisdictions sometimes allow income qualified programs to pass a BCA with a BCR of less than 1.0, which would typically indicate the program is not cost effective. This practice, referred to as using an "alternative BCR threshold," implicitly accounts for the difficult-to-monetize benefits that accrue to the DER host customers. Jurisdictions also typically conduct BCAs for income-qualified programs separately from the other programs in their portfolios, which allows analysts to explicitly measure the energy and non-energy benefits that accrue to income-qualified host customers. Jurisdictions may also include additional societal impacts in their tests, a practice that enables the accounting of some equity metrics, such as public health or job development, across the population on average.

Intergenerational equity is one aspect of distributional equity in that it addresses the distribution of DER costs and benefits among current and future customers. BCAs can capture intergenerational equity, in part, through several practices. First, the BCA study period should cover the life of the DER and thereby capture the full benefits of the DER over its lifetime (NESP 2020). Second, the discount rate used in a BCA reflects the "time preference" of the DER investment, where a high discount rate gives more weight to short-term impacts relative to long-term impacts, while a low discount rate more equally weighs short-term and long-term impacts.

Additionally, some jurisdictions supplement their BCAs with a separate rate, bill, and participation (RBP) analysis to address the distribution of DER benefits and costs between host customers and non-host customers. These analyses provide information about the extent to which rates and bills might change for DER host customers relative to non-host customers and provide

[8] Washington State Department of Commerce Clean Energy Implementation Plan Aggregate Workbook: https://www.commerce.wa.gov/wp-content/uploads/2022/05/COM-CEIP-Aggregate-Workbook-22.5.23-1.xlsx

information on the number of host customers compared to non-host customers (NESP 2020). Since DER host customers typically experience greater benefits than non-host customers, customer participation rates provide useful information about distributional equity between host customers and non-host customers (NESP 2022). Currently, only a handful of jurisdictions regularly perform RBP analyses. New Hampshire performs a rate and bill analysis for its NHSaves energy efficiency portfolio every three years alongside its triennial plan.[9] Rhode Island Energy (formerly National Grid) conducts rate and bills analysis annually with each annual plan.[10]

Table 1 summarizes current practices for incorporating equity into BCAs and other analyses based on program type.

Table 1. Equity Practices in BCAs and Other Analyses

Program Type	Equity Practice	Explanation
Target Population-Specific Programs (e.g., income-qualified programs)	Alternative thresholds	Allows programs to pass BCA screening with a BCR lower than 1.0, and thus implicitly accounts for the non-monetized benefits that accrue to target populations
	Distinct BCA	Enables target population-specific programs to explicitly account for a range of benefits to host customers.
All Programs	Include societal impacts	Recognizes some impacts of DERs (e.g., air pollution) across the total population on average, but does not account for equity across different customer populations.
	Low discount rates	Places a higher value on longer term benefits, and thus increases program benefits to future generations. Discount rates are important to addressing intergenerational equity.
	Analyze rate, bill, and participation impacts	Ensures rates and bills are not unduly high; can determine the types of customers that participate. This analysis should be separate from the BCA and only addresses the distribution of rates and bills between host customer and non-host customers, the target population and other customers.

Source: NESP 2022

[9] New Hampshire Docket DE 20-092 2022-2023 NH Utilities 2022-2023 Hew Hampshire Statewide Energy Efficiency Plan Attachment M (PDF page 1057): https://www.puc.nh.gov/regulatory/Docketbk/2020/20-092/LETTERS-MEMOS-TARIFFS/20-092_2022-03-01_NH_UTILITIES_ATT-NHSAVES-PLAN.PDF

[10] National Grid Annual Energy Efficiency Plan for 2022, Attachment 7 (PDF Page 460): http://www.ripuc.ri.gov/eventsactions/docket/5189-NGrid-Energy%20Efficiency%20Plan%202022%20(PUC%2010-1-21).pdf

Limitations of Addressing Equity in BCAs

One of the major limitations of BCAs to address energy equity is that they are intended to address impacts on customers and society on average (i.e., in absolute, not relative, terms) (NESP 2022). BCAs measure economic efficiency and are designed to evaluate the net benefits of a program or policy (Hammitt 2020). Many of the practices described in Table 1 above are designed to increase the *absolute* benefits to the host customers or society (i.e., maximize the net benefits to host customers and/or society). However, they do not address the key aspect of energy equity: the *relative* benefits and costs (i.e., the benefits to the target population compared to the benefits to other customers).

For example, a utility uses ratepayer funds to implement a building electrification program and all residential customers in their service territory are eligible to participate, including the target population. The program reduces average air pollution emissions across the utility system due to reduced gas consumption. However, the target population includes a few neighborhoods located near a fossil-fired power plant, and they experience an increase in air pollution emissions due to increased generation from the plant as a result of the electrification program. The BCA of this program analyzes the average change in air pollution across the utility system and counts the net decrease in emissions as a program benefit, even though the target population experienced an increase in air pollution.

Additionally, the costs and benefits included in a BCA are typically a blend of impacts experienced by all customers, by broad customer categories (e.g., commercial or industrial customers), or by host customers. Many of the benefits included in the BCA are avoided costs, which are shared across all customers. Therefore, the results of the BCA cannot be broken out to indicate distributional impacts by demographic or firmographic grouping (NESP 2022).[11]

BCAs also leave out a crucial aspect of DER programs: the RBP impacts. RBP analyses should be conducted separately from BCAs, because they answer different question and require the use of different metrics (NSPM 2020). RBP analyses can be used to indicate the extent to which participants' and non-participants' rates and bills will increase or decrease as a result of the DER. While this information is useful for assessing equity between participants, it does not provide information about equity between target populations and other customers.

A Proposed Approach: Distributional Equity and BCA

To strike a balance between the economic efficiency and equity of DER programs, jurisdictions should explicitly account for distributional equity in program decision-making outside of a BCA.

It is preferable to incorporate distributional equity into BCAs in a manner that does not involve wholesale changes to the approach with which jurisdictions are familiar (Revesz 2021). We recommend a conceptual framework that includes complementary distributional equity

[11] One exception to this limitation of BCAs is the Participant Cost Test (PCT), which measures the direct costs and benefits to DER host customers. In this case, there is no blending of multiple customer impacts; the PCT includes the costs, benefits, and non-energy impacts to participants only. Thus, the PCT can be used to measure the benefits experienced by host customers. However, the PCT test provides no information regarding how DERs affect non-participants, nor does it provide any indication about impacts on target populations.

analyses (DEA) conducted alongside BCAs to account for the distributional equity impacts of DER programs.

A DEA is a distinct analysis that measures how a DER program affects different populations to determine if any one population experiences a disproportionate costs or benefits as a result of the program. Essentially, DEAs disaggregate the DER benefits and costs as well as the RBP impacts between the target population(s) and other customers. A DEA provides greater flexibility than a BCA to consider the full range of distributional impacts for any target population. Together, a DEA and a BCA would effectively address distributional equity in DER programs and investments. Figure 3 below provides a visual summary of this conceptual framework.

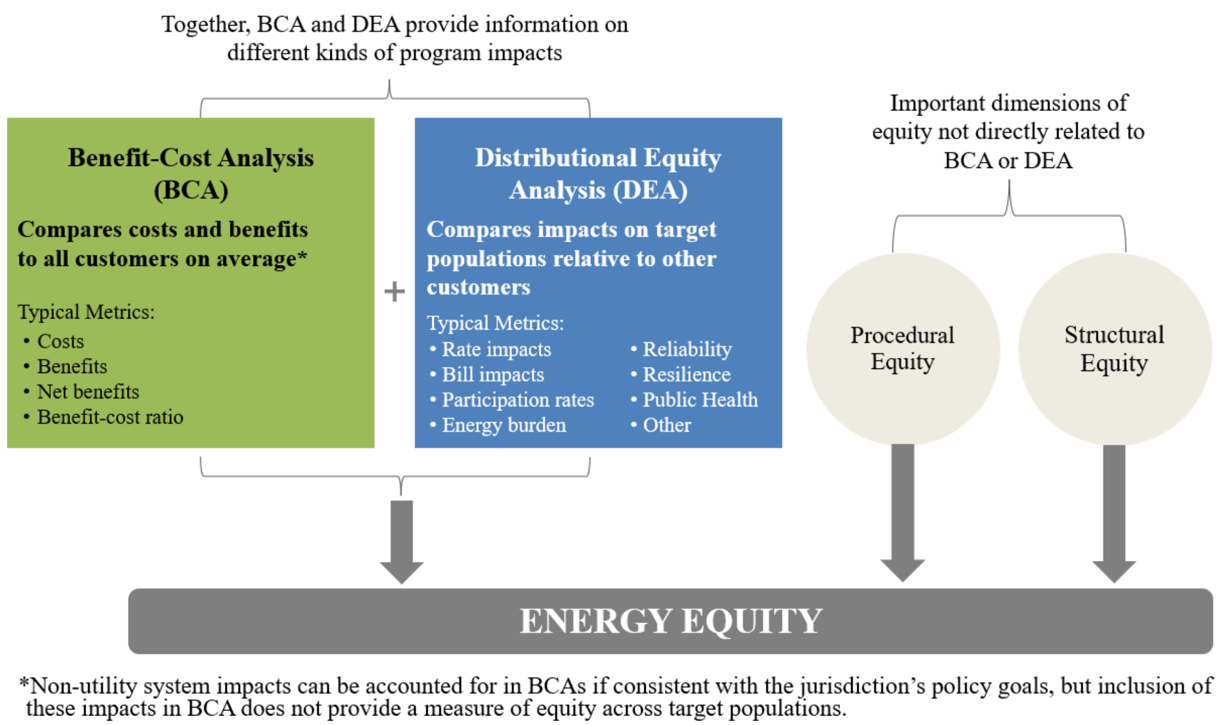

Figure 3. Energy Equity Framework *Source*: NESP 2022

DEAs break down the impacts included in the BCA and compares how they accrue to both the target population and other customers. For example, while a BCA may account for total reductions in particulate matter (PM 2.5) emissions as a result of a DER program, a DEA would measure the change in PM 2.5 between the target population and other customers. This can help jurisdictions determine whether their programs and investments result in equitably distributed benefits and costs. The DEA also breaks out rate and bill impacts to determine whether program costs are distributed equitably, and whether participation rates and the energy burden between target populations and other customers are comparable. BCAs and DEAs are complementary and should be conducted together as they answer different questions, serve different purposes, and include different metrics. Table 2 below summarizes the key differences between BCAs and DEAs.

Table 2. BCA and DEA Comparison

	Benefit Cost Analyses	Distributional Equity Analyses
Purpose	To identify which DER programs utilities should invest in or otherwise support on behalf of their customers	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?
Example Metrics	Costs (PV$) Benefits (PV$) NPV BCR	For target population: • Rate impacts ($/kWh) • Bill impacts ($/month) • Participation rates (% of population eligible) Additional impacts including energy burden, health, safety, reliability, resilience, and others
Scope	A single BCA to assess impacts to utility customer on average from a DER program	One analysis for target population and another for non-target population to compare impacts across groups

Source: NESP 2022

DEA Experience – US EPA

Distributional analyses have been used alongside BCAs in regulatory impact analyses since the Clinton Administration (Revesz 2021). While specific guidance for conducting these analyses is limited, they are a standard part of regulatory impact analyses for some rules and regulations proposed by federal agencies. In their 2021 paper *Distributional Consequences and Regulatory Analysis*, Revesz and Yi review three Obama-era regulatory impact analyses of EPA regulations. Each report discussed the environmental justice implications of the proposed rule, and the distribution of the benefits and costs of the rule. Table 3 below summarizes the distributional analyses conducted for these rules as part of their broader regulatory impact analyses.

Table 3. Summary of EPA Distributional Analyses

EPA Rule	Summary of Distributional Effects
Cross-State Air Pollution	EPA dedicates two pages to environmental justice impacts of the rule. EPA considered the impacts on low-income, minority, and tribal communities and includes a distributional analysis that estimated the PM 2.5 mortality risks by race, income, and educational attainment before and after implementation of the rule. The analysis shows that the proposed rule would result in a lower mortality risk for all populations studied but does

	not provide a quantified characterization of the distribution of costs or benefits.
Mercury and Air Toxics Standards	EPA identified counties where PM 2.5 mortality risk would be at or above the median and upper 95th percentile both before and after implementation. EPA concluded that all populations could benefit from a reduction in PM 2.5 mortality risk and noted that data limitations prevented analysts from delineating PM 2.5 mortality risk by race with confidence. This distributional analysis is based on the notion that disadvantaged communities are disproportionately affected by air pollution, that the rule will reduce such pollution, and therefore the rule must be advantageous to the disadvantaged communities.
Clean Power Plan	EPA dedicates four pages to environmental justice implications of the rule. EPA claims that because minority communities are disproportionately affected by climate change, such communities will be disproportionately benefited by the greenhouse gas emissions reductions as a result of the Clean Power Plan. The distributional analysis concludes that the rule's impacts cannot be problematic because it will reduce pollution.

Source: Revesz 2021

While these distributional analyses lack a quantified analysis of the distribution of benefits and costs of the proposed rule, they provide a basic understanding of how distributional analyses can be used to complement a BCA. Similar concepts can be used to address distributional equity in the utility industry.

DEA Practices for the Utility Industry

Building on available DEA resources, we outline some basic steps that jurisdictions can use to conduct DEAs. These include:

1. Define the target population(s) (see example above for MA).
2. Identify distributional equity metrics (see examples above for MA, CA, WA and OR).
3. Conduct an RBP analysis comparing host customers to non-host customers (see NH and RI examples above). Conduct a similar RBP analysis comparing target populations to other customers.
4. Estimate how target populations (defined in step #1) will be affected in terms of the equity metrics (defined in step #2).
5. Develop reporting standards to present the results in a transparent way that allows stakeholders and regulators to compare the results of the BCA and the DEA together.

For example, a utility wants to focus on promoting their portfolio of energy efficiency programs to environmental justice communities (their target population) in their service territory, using the state definition of "environmental justice communities." The utility has energy equity goals to increase participation from this target population and seeks to reduce asthma emergency department visits, increase reliability, and not increase energy burden for the target population. Their primary cost-effectiveness test accounts for all these impacts: utility system, host customer, environmental (in the form of criteria air pollution emissions), public health (in the form of asthma emergency department visits) and reliability (in the form of reduced outages). The utility conducts a BCA and a DEA of their energy efficiency portfolio to determine the impact of their programs on average and on their target populations. Table 4 below presents the hypothetical results from this analysis.

Table 4. Example BCA and DEA Results

Analysis	Impact of Energy Efficiency Portfolio	Results	
Benefit Cost Analysis		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		Target Population	Other Customers
	Participation (% of eligible population)	28	15
	Rates (% change)	0.4	0.4
	Non-Host Customer Bills (% change)	0.4	0.4
	Host Customer Bills (% change)	-5.6	-4.5
	Non-Host Customer Energy Burden (% change)	1.0	0.3
	Host Customer Energy Burden (% change)	-4.1	-0.1
	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

From this example, decision-makers can easily see that the portfolio is cost effective, with net benefits of $100 million and a BCR of 1.5. The portfolio increases rates by a small amount for all customers and bills for non-host customers (i.e., non-participants) but dramatically decreases both host customer bills and energy burden for the target population and, to a lesser extent, other customers. The portfolio meets its goals to reduce air pollution, improve public health, and reduce outages to the target population. However, the table indicates the portfolio increases non-host customer energy burden by 1.0% for the target population.

In sum, this portfolio is highly cost-effective, reaches a large portion of the target population, and helps meet several of the utility's goals. However, it also raises rates for all customers and increases target population energy burdens for those customers who do not participate. Decision-makers will have to consider these tradeoffs.

Conducting DEA - Challenges

While we believe this framework provides an opportunity and roadmap for jurisdictions to better account for distributional equity in program decision-making, several challenges remain, which must be addressed when implementing a DEA framework.

No Standardized Methodology

There is limited guidance and methodologies for conducting distributional analyses, none of which is specific to the utility industry (Revesz 2021). Circular A-4 provides guidance to federal agencies on conducting regulatory impact analyses and dedicates two paragraphs to the analysis of distributional effects.[12] None of the proposed regulations Revesz and Yi reviewed in their paper provide more than a cursory discussion of the distribution of the benefits and costs of the rule. Two of the three papers merely asserted that because the proposed rules would reduce pollution, and disadvantaged communities are more likely to be adversely affected by pollution, any reduction is positive from a distributional equity standpoint. Further, none of the three analyses reviewed the distributional effects of any policy alternatives, so it is unknown if another policy option would have resulted in greater distributional equity. Additionally, the existing literature on distributional analyses mostly focuses on environmental or health policy, and guidance must be adapted to fit the needs and context of the utility industry.

Data Access and Availability

A major challenge in conducting DEAs is data availability and access. While BCAs analyze impacts in the aggregate, DEAs analyze impacts to highly specific target populations. This requires a high level of granularity in the data used to conduct the DEA to unmask differences in several program outcomes between the target population and other customers.

The data required for a DEA is dependent on the definition of the target population as well as the metrics assessed in the DEA. Target populations defined as discrete communities may match well with data from the US Census, the American Community Survey (ACS), and several federal and state-level tools.[13] Jurisdictions with target populations not defined geographically, such as race, health status, educational attainment, or homeownership status, may find it difficult to use these sources for their DEAs.

Utilities often collect some customer demographic information; however, utilities may not have sufficient customer data (such as income, occupancy, race, etc.) for analysts to conduct DEAs. A review of energy equity metrics by the Energy Equity Project found significant data gaps for priority metrics, including utility shutoff rates and by demographic variables (Schott 2022).[14] Additionally, utilities may be reluctant to share this type of customer data with third-party evaluators due to data security concerns, though this barrier could be overcome by removing customer identifiers from the data set. Regulators should work with utilities to understand barriers to data sharing and to develop consistent reporting requirements to ensure the necessary data is available for analysis.

Some of the impacts analyzed in a DEA may be quite similar to those analyzed in a BCA, such as GHG emissions, air pollution, or other non-energy impacts. Methods and data sources for analyzing these impacts in BCAs can be found in the March 2022 *Methods, Tools, and*

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[12] Circular A-4: https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/

[13] Council on Environmental Quality, Environmental and Economic Justice Screening Tool: https://screeningtool.geoplatform.gov/en/#3.35/25.98/-93.87; Low-Income Energy Affordability Data (LEAD) Tool: https://www.energy.gov/eere/slsc/maps/lead-tool; California Energy Commission, Energy Equity Indicators Map: https://caenergy.maps.arcgis.com/apps/MapJournal/index.html?appid=d081a369a0044d77ba8e80d2ff671c93

[14] While some utility shutoff data exists, there is no comprehensive national dataset.

Resources handbook published by the National Energy Screening Project (NESP). This handbook provides an overview of methods, data sources, and other resources for quantifying DER impacts for BCAs, and may be useful for DEA purposes as well (NESP 2022).

Using DEA Results in Decision-Making

Presenting and using the DEA results in decision-making alongside BCAs is one of the key challenges of this framework. While BCA results are typically presented as total costs, benefits, and net-benefits or with a BCR, DEA results can include several metrics that are not easily combined to provide a single value. Some economists argue distributional impacts can be incorporated directly into a BCA through the use of distributional weights; however, this approach is difficult to execute and has not yet been attempted in this context (Alder 2016, Lienke 2021).

We recommend presenting and considering DEA results alongside BCA results, similar to the conceptual example presented in Table 4 above. This would allow decision-makers to review the BCA results and DEA equity metrics simultaneously. To the extent the BCA and DEA provide conflicting information, such as a program that is highly cost-effective but leads to distributional equity concerns, this information will help decision-makers to better understand the trade-offs of moving forward with a DER investment or whether alternative approaches would yield a more equitable approach. Regulators and practitioners should consider establishing practices that help decision-makers use the results of both analyses, such as determining preset thresholds for DEA metrics or establishing principles to make decisions in cases where DEA and BCA results differ significantly.

Conclusion

The use of DEAs to complement BCAs and inform decisions about DER program investments is a nascent concept. Guidance would help jurisdictions to conduct and use DEAs in decision-making, though key questions must be addressed in developing DEA guidance include:

1. Which energy equity metrics and DER impacts should be used in conducting DEAs?
2. How should utilities collect more granular customer demographic data to identify and create a baseline understanding of target populations? How can utilities and regulators ensure customer privacy?
3. What should be recommended if a highly cost-effective DER is shown to be inequitable through DEAs? What should be recommended if a DER is not cost effective but offers important equity benefits?
4. What thresholds, principles, parameters, or specific frameworks should be used for comparing the results of a BCA to the results of a DEA?
5. How can jurisdictions use BCAs and DEAs to illuminate the cost of underinvesting in target populations?
6. How should DEAs be used to influence DER program design?

We developed this conceptual framework in response to the growing call for the explicit consideration of equity in utility decision-making, particularly in the context of BCAs. While a

BCA is a vital evaluation tool that is widely used by jurisdictions, it alone cannot account for the distribution of DER program impacts. We recommend jurisdictions consider conducting DEAs that will allow for the disaggregation of DER program benefits and costs, to analyze their relative impact on target populations and other customers. DEAs also represent an expanded approach to conducting RBP analysis alongside BCAs to provide key indicators of equity between host customers and non-host customers.

As a next step, we plan to work with a diverse group of stakeholders to develop comprehensive guidance on conducting DEAs that would allow jurisdictions to implement this framework. Such guidance will need to outline the specific steps required to conduct a successful DEA alongside a BCA, as well as outline the data requirements and how to interpret DEA results. Most importantly, it will be critical to ensure that representative voices and positions help to inform this guidance, including a range of stakeholders affected by DER investment decisions.

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