State Benefit-Cost-Analysis Practices:

Accounting for Non-Utility System Impacts of Select Distributed Energy Resources

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About NESP

The National Energy Screening Project (NESP™) is a policy-neutral project that improves cost-effectiveness screening practices and guides state investments in distributed energy resources (DERs) as jurisdictions plan for and implement DERs to meet a range of energy policy goals and objectives. NESP's publications include the National Standard Practice Manual™ for Benefit-Cost Analysis of Distributed Energy Resources, the companion document on Methods, Tools and Resources Handbook for Quantifying DER Impacts, and the development of other resources to support benefit-cost analyses (BCA) of DERs. NESP has been managed and funded by E4TheFuture, with leveraged funds from the U.S. Dept. of Energy and private foundations, since 2017.

About AnnDyl Policy Group

The AnnDyl Policy Group is an energy and environmental strategy firm that specializes in policy solutions to advance smart, efficient, energy technologies, including energy efficiency, renewable energy, and climate change policy, programs, financing, and technology. AnnDyl represents clients from across the energy efficiency and clean energy industries, including technology and financial sector companies, energy trade associations, and non-profit organizations. AnnDyl staff have decades of experience working with contractors, trade associations, and other stakeholders in home energy efficiency and renewable energy and are recognized as principal thought leaders behind adoption of the Home Energy Rebate Programs in the Inflation Reduction Act.

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Executive Summary

The rapid growth and deployment of distributed energy resources (DERs) is creating dynamic and complex challenges for regulators, utilities, and policymakers as they assess the costs and benefits of DER systems and incentive programs. While there is a long history of benefit-cost analysis (BCA) and cost-testing for energy efficiency programs, many regulatory commissions have not yet established equivalent BCA practices for other DERs. State BCA practices for DERs also tend to focus on costs and benefits to the utility system but often do not account for the non-utility system impacts (non-USIs), which can represent a substantial component of the overall benefits of DERs.

This report provides an inventory of current state practices for including non-USIs in BCA efforts for three types of DERs: demand response (DR), distributed generation (DG), and distributed storage (DS).[1] Future research is warranted regarding building electrification (BE) and electric vehicle (EV) BCA practices for non-USIs as states increasingly require BCAs for the full range of DERs. The research identifies emerging trends, key opportunities, and challenges for states in advancing inclusion of non-USIs in BCA practices. The research considered the range of non-USIs as identified in the National Standards Practice Manual (NSPM) for Benefit-Cost Analysis of Distributed Energy Resources (2020), focusing on host customer (participant) impacts and societal impacts. [2]

These findings represent a sample of how states are accounting for different societal and host customer impacts of the specific DERs researched. The research did not comprehensively catalog all practices across all states, and gaps in the research regarding specific state policies or DERs should not be interpreted to imply that a state-level policy or practice does not exist.

Scope and Methodology

The research involved conducting key word searches of utility and state regulatory documents across all U.S. jurisdictions to identify instances where non-USIs were accounted for in formal public utility commission adoption of BCA and cost-effectiveness tests and in project-related documents (such as request for proposals (RFP) requirements for utility projects and metrics reports on pilot programs). State practice is categorized into the following groups:

- Formal cost-effectiveness test or reporting: The state has established a formal BCA or cost-effectiveness test used for the assessment of one or more types of DER(s). This included proposed or preliminary cost-effectiveness tests that have not been officially adopted. This also includes cases where the state uses metrics or BCA to assess certain DER impacts for reporting purposes only, with no requirement to pass a cost-effectiveness test.
    - In some cases, states have adopted a BCA framework or issued guidance regarding impacts to consider but have not yet developed a system for quantifying these impacts.

[1] This report does not specifically address BCA practices for energy efficiency (EE) programs, building electrification (BE), or electric vehicles (EVs). There is already considerable information available on EE BCA practices via the (DSP), available at the ACEEE Database of Screening Practices; this can also include applicability to BE where measures, e.g., air source heat pumps, are part of energy efficiency programs.

[2] As described in detail in the National Standard Practice Manual (NSPM), Tables 4-3, 4-5, and 4-6, www.nationalenergyscreeningproject.org/national-standard-practice-manual/

- Other regulatory contexts: Includes impacts that are being evaluated in other regulatory contexts by utility commissions, state energy offices, or other regulators, including clean energy implementation plans, integrated resources plans (IRPs), permitting decisions, procurement decisions, rate cases and pricing, and other regulatory filings.

This research represents a nationwide snapshot of different state practices for evaluating the three selected DERs – DR, DG, and DS – and accounting for various non-USIs of those DERs. A summary of the results is shown in Table ES1 (Societal Impacts) and Table ES2 (Host-Customer Impacts).

Table ES1: States Accounting for Societal Impacts of DERs

	Resilience	GHG Emissions	Other Environment	Public Health	Economic Develop.	Energy Security	Low- Income Societal/Equity
Demand Response	MI	CA, NJ, MD*, CO, DC, MI	CA, MD, ME, MI	CA, MD, NJ, CO, IL, MI	CA, MD, ME, NJ, MI	MD, MI	CA, MD*, DC, MI*
Distributed Generation	MD, MI	CA, MD, ME, CO, MI	MD, MI	CA, MD, CO, MI	MD, ME, MI	MD, MI	CA, MD*, DC, MI*
Distributed Storage	MD, CT, MI	CA, CT, MD*, CO, MI	MD*, ME, MI	CA, MD*, CO, MI	MD, ME, MI	MI	CA, MD*, DC, MI*

** indicates currently not included, but future use case might include indicated impacts*

Table ES2: States Accounting for Host-Customer Impacts

		Measure costs	Transaction costs	Inter-connection	Risk	Reliability	Resilience	Tax Incentives
Energy Impacts	**Demand Response**	CA – Unspecified/Overall Adder: CO, DC, MD, ME	CA, DC, MD, ME	CO, DC		CO		CA, DC
	Distributed Generation	MD, CO	MD	MD, CO	MD		MD	MD
	Distributed Storage	CT, MD, ME	CT, MD, ME		MD	CO	MD, CT	MD
		Asset value	**Transaction costs**	**O&M**	**Economic well-being**	**Comfort**	**Health & Safety**	**Satisfaction & Empowerment**
Non-Energy Impacts	**Demand Response**	CA, NJ – Unspecified/Overall Adder; DC – Unspecified process: CO, ME	CA, ME, MI	ME	ME	CO general and DIC adder		MD, CA
	Distributed Generation	MD, CO	MI	MD	MD	CO general and DIC adder		MD
	Distributed Storage	CT, MD, ME	MI	MD, ME	MD, ME	CO general and DIC adder		MD

The above tables highlight where states have specifically included non-USIs in their BCA for the selected DERs – the details of how, or whether, these impacts are quantified or assessed are described in detail in

the report below. In cases where states use a more general adder, these are shown as ovals which span the relevant non-USIs referenced as justification for the adder by those states.

Findings

1) States often have not formalized BCA practices for including non-USIs of DR, DG, and DS systems. Even fewer states use consistent practices to evaluate non-USIs across all DERs.

The research identified wide variation in BCA practices for the reviewed DERs other than EE – though DR programs are sometimes considered as part of EE programs and may be subject to some or all of the same BCA practices. In addition to states where BCA practices have been formalized, many other states likely include consideration of non-USI elements in project approvals, tariffs, and other DER proceedings. In many cases, BCA practices may be embedded in individual rate cases, making them difficult to identify and posing challenges for consistent methodologies across utilities and DERs. This lack of formalized BCA practices makes it difficult to compare results across different utility filings, and likely results in incomplete consideration of the full range of societal and host-customer costs and benefits for DERs. Of the states which do include non-USIs for DERs in BCA practices, there are often inconsistent practices across DERs. A few states are an exception (Maryland, Michigan, and the District of Columbia), where regulatory proceedings have led to the development of a consistent BCA test to be applied to all DERs, as well as in different regulatory contexts.

2) GHG emissions reduction is the most frequent societal impact across states.

GHG emissions impacts are the most common societal impact included in DER cost-effectiveness tests, and the most commonly quantified. The District of Columbia and at least six states -- California, Colorado, Connecticut, Maryland, Maine, and New Jersey – include GHG emissions in consideration of one or more DERs reviewed. GHG emissions tend to be quantifiable based on easily accessible data, and they often align with existing and clearly defined policy goals, making these impacts easier to include in BCA practices.

3) Many states are seeking information on non-USIs of programs but have not incorporated them into formal decision-making.

Many states require some consideration of non-USIs in other regulatory contexts, without formalizing or quantifying the results in a BCA. Reporting of metrics generally requires less effort to quantify or monetize and allows the parties to develop regular reporting schedules and procedures before there are consequences for programs. The requirements for data submission and metrics demonstrate current concern by utilities and regulators to develop methods to quantify non-USIs of DERs. States which are collecting metrics and data on non-USIs without currently quantifying them will be well positioned to apply BCA practices as further examples of quantification methods develop.

4) Quantification of societal and host customer non-USIs remains a challenge, even after determining that such impacts should be included in a BCA.

The NSPM multi-step process to develop a jurisdiction's primary test includes ensuring that "benefits and costs are properly addressed," including relevant and materials impacts even if hard to quantify.[3] While there are a range of options for quantifying non-USIs, this process takes time as it requires prioritizing which impact categories to address and when, determine whether to either research/study the impact, use an existing tool to calculate, or develop a reasonable proxy adder, as well as determine the time and resources needed to develop impact value streams. Michigan, Maryland, and the District of Columbia have determined what impacts are to be included in their 'jurisdiction specific tests' developed using the NSPM, and will be addressing the impact methodology stage in 2025, which will likely be staggered over time as methods and values are developed through stakeholder processes.

[3] National Energy Screening Project, National Standard Practice Manual (NSPM), www.nationalenergyscreeningproject.org/national-standard-practice-manual/. P. 58.

1. Introduction

The rapid growth and deployment of distributed energy resources (DERs) is creating dynamic and complex challenges for regulators, utilities, and policymakers as they assess the costs and benefits of DER systems and incentive programs. While there is a long history of benefit-cost analysis (BCA) and cost-testing for energy efficiency programs, many regulatory commissions have not yet established equivalent BCA practices for other DERs. State BCA practices for DERs also tend to focus on costs and benefits to the utility system but often do not account for the non-utility system impacts (non-USIs), which can represent a substantial component of the overall benefits of DERs.

This report provides an inventory of current state practices for including non-USIs in BCA efforts for three types of DERs: demand response (DR), distributed generation (DG), and distributed storage (DS). The research identifies emerging trends, key opportunities, and challenges for states in advancing inclusion of non-USIs in BCA practices. The research considered the range of non-USIs as identified in the National Standards Practice Manual (NSPM) for Benefit-Cost Analysis of Distributed Energy Resources (2020), focusing on host customer (participant) impacts and societal impacts. [4]

Table 1: Non-Utility System Impacts for Consideration in BCA[5]

Societal Impacts	Host-Customer Impacts	
• Resilience • GHG Emissions • Other Environmental • Public Health • Economic Development and Jobs • Energy Security • Low-Income Societal	Energy impacts: • Measure costs • Transaction costs • Inter-connection costs • Risk • Reliability • Resilience • Tax incentives	Non-energy impacts: • Asset value • Transaction costs • O&M (productivity) • Economic well-being • Comfort • Health & Safety • Satisfaction & Empowerment

While some states are formally accounting for these non-USIs in BCA and cost-effectiveness tests, there is wide variability in how these impacts are included in terms of methodology and current practices, even within individual states and across regulatory proceedings. These wide-ranging practices indicate that there is broad interest in, and understanding of, the importance of evaluating non-USIs, even where they are not yet quantified or included in formal cost-test practices.

The development of consistent BCA practices is therefore an evolving process as states work to identify, quantify, and systematize their accounting of non-USIs.

[4] As described in detail in the National Standard Practice Manual (NSPM), Tables 4-3, 4-5, and 4-6, www.nationalenergyscreeningproject.org/national-standard-practice-manual/

[5] For purposes of this report, non-USIs include energy and non-energy impacts associated with host customer and societal impacts. While "Other Fuels" is sometimes considered a non-USI, it is not currently a category of non-USIs in the NSPM and was therefore omitted.

Multiple States are Advancing DER BCA Policies: Several states are currently undertaking proceedings to review and update their BCA practices, including efforts to apply consistent BCA practices across DERs.

- **Maryland**: In May of 2022, the Maryland Public Service Commission (PSC) issued Order 90212 establishing that the State would develop a common framework for assessing the cost-effectiveness of all DERs, and established a Unified BCA (UBCA) Work Group to develop a primary Maryland-specific UBCA test based on the principles of the NSPM.[6] On November 22, 2024, the Maryland PSC adopted the UBCA work group's proposed framework, and moved the state to Phase II of the development process.[7]
    - Phase II itself will be a two-part process, with the first part focused on identification of methodologies to account for DERs (monetized or quantified assessments), and part two of Phase II will provide guidance on conducting 1) distributional equity analysis, 2) economic development analysis, and 3) rate and bill impact analysis alongside BCAs.[8]

- **District of Columbia**: Beginning in 2019, in response to climate and clean energy legislation enacted in the District, the DC PSC began to seek input on how it should evaluate its activities relative to climate change and greenhouse gas emissions. The Clean Energy Act Implementation Working Group recommended use of a BCA and in its December 8, 2023, order, the DC PSC adopted several recommendations of its working group to implement a standardized BCA framework. [9]
    - The District has entered Phase II of its BCA development process, which is focused on the development of an Excel model accounting for the various impacts adopted by the PSC as part of its BCA. The District's BCA, once finalized, will "apply to all programs and proposals, including DERs, for the future."[10]

- **Michigan:** In 2021, Michigan began addressing BCAs of DERs via the Michigan Power Grid Initiative, aimed at supporting the transition to clean energy in the state. On October 12, 2023, the Michigan PSC adopted a jurisdiction-specific test (JST) using the NSPM guidance, including a

[6] 17 May 2024. Maryland Unified BCA Work Group, "Maryland Unified Benefit-Cost Analysis (UBCA) Framework for Distributed Energy Resources." Docket No. 9674. https://webpscxb.psc.state.md.us/DMS/case/9674
[6] Ibid., p. 10.
[7] 22 Nov 2024. Maryland Public Service Commission. Order No. 91424 on Accepting the Proposed UBCA Framework and Authorizing Phase II (ML 313783). Docket No. 9674. https://webpscxb.psc.state.md.us/DMS/case/9674
[8] Ibid., p. 10.
[9] 8 Dec 2023. Public Service Commission of the District of Columbia. In the Matter of the Implementation of the 2019 Clean Energy DC Omnibus Act Compliance Requirements. Order No. 21938, General Docket No. 2019-04-M. https://edocket.dcpsc.org/apis/api/Filing/download?attachId=196851&guidFileName=8d6e3aa5-43e7-4e9d-8197-d2d36c1fb7bd.pdf.
[10] 30 Oct 2020. Public Service Commission of the District of Columbia. In The Matter of The Development of Metrics for Electric Company and Gas Company Energy Efficiency and Demand Response Programs Pursuant to Section 201(B) Of the Clean Energy Dc Omnibus Amendment Act. Order No. 20654, Formal Case No. 1160. https://edocket.dcpsc.org/apis/api/Filing/download?attachId=109180&guidFileName=d426b77b-1325-4a43-b5b4-0a6e89091164.pdf. P. 1

range of non-USIs. While the focus of the Michigan Docket U-20898 was on DER pilots (including EE, DR, DS, and DG), the test will be applied to pilots 'at scale'.[11]

Energy Efficiency BCA Practices Serve as a Model for Other DERs: This report does not specifically address BCA practices for energy efficiency (EE) programs, as most states currently offer such programs and have well-established BCA practices for EE.[12] There is already considerable information available on state inclusion of non-USIs in their BCAs via the Database of Screening Practices (DSP), including applicability to building electrification (BE) where measures, e.g., air source heat pumps, are part of energy efficiency programs.

Energy efficiency BCA methods are generally the most robust within state and utility practices and therefore have served as a useful starting point for states in developing their BCA practices for other DERs. Some states have nevertheless continued to improve or expand the inclusion of non-USIs in their EE BCA practices, which may provide further opportunities for establishing uniform practices with other DERs.

Scope and Methodology

These findings represent an illustrative sample of how states are accounting for different societal and host customer impacts of DR, DG, and DS systems. The effort did not comprehensively catalog all BCA practices for these DERs across all states, and gaps in the research regarding specific state policies or DERs should not be interpreted to imply that a state-level policy does not exist.

States vary widely in what level of detail is available in their regulatory proceedings regarding BCA practices and methodologies, including the level of granularity that is publicly available. These factors constrain the depth of the research in some areas, particularly regarding utility practices for quantifying impacts of DERs. **As discussed in the *Areas for Further Research* section of this report, additional effort to engage with utility and BCA practitioners on the specific quantification methodologies will help to further identify best practices for BCA of non-USI for DERs.**

This research relied on a list of key words and phrases for filtering the vast body of utility and state regulatory process documents on this topic.[13] The regulatory proceeding database Insight Engine[14] was used to review the existing body of utility regulatory dockets to see how non-USIs were accounted for in public utility commission proceedings; this included both formal adoption of BCA and cost-effectiveness

[11] 12 Oct 2023. Michigan Public Service Commission. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. Docket no. U-20898. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y00000ACa8IAAT. p. 25.

[12] The Database of Screen Practices (DSP) provides a comprehensive review of the BCA practices for state energy efficiency programs. Developed by NESP, this resource lives and is managed by ACEEE (as of February 2024) See: ACEEE Database of Screening Practices.

[13] Keywords included: cost test, benefit cost analysis, distributed storage, distributed generation, distributed energy resource, impact, non-energy impact, and non-energy benefit. Boolean operators were used in searching, so terms were designated as required and combined in various ways (rather than searched individually) to ensure the most relevant results. Furthermore, given the range of terms used to refer to identical concepts, searches were repeated with varied keywords to avoid missing single hits. These searches often identified proceedings which referenced additional relevant proceedings, providing further sources of information.

[14] The Insight Engine tool is a product developed and maintained by Advanced Energy United. The platform provides keyword searchable access to every docket from the public utilities commission in all 50 states and the District of Columbia. See: https://insightengine.org/

tests as well as informal evaluations and references in project-related documentation (such as request for proposals (RFP) requirements and metrics on pilot programs). The research also reviewed state legislation where appropriate to further identify relevant policies and procedures.

Given the range of regulatory contexts and types of assessment practices, each state practice was categorized into the following groups:

- Formal cost-effectiveness test or reporting: The state has established a formal BCA or cost-effectiveness test used for the assessment of one or more types of the relevant DERs. This included proposed or preliminary cost-effectiveness tests that have not been officially adopted yet. This also includes cases where the state uses metrics or BCA to assess certain DER impacts for reporting purposes only, with no requirement to pass a cost-effectiveness test.

- Other regulatory contexts: Includes impacts that are being evaluated in other regulatory contexts by utility commissions, state energy offices, or other regulators, including clean energy implementation plans, IRPs, permitting decisions, procurement decisions, rate cases and pricing, and other regulatory filings.

This research represents a snapshot of different state practices for evaluating the three selected DERs (DS, DG, and DR) and accounting for various non-USIs of those DERs; each of the following sections reviews various state BCA practices for assessing societal and host-customer impacts for each DER type. It is not scoped to be a comprehensive or exhaustive account of DER evaluation practices but is instead an illustrative sampling of the types of practices that states are using to evaluate DERs. Further research will be required to comprehensively catalog all state practices for all DERs.

2. Demand Response

Demand Response Section Summary:

Societal impacts: California and New Jersey explicitly account for societal non-USIs of DR programs in their BCA practices. Maryland has adopted a UBCA framework which includes societal non-USIs, though Maryland has not yet quantified the BCA values. Michigan is developing a BCA for DER pilots but also has not quantified BCA values beyond directing monetization or quantification. Utilities in Colorado and Illinois have also included GHG and public health benefits of DR in BCA practices. The District of Columbia includes GHG emissions and the social cost of carbon in their BCA practices for DERs.

Host customer impacts: California, Colorado, the District of Columbia, Maryland, Michigan, New Jersey, and Pennsylvania address some host customer impacts, including both energy impacts and non-energy impacts, in their BCA practices regarding DR programs; however, the guidance for the tests does not always specifically address which types of impacts are included or map directly onto the list of impacts here.

Note on EE: *While this report does not specifically address EE, some states include DR as part of their EE BCA practices. In many cases, the extent to which the EE program BCAs are applied to DR is often unclear.*[15]

2.1 Societal Impacts

Table 2: Accounting for Societal Impacts: Demand Response

Resilience	GHG Emissions	Other Environment	Public Health	Economic Develop./Jobs	Energy Security	Low-Income Societal / Equity
MI	CA, NJ, MD*, CO, DC, MI	CA, MD, ME, MI	CA, MD, NJ, CO, IL, MI	CA, MD, ME, NJ, MI	MD, MI	CA, MD*, DC, MI*

** indicates currently not included, but future use case might include impact*

2.1.1 Resilience

The **Maryland** UBCA Work Group identified societal resilience as "not applicable" for DR programs, as it only identified societal resilience for EE, DG, and DS investments. The work group's report notes the importance of avoiding double-counting between utility system, societal, and host-customer resilience.[16]

Michigan will include resilience in its BCA for DER pilot programs. The PSC has recommended monetization and quantification wherever possible, including for resilience.[17] Specific methodologies to quantify the impacts have not yet been determined. At this time, the BCA will only be required for pilot programs but may have broader applicability in the future.

[15] For example, Arizona, Illinois, and Florida, among others all include DR as part of their EE programs.
[16] Maryland Public Service Commission, Docket No. 9674, Unified Benefit Cost Analysis (BCA) Framework for Distributed Energy Resources. https://webpscxb.psc.state.md.us/DMS/case/9674.
[17] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26.

2.1.2 GHG Emissions

California defines five different cost effectiveness tests within the Standard Practice Manual, and has a robust body of procedures for BCA of different DERs. California adopted the Societal Cost Test (SCT) as an additional "component to inform the broader framework of tests" in a July 2024 order – this is explicitly only to provide information and does not become required until April 1, 2025.[18] SCT inputs into the ACC would be a social discount rate of 3%, a statewide air quality adder of $14 per MWh, a base value of 2.3% for methane leakage, and two values for the social cost of carbon:

- Base Social Cost of Carbon = 2020$/metric ton values in the range of approximately $53 in 2020 and approximately $81 in 2045.
- High Social Cost of Carbon = 2020$/metric ton values in the range of approximately $155 in 2020 and approximately $249 in 2045 (95th percentile of possible climate impacts).[19]

California offers robust public information and manuals, which offer more detail about calculation methods than in many other states. Specific program documentation further describes the existing process for DR program BCA, which seeks both qualitative and quantitative analyses of these impacts:

> "The [load serving entity (LSE)] is required to provide a qualitative analysis of the following non-energy and non-monetary benefits or costs. LSEs should include numeric values for these inputs if and when it is possible to estimate quantitative values for any one of them for a specific DR program.
>
> 1. Social non-energy benefits or costs, such as environmental benefits (in addition to the avoided GHG cost included in the avoided cost calculator), job creation benefits, and health benefits."[20] [emphasis added]

The California ACC documentation provides detailed guidance on the quantification methodology for GHG emissions, and states:

> "The value of GHG emissions is represented by the sum of two values: 1) the monetized carbon cap and trade allowance cost embedded in energy prices, and 2) the non-monetized carbon price beyond the cost of cap-and-trade allowances (represented by the 'GHG Adder,' as adopted by the CPUC). The GHG Adder reflects the cost of further reducing carbon emissions from electricity supply, rather than the compliance cost represented by the cap-and-trade allowance price. The combination of adding the cap-and-trade price and the GHG Adder is the total GHG avoided cost component included in the 2022 ACC."[21]

Colorado requires utilities to evaluate DR as a proposed non-wires alternative (NWA) with an NSPM-consistent methodology, including consideration of GHG emissions, or through other utility-proposed

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[18] 11 Jul 2024. California Public Utilities Commission. Decision Adopting the Societal Cost Test. Rulemaking 22-22-013. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M535/K822/535822173.PDF. P. 47.
[19] Ibid., p. 2.
[20] Jul 2016. California Public Utilities Commission. July 2016 Demand Response Cost Effectiveness Protocols. https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/demand-response-cost-effectiveness p. 11.
[21] Jun 2022. California Public Utilities Commission. 2022 Distributed Energy Resources Avoided Cost Calculator Documentation. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/demand-side-management/acc-models-latest-version/2022-acc-documentation-v1a.pdf

methodologies.[22] Xcel Energy/Public Service Company of Colorado (PSCo) proposed, and received approval for, an alternative methodology in their 2022 Distribution System Plan filing that accounts for GHG emissions, among other non-energy benefits, using the February 2021 Social Cost of Carbon.[23] Additionally, Xcel's framework explicitly calls out that emissions reductions typically result in improvements to the environment and public health, societal impacts accounted for separately (see below).[24] While this cost-effectiveness test is not applied statewide, Xcel/PSCo is the largest single utility with 55% of residential customers in the state.[25]

The **District of Columbia** PSC will apply its forthcoming BCA to DR programs. The DC PSC has adopted a wide scope of emissions to be quantified in its BCA which will apply to all the DERs in this research.[26] The DC PSC has directed inclusion of CO_2, CH_4, and N_2O as greenhouse gases in the BCA practices, and future updates to the test will include HFCs and SF_6. The DC PSC uses a cost for CO_2 emissions of $160 per $MMCO_2e$ (consistent with the DC Sustainable Energy Utility's rate) and will continue to revisit that amount to account for inflation. However, the implementation plan for a standardized marginal abatement cost framework for GHG emissions and the exact plans for monetizing the impact of the aforementioned GHGs remain in progress.[27]

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test should include greenhouse gas emissions impacts for all DER investments; the Work Group assessed that GHG emissions impacts from DR programs are not materially significant in applications today but could be in the future as the grid evolves.

The **New Jersey** Cost Test (NJCT) applies to DR programs (in addition to EE). New Jersey reviews its cost-effectiveness test every three years in advance of its next triennium of efficiency and peak demand reduction (PDR) programs; the NJCT was recently updated for the next program Triennium 2 from 2025-2027[28] and board staff have already recommended further study of inclusion of avoided emissions for Triennium 3.[29] The NJCT includes impacts of three emissions: carbon dioxide (CO_2), sulfur dioxide (SO_2), and nitrogen oxides generally (NOx). The valuation for CO_2 is calculated for both electric and gas programs using the 3% discount rate "Annual SC-CO_2," value, adjusted for current inflation, published in the most recent *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis*, and based

[22] Code of Colorado Regulations, 4 CCR 723-3: Rules Regulating Electric Utilities., Rule 3535, p. 106-107, https://drive.google.com/file/d/0B8qvU2knU8BkcEJneE93YkNRQmM/view?resourcekey=0-XGWvr_3zVqbuKs9g1SpG1Q. NWAs can encompass one or multiple DERs, including but not limited to demand response measures, energy efficiency, energy storage, and distributed generation, p. 97.

[23] At 2.5% discount rate and using hourly emissions rates for 2022-2045 provided by Xcel's 2021 Electric Resource Plan (ERP). The methodology specifies that long run marginal emissions rates should be utilized when evaluating emissions in a planning context.

[24] 2 May 2022. Public Service Company of Colorado (subsidiary of Xcel Energy), before the Colorado Public Service Commission. Distribution System Plan: Hearing Exhibit 101, Attachment ZDP-5-NWA BCA Methodology – Final. Docket No. 22A-0189E. https://www.dora.state.co.us/pls/efi/EFI.Show_Docket?p_session_id=&p_docket_id=22A-0189E p. 22-23.

[25] Insight Engine. State Profile: Colorado – Colorado Utilities.

[26] 8 Dec 2023. Public Service Commission of the District of Columbia. In the Matter of the Implementation of the 2019 Clean Energy DC Omnibus Act Compliance Requirements. p. 26 and footnote 99.

[27] Ibid., p. 13.

[28] Oct 2023. New Jersey Board of Public Utilities. Triennium 2, New Jersey Cost Test (NJCT). https://njcleanenergy.com/files/file/BPU/2023/Market%20Analysis%20Baseline%20Studies/QO23030150-%20Tri2%20EE1%20+%20EE2-%20Order%20Attch%20F-%20NJCT.pdf

[29] Ibid., p. 16.

on PJM emissions rates.[30] The valuation for SO_2 and NO_x is calculated for both electric and gas using the average of the high and low case estimates from the EPA report titled *Estimating the Benefit per Ton of Reducing Directly-Emitted PM2.5, PM2.5 Precursors and Ozone Precursors from 21 Sectors*, and based on PJM emission rates.[31]

Michigan will account for the societal impacts of GHG emissions for DER pilot programs, including DR pilot programs.[32] The PSC has directed that this be monetized, and that calculations should include both upstream and downstream emissions associated with the generation, delivery, and use of the fuel being used in the pilot.[33] In Michigan's case, this impact is defined as "GHG emissions created by fossil-fueled energy resources." Specific methodologies to quantify the impacts have not yet been determined.

2.1.3 Other Environmental

California accounts for other environmental impacts in DR program guidance in much the same way as GHG emissions. LSEs are required to provide a qualitative analysis of non-energy and non-monetary benefits or costs in the workpapers associated with their DR Cost-Effectiveness Report, "even if they believe that these benefits or costs do not apply to their DR programs. LSEs should include numeric values for these inputs if and when it is possible to estimate quantitative values for any one of them for a specific DR program."[34] California lists several specific examples of "other environmental impacts" including noise pollution, water quality, and biological impacts.[35] The methodology notes that the ACC for utility costs already includes some environmental impacts embedded as part of the cost of compliance with environmental regulation of criteria pollutants, stating:

> "Criteria emission pollutant-related costs that can be avoided by DR programs are already reflected in estimates of the generation capacity costs avoided by that DR program, to the extent that pollutant limits are required by current environmental regulation. However, environmental regulations are enacted to limit pollutants, not to limit the abatement of pollutants. There are residual benefits of avoiding criteria pollutants above and beyond the level of existing environmental regulation."[36]

This clearly establishes policy that the cost-effectiveness test may include additional impacts from emissions reductions beyond those regulatory compliance impacts but will require careful analysis to avoid double-counting of impacts (e.g., with public health benefits).

Maine's energy efficiency program is administered by the Efficiency Maine Trust, which establishes that programs may include energy efficiency, demand response, storage, and electrification, specifically allowing programs to "reduce the price of electricity over time for all consumers by reducing or shifting demand for electricity or balancing load, including by the implementation of beneficial electrification

[30] See https://www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf
[31] See https://www.epa.gov/benmap/estimating-benefit-ton-reducing-directly-emitted-pm25-pm25-precursors-and-ozone-precursors
[32] Michigan has defined DERs to include DR. See Michigan source #2, p. 6.
[33] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[34] Jul 2016. California Public Utilities Commission. July 2016 Demand Response Cost Effectiveness Protocols. p. 43.
[35] Ibid., p. 44.
[36] Ibid., p. 43.

and energy storage systems" (emphasis added).[37] The rules establish that cost-effectiveness testing should include program benefits and costs, including:

> "Non-resource benefits, including customer benefits such as reduced operation and maintenance costs, deferred replacement costs, productivity improvements, economic development benefits and environmental benefits, to the extent such benefits can be reasonably quantified and valued. "[38] *(emphasis added)*

The Efficiency Maine Trust proposal for program years 2023-2025 included demand response and a load shifting initiative to include battery storage.[39]

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test includes other environmental impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

Michigan will account for other environmental impacts in its BCA for DER pilots. This impact should be monetized, and quantified if monetization is not possible.[40] Michigan defines this impact as "other air emissions, solid waste, land, water, and other environmental impacts."[41] Specific methodologies to quantify the impacts have not yet been determined.

2.1.4 Public Health

The **California** SCT includes an air quality adder of $14 per MWh, which "measures the impact of gas generation on human health." This value is based on the results of a January 2022 Air Quality Impact Report published by Energy Division staff, in partnership with UC Irvine and E3.[42]

Specific to DR program guidance, California accounts for public health in much the same way as GHG emissions and environmental impacts. LSEs are required to provide a qualitative analysis and may choose to provide "evidence of the magnitude of the benefits or costs." California specifically references "decreased health care costs associated with lower emission levels, especially decreased air pollution" as a component of environmental impacts to be considered by utilities. Based on the specific wording of the guidance, utilities will need to avoid double counting in calculating this impact, with societal costs (e.g. hospital and insurance carrier costs) attributed as a societal impact, and individual reductions in health care costs attributed as a host-customer impact (see below).[43] Similar to the process for

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[37] Maine Administrative Rules 95-648, *Efficiency Maine Trust*, Chapter 3, Electric Efficiency and Conservation Programs, https://www.efficiencymaine.com/docs/Ch3_Electric-Efficiency-and-Conservation-Programs.pdf

[38] Ibid, p. 7-8.

[39] Triennial Plan for Fiscal Years 2023-2025, Efficiency Maine Trust, November 29, 2021, https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/ViewDoc.aspx?DocRefId={D1FB2C28-8E6E-4796-A0B6-B6B2D13E4414}&DocExt=pdf&DocName={D1FB2C28-8E6E-4796-A0B6-B6B2D13E4414}.pdf

[40] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26.

[41] 1 Feb 2023. DTE Electric Company and Consumers Energy Company before the Michigan Public Service Commission. Proposed Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. Docket no. U-20898. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000006b4QyAAI. P. 25

[42] 11 Jul 2024. California Public Utilities Commission. Decision Adopting the Societal Cost Test. Rulemaking 22-22-013. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M535/K822/535822173.PDF. P. 31-2.

[43] Jul 2016. Demand Response Cost Effectiveness Protocols. P. 44.

environmental impacts, utilities must also avoid double counting public health benefits from criteria emissions reductions already captured in the ACC, as described above.

In **Colorado**, Xcel/PSCo's approved BCA for DR quantifies public health using EPA's COBRA tool and marginal emissions from the 2021 ERP data.[44, 45] Public health costs are defined as degradations in air quality and human health due to air pollution from particulate emissions, SO_2, and NO_x; the state explicitly values both GHG emissions reduction and their resulting public health impacts. Xcel/PSCo indicates that this COBRA variable represents "the economic value of pollutant reduction due to improvements in human health per ton of pollutant decreased."[46]

Illinois applies its energy efficiency cost-effectiveness testing policies contained in the Energy Efficiency Policy Manual to DR programs as well.[47] ComEd, the state's largest utility with 71% of residential customers,[48] includes valuation of public health using the EPA's AVERT and COBRA tools.[49] AVERT estimates marginal emissions rates for six pollutants (PM2.5, SO_2, NO_x, VOCs, NH_3, and CO_2) and applies those rates to efficiency savings to determine a county-level reduction in each pollutant. Those outputs are then entered into COBRA using a 30-year exposure period; COBRA discounts the health benefits back to the year in which savings are realized.[50] The health conditions included in ComEd's valuation are: infant and adult mortality, non-fatal heart attacks, cardio and respiratory hospital admissions, acute bronchitis, upper and lower respiratory symptoms, asthma exacerbations, asthma ER visits, minor restricted activity days, and work loss days.[51]

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test includes public health impacts for all DER program cost-effectiveness testing, including DR; specific methodologies to quantify the impacts have not yet been determined.

New Jersey addresses public health and economic development impacts using a 15% adder applied to avoided wholesale energy costs. The adder is generally intended to cover non-energy benefits that are not already captured by the NJCT and are difficult to quantify; public health and economic development are specific examples given in the cost-effectiveness test documentation.[52, 53]

The **Michigan** PSC has directed that the public health impacts of DR programs must be monetized. The MPSC has directed quantification if monetization is not possible.[54] Public health impacts are defined in

[44] EPA, CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA). https://cobra.epa.gov/
[45] 2 May 2022. Public Service Company of Colorado (subsidiary of Xcel Energy), before the Colorado Public Service Commission. Distribution System Plan: Hearing Exhibit 101, Attachment ZDP-5-NWA BCA Methodology – Final. Docket No. 22A-0189E. https://www.dora.state.co.us/pls/efi/EFI.Show_Docket?p_session_id=&p_docket_id=22A-0189E. p. 23-25
[46] Ibid., p. 24.
[47] Illinois Energy Efficiency Policy Manual Version 2.1. https://www.ilsag.info/wp-content/uploads/IL_EE_Policy_Manual_Version_2.1_Final_12-7-2021-1.pdf p. 11, 15.
[48] Insight Engine, Illinois State Profile: Utilities.
[49] EPA, AVoided Emissions and geneRation Tool (AVERT). https://www.epa.gov/avert#what%20AVERT
[50] 12 June 2023. ComEd CY 2022 Societal Non-Energy Impacts Research Report. https://www.ilsag.info/wp-content/uploads/ComEd-CY2022-Societal-NEI-Report-2023-06-12-Final.pdf. P. 8-10.
[51] Ibid., p. 8.
[52] Triennium 2, New Jersey Cost Test (NJCT). P. 6.
[53] New Jersey also lists water and sewer impacts among those impacts captured by the 15% adder applied to avoided wholesale energy costs. These are separate from the Other Environmental Impacts category of non-USIs.
[54] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.

the BCA as "health impacts, medical costs, and productivity affected by health."[55] Specific methodologies to quantify the impacts have not yet been determined.

2.1.5 Economic Development and Jobs

State policies sometimes identify economic development and job creation as a key policy goal for ratepayer-funded utility DER investments. While this category of impact has traditionally been viewed as a societal impact in BCA, best practices for accounting for economic development and jobs impacts have evolved since the NSPM was published in 2020. The current recommended best practice is to assess economic and job impacts separately from, but alongside, a formal BCA because these impacts are the result of utility system savings (e.g. creating savings for ratepayers leading to economic growth) or costs (creating jobs through investment), which creates a significant risk of double-counting costs and benefits with utility system impacts. Further, job impacts are typically reported using full-time equivalent (FTE) jobs and are not monetized. Economic and jobs analysis may nevertheless provide helpful context for regulators – particularly where state policy articulates support for economic development through DER deployment – but should be conducted separately from the quantified BCA. Future NSPM updates will provide further guidance on best practices for addressing economic development impacts of DERs.

California accounts for jobs and economic impacts in much the same way as environmental impacts. LSEs are required to provide a qualitative analysis and may choose to provide "evidence of the magnitude of the benefits or costs." California specifically states that "Job Creation Benefits or Costs for DR can be those over and above the job creation benefits of a combustion turbine or constructing distribution and transmission upgrades."[56]

Maine's Efficiency Maine Trust rules establish that cost-effectiveness testing should include program benefits and costs, including:

> "Non-resource benefits, including customer benefits such as reduced operation and maintenance costs, deferred replacement costs, productivity improvements, economic development benefits and environmental benefits, to the extent such benefits can be reasonably quantified and valued."[57]

As noted in earlier sections, Efficiency Maine's programs include DR programs.

Maryland's UBCA Work Group recommended that the Maryland primary cost assessment framework include consideration of economic development and job impacts for all DER programs, but recommended that they not be quantified as part of the cost-effectiveness test to avoid double counting of other cost impacts. Specific methodologies to assess the impacts have not yet been determined.

New Jersey addresses public health and economic development impacts using a 15% adder applied to avoided wholesale energy costs. The adder is generally intended to cover non-energy benefits that are

[55] 1 Feb 2023. DTE Electric Company and Consumers Energy Company before the Michigan Public Service Commission. Proposed Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. Docket no. U-20898. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000006b4QyAAI. P. 25

[56] Jul 2016. Demand Response Cost Effectiveness Protocols. P. 43.

[57] Maine Administrative Rules 95-648, *Efficiency Maine Trust*, Chapter 3, Electric Efficiency and Conservation Programs, p. 7-8.

not already captured by the NJCT and are difficult to quantify; public health and economic development are specific examples given in the document.[58]

The **Michigan** PSC has directed that economic development and jobs should be monetized in its BCA for DR pilots. This impact should be quantified if monetization is not possible.[59] This impact is defined as "increased economic development and job impacts."[60] Specific methodologies to quantify the impacts have not yet been determined.

2.1.6 Energy Security

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test include energy security impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

In **Michigan**, energy security is included in the BCA for DER pilots and the PSC has directed that it be monetized where possible, and quantified if not.[61] This impact is defined as "energy imports and energy independence."[62] Specific methodologies to quantify the impacts have not yet been determined.

2.1.7 Societal Low-Income Impacts / Equity

The research did not identify any states which account for societal low-income impacts of DER programs in BCA practices. Most states that include low-income impacts address them at the host customer level rather than the societal level. However, some states have explicit policies to ensure the equitable distribution of benefits and costs of DER investments to all customers, including priority populations (e.g., underserved, or disadvantaged communities). States such as California, Maryland, Michigan, and the District of Columbia have such policies in place and are at various stages of assessing the distribution of DER impacts.

Maryland and **Michigan** both plan to look at distributional equity alongside BCA for all DERs, but have not yet done so. The **District of Columbia** PSC directed the monetization of racial equity impacts in future phases of their BCA development, and will convene a working group to make recommendations on the process. **California** does not directly include equity in the Societal Cost Test (SCT) for DERs; the California PUC addressed concerns over the lack of equity considerations in the SCT by stating that since the SCT is an information-only test, the Commission may consider equity through other measures such as mitigation of "environmental harms of fossil-based energy production, which have disproportionately impacted low-income and disadvantaged communities."[63]

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[58] Triennium 2, New Jersey Cost Test (NJCT). P.6.
[59] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[60] 1 Feb 2023. DTE Electric Company and Consumers Energy Company before the Michigan Public Service Commission. Proposed Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. Docket no. U-20898. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000006b4QyAAI. P. 25
[61] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26.
[62] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25
[63] 11 Jul 2024. California Public Utilities Commission. Decision Adopting the Societal Cost Test. Rulemaking 22-22-013. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M535/K822/535822173.PDF. P. 23.

In all cases, conducting a distributional equity analysis to address metrics such as energy burden and affordability is separate from conducting a BCA, consistent with distributional equity analysis guidance developed by the Lawrence Berkeley National Laboratory (LBNL) and E4TheFuture. [64]

2.2 Host Customer Impacts

Table 3: Accounting for Host Customer Impacts: Demand Response							
	Measure costs	**Transaction costs**	**Inter-connection**	**Risk**	**Reliability**	**Resilience**	**Tax Incentives**
Energy Impacts	CA – Unspecified/Overall Adder						
	CO, DC, MD, ME, MI	CA, MD, ME, DC	CO, DC, MI	MI	CO, MI	MI	CA, DC, MI
	Asset value	**Transaction costs**	**O&M**	**Economic well-being**	**Comfort**	**Health & Safety**	**Satisfaction & Empowerment**
Non-Energy Impacts	CA, NJ – Unspecified/Overall Adder DC – Unspecified process CO general and DIC adder						
	CO	CA, ME, MI	ME	ME			MD, CA

Note: Many states which include host customer impacts in their BCA practices do not specify which energy or non-energy impacts they are including or quantifying, and they may only reference specific impacts as examples of host customer impacts to include. The above table highlights where specific impacts are mentioned in policy directives, but in many cases, guidance allows for inclusion of all host customer impacts.

California specifies that LSEs should include host customer benefits of DR programs in the Participant Test but only requires a qualitative analysis. It includes participant costs in its TRC test, but not participant benefits, and thus applies an asymmetrical approach to accounting for participant costs and benefits.[65] California specifically mentions tax credits as a category of impacts separate from host-customer impacts, stating that while tax credits are not currently available for DR programs, they should be considered in the TRC and participant tests if applicable in the future.

California also treats transaction costs and productivity/value of lost service separately from host-customer impacts, stating "these two categories include all of the costs to the participant, other than bill increases and equipment costs, of participating in a DR program."[66] In quantifying these costs, California states:

> "Direct estimation of value of service lost or productivity losses would require extensive research and customer surveying, which is likely to be expensive and yield results that are highly uncertain. For this reason, a proxy variable is used to estimate these costs… It is reasonable to assume that participants in voluntary DR programs perceive their costs as being less than the

[64] *Distributional Equity Analysis for Energy Efficiency and Other Distributed Energy Resources: A Practical Guide. May 2024.* See https://www.nationalenergyscreeningproject.org/resources/distributional-bca/

[65] Jul 2016. Demand Response Cost Effectiveness Protocols. P. 44.

[66] Ibid., p. 46.

benefits, or at the very least participants perceive that they are "breaking even."…Hence, for the purpose of calculating values for the TRC test, for voluntary DR programs only, LSEs should assume that the maximum possible value of the transaction costs and value of service lost can be approximated as the value of all incentives paid to customers plus the customers' total estimated bill reductions minus any participant capital costs."[67] (emphasis added)

California establishes percentage values of this maximum possible benefit for estimating the transaction cost impacts, with different values for programs with low productivity losses (e.g. residential programs with limited costs and impacts):

Voluntary DR: Transaction Costs as a Percentage of Maximum Possible Benefits			
DR Program	**High**	**Medium**	**Low**
Standard DR	100%	75%	50%
Low-Impact DR	60%	35%	10%

In **Colorado**, Xcel/PSCo's approved BCA explicitly includes measure costs and interconnection as host customer impacts for DR. Xcel/PSCo also include general host customer non-energy benefits and income-qualified and disproportionately impacted communities (DIC) non-energy benefits,[68] noting that "these values have been difficult, time intensive, or expensive to quantify using established methods. Because of this, many jurisdictions represent NEI impacts in the form of a proxy or adder on top of other benefits."[69]

This BCA is used by Xcel/PSCo to review NWA proposals, in alignment with direction from the Colorado Public Utilities Commission (CPUC) to develop and utilize a methodology for evaluating the cost-effectiveness of such projects.[70]

- The **host customer portion of measure costs** is defined as "costs incurred by a host customer to install and operate a DER…included as an impact when an NWA program motivates a customer to make a purchase they would not have made otherwise…[they] should also be included as an impact when additional cost is incurred relative to an alternative consumer choice." Host customer measure costs are a user-defined input and provided by the entity bidding on the NWA project. Therefore, Xcel/PSCo notes that bidders should carefully develop their baseline for normal consumer spending vs. additional spending due to NWA, DER installation, or other choice.[71]
- Like host customer measure costs, **interconnection fees** are a user-defined input, this time provided by Xcel/PSCo. They must be applied when the host customer must pay for interconnection; if the utility or another entity takes on the burden of cost, it becomes a utility system cost.[72]
- Xcel/PSCo groups certain **host customer general and DIC non-energy impacts** together, defining them to include related impacts of DERs such as asset value, health and safety, comfort,

[67] Jul 2016. Demand Response Cost Effectiveness Protocols. P. 46-47.
[68] 2 May 2022. Distribution System Plan: Hearing Exhibit 101, Attachment ZDP-5-NWA BCA Methodology – Final. Docket No. 22A-0189E. P. 7-8.
[69] Ibid., p. 21.
[70] Ibid., p. 2.
[71] Ibid., p. 19.
[72] Ibid., p. 20.

productivity, satisfaction and pride, and empowerment. These take the form of the adders, multiplied by the sum of all utility system benefits:[73]

- Ten percent for natural gas programs and electric programs.
- Twenty-five percent for low-income natural gas and electric programs.

The **District of Columbia** PSC, in its Order No. 21938 issuing decisions on impacts to include in its forthcoming BCA, directed that the following host customer impacts should be monetized in the earliest phases of BCA development: the host portion of DER costs, host transaction costs, interconnection fees, tax incentives, host customer non-USIs, and low-income impacts.[74] While definitions and potential valuations of these impacts is forthcoming in future proceedings, the Commission notes that:

> "Both racial equity and energy burden metrics should be quantified where possible, recorded at the neighborhood level, and the consultant is directed to quantify these costs/benefits in Phase 2, Part B." (referring to future parts of the ongoing BCA development process)[75]

Maine's Efficiency Maine Trust also established that cost-effectiveness testing should include customer benefits and costs, including:

> "Non-resource benefits, including customer benefits such as reduced operation and maintenance costs, deferred replacement costs, productivity improvements, economic development benefits and environmental benefits, to the extent such benefits can be reasonably quantified and valued…
>
> Ongoing customer costs, including costs such as increased operation and maintenance costs, reduced productivity, and lost economic development opportunities, to the extent such costs can be reasonably quantified and valued."[76] *[emphasis added]*

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test includes host customer impacts for all DERs; for DR programs, the Work Group identified measure costs, transaction costs, and amenity benefits as being material and significant; all other impacts were assessed as non-material or not applicable. Specific methodologies to quantify the impacts have not yet been determined.

New Jersey uses adders to account for host customer non-energy impacts, both for low income and non-low-income participants. An adder of 15% is to be applied to avoided wholesale energy costs for all programs. An additional 15% adder is to be applied to avoided wholesale energy costs for low- and moderate-income customers, for a total of 30% applied to avoided wholesale energy costs for LMI programs.[77] New Jersey's use of an adder as a catch-all for all categories of non-energy benefits helps to ensure compliance with the NSPM principle of symmetry which require that "both the benefits and costs should be accounted for."[78] However, there is potential that impacts that are not fully recognized may

[73] Ibid., p. 22.
[74] 8 Dec 2023. Public Service Commission of the District of Columbia. In the Matter of the Implementation of the 2019 Clean Energy DC Omnibus Act Compliance Requirements. p. 25-26.
[75] Ibid., p. 8-9.
[76] Maine Administrative Rules 95-648, *Efficiency Maine Trust*, Chapter 3, Electric Efficiency and Conservation Programs, p. 7-8.
[77] Triennium 2 New Jersey Cost Test (NJCT). P. 16.
[78] NSPM 2020, p. 2-5.

not be appropriately accounted for in the adder, and it makes it difficult to evaluate the specific sources of cost and benefits of the DER.

Michigan includes a comprehensive list of host customer impacts for DR program pilots: measure and transaction costs, interconnection fees, risk, reliability, resilience, tax incentives, NEIs for low-income and non-low income, and other fuels. [79] Impacts should be monetized, and quantified if monetization is not possible.[80] Michigan also includes non-energy impacts for low-income and non-low-income; these are defined as "benefits and costs that are separate from energy-related impacts."[81] Specific methodologies to quantify the impacts have not yet been determined.

[79] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 34
[80] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26-27.
[81] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 26.

3. Distributed Generation

Distributed Generation Section Summary:

Societal impacts: Maryland has adopted a UBCA framework which includes societal non-USIs, though Maryland has not yet quantified the BCA values. Colorado utilities have included the impacts of DG on public health and GHG emissions. Maine has accounted for societal non-USIs of DG programs in a cost-effectiveness test but has yet to apply it statewide. Michigan is developing a BCA to apply to DER pilots, including DG, and the BCA will account for a wide range of societal impacts. California accounts for GHG emissions of DG installations, but the research did not identify accounting for other impacts.

Host customer impacts: In Colorado, utilities have included some host customer impacts for DG. Maryland's UBCA work group recommended the cost-effectiveness test include several host customer impacts for DG programs, but the methodologies are yet to be determined. Michigan includes a wide range of host customer impacts but limits the application of its BCA to DER pilots, at least initially.

3.1 Societal Impacts

Table 4: Accounting for Societal Impacts: Distributed Generation

Resilience	GHG Emissions	Other Environment	Public Health	Economic Develop./Jobs	Energy Security	Low-Income Societal/Equity
MD, MI	CA, MD, ME, CO, MI	MD, MI	CA, MD, CO, MI	MD, ME, MI	MD, MI	CA, MD*, DC, MI*

3.1.1 Resilience

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test includes societal resilience impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

Michigan will account for resilience impacts in its BCA for all DER pilot programs. The PSC has directed societal resilience to be monetized wherever possible, and quantified where it is not possible to monetize the value.[82,83] This impact is defined as "resilience impacts beyond those experienced by utilities or host customers (e.g., allowing critical facilities to continue providing services during an outage)." Specific methodologies to quantify the impacts have not yet been determined.

3.1.2 GHG Emissions

California utilizes its regularly updated ACC to determine GHG emissions for DG installations.

> "'The outputs of the Avoided Cost Calculator feed into the cost-benefit analysis for distributed energy resources' (D.22-05-002, p. 2-3). As the Commission previously directed in both D.16-06-007 and D.19-05-019, avoided costs shall be determined in the routine update of the Avoided

[82] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26-27.
[83] Michigan's BCA will apply to DER pilots across the board; the proposed test includes DG as a DER.

> Cost Calculator, which will then be used as inputs in the four standard practice manual tests to determine cost-effectiveness in resource specific proceedings, the avoided costs determined in the Avoided Cost Calculator are the utilities' marginal costs of providing electric service to customers. Those costs can be avoided when the demand for energy decreases because of distributed energy resources, and are, thus, the benefits of using distributed energy resources."[84]

As discussed in section 2.1.2 above, California adopted the SCT as an additional "component to inform the broader framework of tests" in its July 2024 order – includes two values for the social cost of carbon: a Base Social Cost of Carbon of approximately $53 in 2020 and approximately $81 in 2045, and a High Social Cost of Carbon of approximately $155 in 2020 and approximately $249 in 2045.[85]

In **Colorado**, the Xcel/PSCo's BCA valuation strategy also applies to DG, as this is considered an NWA in the state. See the Demand Response – GHG Emissions section for information on how the utility will account for GHG emissions resulting from DG.

In **Maine**, the Distributed Generation Stakeholder Group (DSGS) (a working group formed by the Governor's Energy Office (GEO) in collaboration with the Public Utility Commission (PUC)) leveraged the NSPM process to develop a cost-effectiveness test for Maine's distributed generation programs ("the Maine Test"). As described in their report, "the group decided on a set of benefits to include as part of the Maine Test, which includes utility system impacts and the primary societal impacts of DG. The test does not include all the potential benefits of DG, many of which are difficult to quantify or do not easily lend themselves to inclusion in a traditional BCA framework."[86] Maine used the cost-effectiveness test developed through the DGSG to evaluate different program models and recommend the development of a successor program. The test includes accounting for greenhouse gas emissions limited to CO_2 and NO_x. The benefit is defined as the "avoided societal cost of GHG emissions" brought about by the use of DERs,[87] using the triannual Avoided Energy Supply Components (AESC) study for New England report to determine the full societal value of the avoided GHG emissions.[88] The Maine process then subtracts the value of the RECs to avoid double-counting of the GHG emissions impacts already captured in the REC value.[89] For non-embedded GHG emissions (avoiding the double-counting risk from RGGI participation and RECs throughout the region), the AESC 2021 report finds an avoided cost for NO_X equal to $0.77 per MWh,[90] and recommends using the New York State SCC Guideline values of "$116 (in 2020) to $165 (in 2050) in 2021 dollars per short ton of CO2, and a 15-year levelized value of $128 per short ton."[91]

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test includes GHG emissions impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

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[84] 15 Dec 2022. California Public Utilities Commission. Decision Revising Net Energy Metering Tariff and Subtariffs. Rulemaking 20-08-020. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M499/K921/499921246.PDF. P. 58-59.
[85] Ibid., p. 2.
[86] 6 Jan 2023. Final Report of the Distributed Generation Stakeholder Group. p. 17.
[87] Ibid., p. 61.
[88] Ibid., p. 123.
[89] Ibid., p. 118.
[90] 15 Mar 2021. Avoided Energy Supply Components in New England: 2021 Report. https://www.synapse-energy.com/sites/default/files/AESC_2021_.pdf. p. 200-201.
[91] Ibid., p. 175.

Michigan will account for the societal impact of GHG emissions associated with DG pilots. The PSC has directed that this impact should be monetized, and calculations should include both upstream and downstream emissions associated with the generation, delivery, and use of the fuel being used in the pilot.[92] This impact is defined in the same way as for other DERs: "GHG emissions created by fossil-fueled energy resources." Specific methodologies to quantify the impacts have not yet been determined.

3.1.3 Other Environmental

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test includes other environmental impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

Michigan will account for other environmental impacts in its BCA for DG pilots. The PSC has directed that this impact should be monetized, and quantified if monetization is not possible.[93] Michigan defines this impact as "other air emissions, solid waste, land, water, and other environmental impacts."[94] Specific methodologies to quantify the impacts have not yet been determined.

3.1.4 Public Health

As discussed in section 2.1.4, the **California** SCT includes an air quality adder of $14 per MWh, which "measures the impact of gas generation on human health."[95]

In **Colorado**, Xcel/PSCo's approved BCA quantifies public health using EPA's COBRA tool and marginal emissions from the 2021 ERP data.[96] See the Demand Response – Public Health section for full details on the calculation of this value.

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test includes public health impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

Michigan will account for the public health impacts in its BCA for all DER pilots. The PSC has directed that this impact must be monetized, or quantified if monetization is not possible.[97] Public health impacts are defined in the BCA as health impacts, medical costs, and productivity affected by health.[98] Specific methodologies to quantify the impacts have not yet been determined.

3.1.5 Economic Development and Jobs

> **Note:** See the note in the *Demand Response – Economic Development and Jobs* section above for details regarding how economic impacts and jobs analysis complements BCA results.

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[92] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[93] Ibid., p. 26.
[94] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25
[95] 11 Jul 2024. California Public Utilities Commission. Decision Adopting the Societal Cost Test. Rulemaking 22-22-013. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M535/K822/535822173.PDF. P. 31.
[96] EPA, CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA). https://cobra.epa.gov/
[97] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[98] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25

Maine assessed the economic development and jobs impacts of the proposed DG program, as determined by the DGSG, using "IMPLAN, an industry standard input-output model, to estimate these macroeconomic impacts."[99] IMPLAN maps regional buy-sell relationships to "predict how specific economic changes will impact a given regional economy or estimate the effect of past or existing economic activity," but specifically permits analysts to enter local data for the most detailed and specific information.[100] Specifically, Maine looked at job years (one year of full-time employment), income, and state GDP; and accounted for direct, indirect, and induced impacts, in their BCA assessment.[101]

Maryland's UBCA Work Group recommended that the future Maryland primary cost assessment framework include consideration of economic development and job impacts for all DER programs, but recommended that they not be quantified as part of the cost-effectiveness test to avoid double counting of other cost impacts. Specific methodologies to assess the impacts have not yet been determined.

Michigan will account for the impact on economic development and jobs in its BCA for all DER pilots. The PSC has directed that this impact should be monetized, and quantified if monetization is not possible.[102] This is defined as "increased economic development and job impacts."[103] Specific methodologies to quantify the impacts have not yet been determined.

3.1.6 Energy Security

Maryland's UBCA Work Group recommended that the future Maryland primary cost-effectiveness test includes energy security impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

Michigan will account for energy security impacts of DER pilots in its BCA. The PSC has directed that it be monetized where possible, and quantified if not.[104] This impact is defined as "energy imports and energy independence."[105] Specific methodologies to quantify the impacts have not yet been determined.

3.1.7 Societal Low-Income Impacts / Equity

> **Note:** See the note in section 2.1.7., Demand Response – Societal Low-Income Impacts / Equity above for details regarding how distributional equity analysis complements BCA results.

[99] 6 Jan 2023. Final Report of the Distributed Generation Stakeholder Group. P. 94.
[100] 30 Aug 2023. Dr. Candi Clouse: How IMPLAN Works. https://support.implan.com/hc/en-us/articles/360038285254-How-IMPLAN-Works#:%7E:text=IMPLAN%20is%20an%20I%2DO%20modeling,past%20or%20existing%20economic%20activity
[101] 6 Jan 2023. Final Report of the Distributed Generation Stakeholder Group. P. 52-53.
[102] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[103] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25
[104] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26.
[105] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25

3.2 Host Customer Impacts

Table 5: Accounting for Host Customer Impacts: Distributed Generation							
Energy Impacts	**Measure cost** MD, CO, MI	**Transaction costs** MD	**Inter-connection** MD, CO, MI	**Risk** MD, MI	**Reliability** MI	**Resilience** MD, MI	**Tax Incentives** MD, MI
Non-Energy Impacts	**Asset value** MD, CO	**Transaction costs** MI	**O&M** MD	**Economic well-being** MD	**Comfort** **CO general and DIC adder**	**Health & Safety**	**Satisfaction & Empowerment** MD

Note: Many states which include host customer impacts in their BCA practices do not specify which energy or non-energy impacts they are including or quantifying, and may only reference specific impacts as examples of host customer impacts to include. The above table highlights where specific impacts are mentioned in guidance, but in many cases, the guidance may allow for inclusion of all impacts.

In **Colorado**, Xcel/PSCo's approved BCA explicitly includes measure costs and interconnection impacts for DERs, including DG. Xcel/PSCo also includes general host customer non-USIs and income-qualified and disproportionately impacted communities (DIC) non-USIs.[106] Xcel/PSCo treats DG much in the same manner as DR; see the Demand Response – Host Customer section for a description of the BCA practices for many of these host customer impacts.

One difference between the DG and DR BCA framework is the inclusion of reliability; reliability is included for DR and DS systems, as well as combined DG/DS systems, but not for DG by itself. The reliability impacts are assessed to include:

- Host customer reliability occurs when the installed DER lowers the host customer minutes out (CMO) compared to customers without a DER. Calculations are largely based on bidder inputs for a specific DS or DG installation. Variables include the energy capacity of the storage system, capacity factor for a PV array if present, customer load, and the average annual state of charge for the storage system.[107]
- Xcel/PSC does not apply this impact for installations of generation without storage, since they state there is not significant potential to reduce CMO without storage.

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test include host customer impacts for all DERs; for DG programs, the Work Group identified measure costs, transaction costs, interconnection costs, risk, resilience, tax incentives, asset value, operations & maintenance, economic well-being, and satisfaction/pride as being material and significant; all other impacts were assessed as non-material or not applicable. Specific methodologies to quantify the impacts have not yet been determined.

Michigan includes a comprehensive list of host customer impacts for DER pilots: measure and transaction costs, interconnection fees, risk, reliability, resilience, tax incentives, NEIs for low-income and

[106] 2 May 2022. Distribution System Plan: Hearing Exhibit 101, Attachment ZDP-5-NWA BCA Methodology – Final. Docket No. 22A-0189E. P. 7-8.
[107] Ibid., p. 20-21.

non-low income, and other fuels. [108] The PSC has directed that impacts should be monetized, and quantified if monetization is not possible.[109] Michigan also includes non-energy impacts for low-income and non-low-income; these are defined as "benefits and costs that are separate from energy-related impacts."[110] Specific methodologies to quantify the impacts have not yet been determined.

[108] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 34
[109] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26-27.
[110] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 26.

4. Distributed Storage

Distributed Storage Section Summary:

Societal impacts: Connecticut and Maryland (legacy practice), account for societal non-USIs of DS programs in their BCA practices using metrics and reporting of data, but do not explicitly include them numerically in any cost-effectiveness tests. Maryland has adopted a UBCA framework which includes societal non-USIs, though Maryland has not yet quantified the BCA values. In Colorado, utilities have included quantification of some societal impacts of DS systems in their BCA. Michigan accounts for societal impacts of DER pilot programs and is still determining methods for quantification and monetization.

Host customer impacts: Three states – Connecticut, Maryland, and Colorado – account for some host customer non-USIs of DS programs. Connecticut and Colorado include them in cost-effectiveness testing, while Maryland only requires reporting at this time, though the state has adopted a UBCA framework and is development quantification methods. Michigan accounts for some host customer non-USIs for DER pilots, including DS.

4.1 Societal Impacts

Table 6: Accounting for Societal Impacts: Distributed Storage

Resilience	GHG Emissions	Other Environment	Public Health	Economic Develop./Jobs	Energy Security	Low-Income Societal/Equity
MD, CT, MI	CA, CT, MD*, CO, MI	MD*, ME, MI	CA, MD*, CO, MI	MD, ME, MI	MI	CA, MD*, DC, MI*

4.1.1 Resilience

The **Connecticut** DS program has several objectives set out by the Public Utilities Regulatory Authority (PURA), including increasing resilience for critical facilities, low- to moderate-income (LMI) and marginalized customers, and customers who experience more frequent and longer outages during major storms. The program is to be administered by the Connecticut Green Bank (CGB), with progress monitored via annual metrics reporting and three-year holistic reviews. The program uses the Total Resource Cost Test, Program Administrator Cost Test (Utility Cost Test), Participant Cost Test, Societal Cost Test, and Ratepayer Impact Test.[111]

Although **Maryland** does not currently account for non-USIs in its present BCA for DS programs, the state does require tracking and reporting of certain metrics for informational purposes. Societal level resiliency is framed as grid resiliency in this context in Maryland, and measured as the time to restore from a major outage.[112] The time is to be measured in hours or days, suggesting the scale of the outage is one that would risk customer lives or the normal functioning of day-to-day activities.[113] This

[111] 28 Jul 2021. Final Decision and Appendix A, PURA Investigation into Distribution System Planning of the Electric Distribution Companies – Electric Storage. Docket No. 17-12-03RE03. P. 34.
[112] 15 May 2023. Baltimore Gas & Electric. 2023 Energy Storage Projects Metrics Report. Case no. 9619. P. 14.
[113] 31 Mar 2021. Public Utility Law Judge Division. Submission of the PC 44 Energy Storage Working Group – Docket No. 9619. P. 15.

information is reported to the PSC by their direction, but is not formally included in a BCA at this time; the PSC is actively refining and exploring measurement and quantification of these various impacts. Maryland's UBCA Work Group recommended that the future Maryland primary cost-effectiveness test should include societal resilience impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

Michigan will include societal resilience in its BCA for all DER pilot programs.[114] The Michigan Public Service Commission has recommended monetization and quantification wherever possible, including for resilience.[115] This impact is defined as "resilience impacts beyond those experienced by utilities or host customers (e.g., allowing critical facilities to continue providing services during an outage)." Specific methodologies to quantify the impacts have not yet been determined.

4.1.2 GHG Emissions

As discussed in section 2.1.2 above, **California** adopted the SCT as an additional "component to inform the broader framework of tests" in its July 2024 order – includes two values for the social cost of carbon: a Base Social Cost of Carbon of approximately $53 in 2020 and approximately $81 in 2045, and a High Social Cost of Carbon of approximately $155 in 2020 and approximately $249 in 2045.[116]

In **Colorado**, the Xcel/PSCo's BCA valuation strategy also can apply to DS projects, as this is considered an NWA in the state. The calculation process for GHG impacts is the same for each DER; see the *Demand Response—GHG Emissions* section for information on how the utility will account for GHG emissions reductions resulting from DG.

Connecticut evaluates GHG emissions as Avoided Non-Embedded Emissions within the Societal Cost Test, calculated as "the estimated emissions impacts based on ISO-NE electric-sector emissions rates by season, assuming a $100 per short ton of CO2, net of emissions compliance costs already embedded in avoided energy costs."[117] The state does not account for greenhouse gases beyond CO_2. This is also aligned with the state's Conservation and Load Management (CLM) plan, which is refreshed annually and revised completely every three years. In the 2022-24 CLM, the 15-year value-levelized cost of CO_2 emissions was $0.0482 per kWh based on the 2021 AESC's New England-based marginal abatement cost derived from the electric sector.[118]

Maryland currently accounts for greenhouse gas emissions impacts of DS projects via a step-by-step process for estimating hourly emissions. The most recent PJM emission rates are used for calculating CO_2, NO_x, and SO_2 emissions, and the rates are based on the hourly charging and discharging data of the battery storage system.[119] This information is reported to the PSC only in periodic program update filings,

[114] The proposed test includes DR as a DER.
[115] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26.
[116] Ibid., p. 2.
[117] 28 Jul 2021. Final Decision and Appendix A, PURA Investigation into Distribution System Planning of the Electric Distribution Companies – Electric Storage. Docket No. 17-12-03RE03. P. 30-31.
[118] 1 Nov 2023. Eversource Energy et al. before the Department of Energy and Environmental Protection (DEEP) and the Public Utilities Regulatory Authority (PURA). 2024 Plan Update to Connecticut's 2022-24 Conservation & Load Management Plan. https://app.box.com/s/ojn0ih95n5ghws789sskzsbmou2mymdk P. 49
[119] 15 May 2023. Potomac Electric Company, before the Maryland Public Services Commission. 2023 Energy Storage Projects Metrics Report, In the Matter of the Maryland Energy Storage Pilot Program. Attachment B. Case no. 9619 (ML 302936). https://webpsc.psc.state.md.us/DMS/case/9619. P. 1

and is not formally included in a BCA at this time. Maryland's UBCA Work Group recommended that the future Maryland primary cost-effectiveness test should include GHG emissions impacts for all DER program cost-effectiveness testing; the Work Group assessed that GHG emissions impacts from DS programs are not materially significant in applications today but could be in the future as the grid evolves.

Michigan will account for the societal impacts of GHG emissions from all DER pilot programs. The Michigan Public Service Commission has directed that this impact be monetized and that calculations should include both upstream and downstream emissions associated with the generation, delivery, and use.[120] This impact is defined in the same way as for other DERs: "GHG emissions created by fossil-fueled energy resources." Specific methodologies to quantify the impacts have not yet been determined.

4.1.3 Other Environmental

Maine's Efficiency Maine Trust rules establish that cost-effectiveness testing should include program benefits and costs, including:

> "Non-resource benefits, including customer benefits such as reduced operation and maintenance costs, deferred replacement costs, productivity improvements, economic development benefits and environmental benefits, to the extent such benefits can be reasonably quantified and valued."[121] *[emphasis added]*

The trust is directed to consider programs that "reduce the price of electricity over time for all consumers by reducing or shifting demand for electricity or balancing load, including by the implementation of beneficial electrification and energy storage systems."[122] The Efficiency Maine Trust rules would apply to any DS offerings within their programs; the proposal for program years 2023-2025 included a load shifting initiative to include battery storage.[123]

Maryland's UBCA Work Group recommended that the future Maryland primary cost-effectiveness test includes other environmental impacts for all DER program cost-effectiveness testing; the Work Group assessed that other environmental impacts from DS programs are not materially significant in applications today, but could be in the future as the grid evolves.

Michigan will account for other environmental impacts in its BCA for DER pilots. The PSC has directed that impact should be quantified if monetization is not possible.[124] Michigan defines this impact as "other air emissions, solid waste, land, water, and other environmental impacts."[125] Specific methodologies to quantify the impacts have not yet been determined.

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[120] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[121] Maine Administrative Rules 95-648, *Efficiency Maine Trust*, Chapter 3, Electric Efficiency and Conservation Programs, p. 7-8.
[122] Ibid., p. 5.
[123] Triennial Plan for Fiscal Years 2023-2025, Efficiency Maine Trust, November 29, 2021, https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/ViewDoc.aspx?DocRefId={D1FB2C28-8E6E-4796-A0B6-B6B2D13E4414}&DocExt=pdf&DocName={D1FB2C28-8E6E-4796-A0B6-B6B2D13E4414}.pdf.
[124] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26.
[125] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25

4.1.4 Public Health

As discussed in section 2.1.4, the **California** SCT includes an air quality adder of $14 per MWh, which "measures the impact of gas generation on human health."[126]

Maryland currently calculates the health benefits of DS programs based on reductions in emissions. The public health metric is measured in the dollar value of carbon emissions reduced based on the number of MWhs shifted to off-peak times. The MDPSC must still adopt a calculation method through both the EmPOWER Evaluation Advisory & Energy Storage Working Group's processes. Separately, the filings note that EPA has not yet finalized a public health benefits calculator specific to energy storage that could be used to support the measurement. This information is intended for reporting to MD PSC only, and not formally included in a BCA at this time.[127] Maryland's UBCA Work Group recommended that the future Maryland primary cost-effectiveness test include public health impacts for all DER program cost-effectiveness testing; the Work Group assessed that public health impacts from DS programs are not materially significant in applications today, but could be in the future as the grid evolves.

In **Colorado**, Xcel/PSCo's approved BCA quantifies public health using EPA's COBRA tool and marginal emissions from the 2021 ERP data.[128] See the Demand Response – Public Health section for full details on the calculation of this value for DS.

Michigan will account for the public health impacts of DS pilot programs in its BCA. The PSC has directed quantification if monetization is not possible.[129] Public health impacts are defined in the BCA as health impacts, medical costs, and productivity affected by health.[130] Specific methodologies to quantify the impacts have not yet been determined.

4.1.5 Economic Development and Jobs

> **Note:** See the note in the Demand Response – Economic Development and Jobs section above for details regarding how economic impacts and jobs analysis complements BCA results.

Maine's Efficiency Maine Trust rules establish that cost-effectiveness testing should include program benefits and costs, including:

> "Non-resource benefits, including customer benefits such as reduced operation and maintenance costs, deferred replacement costs, productivity improvements, economic development benefits and environmental benefits, to the extent such benefits can be reasonably quantified and valued."[131] *[emphasis added]*

Maryland's UBCA Work Group recommended that the future Maryland primary cost assessment framework include consideration of economic development and jobs impacts for all DER programs, but

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[126] 11 Jul 2024. California Public Utilities Commission. Decision Adopting the Societal Cost Test. Rulemaking 22-22-013. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M535/K822/535822173.PDF. P. 31.
[127] Ibid., p. 19.
[128] EPA COBRA. https://cobra.epa.gov/
[129] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[130] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25
[131] Maine Administrative Rules 95-648, *Efficiency Maine Trust*, Chapter 3, Electric Efficiency and Conservation Programs, p. 7-8.

recommended that they not be quantified as part of the cost-effectiveness test to avoid double counting of other cost impacts. Specific methodologies to assess the impacts have not yet been determined.

Michigan will account for the impact on economic development and jobs in its BCA for all DER pilots. The PSC has directed that this impact should be monetized, and quantified if monetization is not possible.[132] This is defined as increased economic development and job impacts.[133] Specific methodologies to quantify the impacts have not yet been determined.

4.1.6 Energy Security

Maryland's UBCA Work Group recommended that the future Maryland primary cost-effectiveness test includes energy security impacts for all DER program cost-effectiveness testing; specific methodologies to quantify the impacts have not yet been determined.

Michigan will account for the impact on energy security in the BCA for DER pilots. The PSC has directed that it be monetized where possible, and quantified if not.[134] This impact is defined as "energy imports and energy independence."[135] Specific methodologies to quantify the impacts have not yet been determined.

4.1.7 Low-Income Societal Impacts / Equity

> **Note:** See the note in section 2.1.7, Demand Response – Societal Low-Income Impacts / Equity above for details regarding how distributional equity analysis complements BCA results.

4.2 Host Customer Impacts

Table 7: Accounting for Host Customer Impacts: Distributed Storage

Energy Impacts	**Measure cost** CT, MD, ME, MI	**Transaction costs** CT, MD, ME	**Inter-connection** MI	**Risk** MD, MI	**Reliability** CO, MI	**Resilience** MD, CT, MI	**Tax Incentives** MD, MI
Non-Energy Impacts	**Asset value** CT, MD, ME	**Transaction costs** ME, MI	**O&M** MD, ME	**Economic well-being** MD, ME	**Comfort** **CO general and DIC adder**	**Health & Safety**	**Satisfaction & Empowerment** MD

Note: Many states which include host customer impacts in their BCA practices do not specify which energy or non-energy impacts they are including or quantifying, and may only reference specific impacts as examples of host customer impacts to include. The above table highlights where specific impacts are mentioned in guidance, but in many cases, the guidance may allow for inclusion of all impacts.

[132] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 27.
[133] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25
[134] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26.
[135] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 25

In **Colorado**, Xcel/PSCo's approved BCA explicitly includes measure costs, interconnection, and reliability. Xcel/PSCo also includes general host customer non-USIs and income-qualified and disproportionately impacted communities (DIC) non-USIs.[136] Xcel/PSCo treats DG much in the same manner as DR; see the Demand Response – Host Customer Impacts section for a description of the BCA practices for many of these host customer impacts. Specific to DS programs:

- Host customer reliability occurs when the installed DER lowers the host customer minutes out (CMO) compared to customers without a DER.[137] Calculations are largely based on bidder inputs for a specific DS or DG installation. Variables include the energy capacity of the storage system, capacity factor for a PV array if present, customer load, and the average annual state of charge for the storage system.[138]

Connecticut's DS program has a goal of improving resilience for low-income and marginalized customers and customers who experience frequent outages, but the accounting method has not yet been shared in public filings. The CT PURA requires the Participant Cost Test to be run on all programs, and that test includes a calculation of "net avoided outage benefits" for participants, but the specific methodology for valuing the enhanced participant resiliency is not included in the public filings. The PCT also includes participant bill savings, tax incentives, and asset value in the assessment. PURA cited all five costs tests as "vitally important and informative," while noting that not all benefits can be captured by the tests, including the "added resilience for underserved communities and small businesses."[139]

Maine's Efficiency Maine Trust also established that cost-effectiveness testing should include customer benefits and costs, including:

> "Non-resource benefits, including customer benefits such as reduced operation and maintenance costs, deferred replacement costs, productivity improvements, economic development benefits and environmental benefits, to the extent such benefits can be reasonably quantified and valued…
>
> Ongoing customer costs, including costs such as increased operation and maintenance costs, reduced productivity, and lost economic development opportunities, to the extent such costs can be reasonably quantified and valued."[140] *[emphasis added]*

Maryland currently accounts for some host customer impacts of distributed storage through metrics reporting, but not as part of a formal BCA. Maryland's Energy Storage Pilot Program is developing freestanding distributed storage installations, not paired with new renewables installations; the installations are separate from customer homes, although the PSC has included "customer resiliency" in the list of metrics to be tracked in association with the project. In this case, customer resiliency is measured in minutes of energy provided while the grid is unavailable. There is currently no dollar value

[136] 2 May 2022. Distribution System Plan: Hearing Exhibit 101, Attachment ZDP-5-NWA BCA Methodology – Final. Docket No. 22A-0189E. P. 7-8.
[137] Ibid., p. 20.
[138] Ibid., p. 21.
[139] 28 Jul 2021. Connecticut Public Utility Regulatory Authority. Final Decision and Appendix A, PURA Investigation into Distribution System Planning of the Electric Distribution Companies – Electric Storage. Docket No. 17-12-03RE03. www.dpuc.state.ct.us/2NDDOCKCURR.NSF/8e6fc37a54110e3e852576190052b64d/6991ef77ba07bae185258752007994f7?OpenDocument p. 34.
[140] Maine Administrative Rules 95-648, *Efficiency Maine Trust*, Chapter 3, Electric Efficiency and Conservation Programs, p. 7-8.

attributed to those minutes. The storage working group recommended that utilities be directed to research the best way to value customer resiliency.[141]

Maryland also tracks the transaction and interconnection costs associated with these distributed storage installations, but there is no clear determination on how they are being factored into decisions about the programs. Both transaction costs and interconnection costs are measured in dollars.[142]

Maryland's UBCA Work Group recommended that the Maryland primary cost-effectiveness test include host customer impacts for all DERs; for DS programs, the work group identified measure costs, transaction costs, risk, resilience, tax incentives, asset value, operations & maintenance, economic well-being, and empowerment as being material and significant; all other impacts were assessed as non-material or not applicable. Specific methodologies to quantify the impacts have not yet been determined.

Michigan includes a comprehensive list of host customer impacts for DER pilots: measure and transaction costs, interconnection fees, risk, reliability, resilience, tax incentives, NEIs for low-income and non-low income, and other fuels.[143] The PSC has directed that these impacts should be monetized, and quantified if monetization is not possible.[144] Michigan also includes non-energy impacts for low-income and non-low-income; these are defined as "benefits and costs that are separate from energy-related impacts."[145] Specific methodologies to quantify the impacts have not yet been determined.

[141] 15 May 2023. Potomac Electric Company, before the Maryland Public Services Commission. 2023 Energy Storage Projects Metrics Report, In the Matter of the Maryland Energy Storage Pilot Program. Case no. 9619 (ML 302936). https://webpsc.psc.state.md.us/DMS/case/9619 Attachment A, p. 2

[142] Ibid., p. 1; and Baltimore Gas & Electric, 2023 Energy Storage Projects Metrics Report, p. 30.

[143] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 34

[144] 12 Oct 2023. Provides guidance on the substance of the benefit cost analysis and announces a future collaborative planned for 2024 for the purpose of developing a jurisdictional specific societal cost test and utility cost test. P. 26-27.

[145] 1 Feb 2023. Requirements and Further Guidance on Benefit-Cost Analyses for Pilot Initiatives. P. 26.

5. Other Regulatory Contexts (beyond BCA)

In addition to the formal BCA practices and metrics documented in the previous sections, numerous states are evaluating non-USIs of DERs outside the bounds of a formal BCA. These practices demonstrate a willingness and interest in valuing non-USIs, even where no formal methodology or quantified process is available. These practices can include general "consideration" of specified factors by regulators, bonus adders in request for proposal processes, or other preferential regulatory practices without seeking to formalize inclusion in a BCA. Illustrative examples of such practices are detailed below.

5.1 Societal Impacts

In **Minnesota**, Xcel Energy requires a pollinator habitat scorecard assessment form to be submitted with RFP bid packages for solar and solar-plus-storage projects (Other Environmental impact). This indicates some value being placed on pollinators and their habitats, but it remains unclear how the results of this habitat assessment will be included in the evaluation of the RFP and this element is not part of a formal cost-effectiveness test instituted by the regulatory body.[146]

Maine does not have a formal cost-effectiveness testing practice in place for other environmental impacts of distributed generation; however, a working group report on a proposed successor program identified siting of DG as an environmental and environmental justice issue. The proposed program includes preferential evaluation of proposed DG projects using degraded landscapes, with RFPs evaluated at 85% of their bid price while still receiving their full bid price if chosen.[147]

In **Washington** state, Puget Sound Energy (PSE) submitted its first Clean Energy Implementation Plan (CEIP) in 2021 to implement the Clean Energy Transformation Act (CETA). Commission rules require each plan to "*include proposed or updated customer benefit indicators and associated weighting factors including, at a minimum, one or more customer benefit indicators associated with energy benefits, nonenergy benefits, reduction of burdens, public health, environment, reduction in cost, reduction in risk, energy security, and resiliency,"*[148] but does not establish a formal cost-effectiveness test for any of the plan elements. The PSE CEIP includes proposals for DS, DG, and DR programs, and identified customer benefit indicators and metrics to include societal impacts (environmental, GHG reduction, public health, economic development and jobs, resilience, and energy security) and host-customer impacts (comfort, participant cost reduction, and resiliency). PSE states that they will incorporate these benefits into upcoming RFPs for DR, DG, and DS procurements. The Commission approved the plan, subject to certain conditions, including updates to the methodology for quantifying GHG emissions.[149]

In **Virginia,** the 2020 Environmental Justice Act is a major influence in some regulatory decisions, though it does not specifically establish a cost-effectiveness test or metric for GHG emissions. The State

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[146] 15 Sept 2023. Xcel Energy, before the Minnesota Public Utilities Commission. Staff Briefing Papers. In the Matter of Xcel Energy's 2022 Solar RFP Portfolio. Docket 22-403. https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={40AB998A-0000-C215-9D05-D71320C3C072}&documentTitle=20239-198955-01

[147] 6 Jan 2023. Final Report of the Distributed Generation Stakeholder Group. P. 31, p. 33.

[148] Washington Administrative Code WAC 480-100-640(4)(c), https://apps.leg.wa.gov/wac/default.aspx?cite=480-100

[149] 6 Jun 2023. Puget Sound Energy, before the Washington Utilities and Transportation Commission. Final Order 08 Approving Clean Energy Implementation Plan Subject to Conditions, Appendix A to Order 08 List of Conditions – PSE CEIP. Docket no. UE-210795. https://apiproxy.utc.wa.gov/cases/GetDocument?docID=1015&year=2021&docketNumber=210795

Corporation Commission (SCC) has nevertheless specifically cited the Act as an influence on permitting decisions for a DS project. The commission found that the proposed project does not inhibit the goals of the legislation because it "will not emit harmful air pollutants or greenhouse gases and will reduce dependence on traditional energy generating facilities such as coal, natural gas, and oil-fired power plants."[150] The commission reads these laws to apply to the cases before them, introducing the evaluation of GHG impacts into decision-making processes at the SCC well before the development of a BCA.

In **North Carolina,** Duke Energy qualitatively referenced avoided environmental impacts in justifying a proposed DG microgrid development, but the benefit was not formally included in a BCA. The avoidance of potential future environmental disturbance is cited as a specific additional impact in favor of the project, stating that "once the [m]icrogrid is in full operation, distribution upgrades will be deferred, which will mitigate disturbance within the Hot Springs feeder's approximately 10-mile right-of-way that runs through the Great Smoky Mountains and Pisgah National Forest."[151]

5.2 Host Customer Impacts

Vermont's Green Mountain Power has instituted a battery storage demand response program using batteries to develop host customer and utility reliability and resilience capacity through domestic energy storage deployment. The utility's filings before the commission highlight the "personal reliability" benefit for customers[152] and consumer-facing marketing even highlights the host customer reliability and personal emissions reduction benefits of enrollment in the program.[153]

[150] 7 Jun 2021. Michael Cizenski, staff to the Virginia State Corporation Commission. Staff Report on Application of Shockoe Solar, LLC for a Permit to Construct and Operate an Energy Storage Facility. PUR-2021-00041. https://www.scc.virginia.gov/docketsearch/DOCS/51gs01!.PDF p. 8-11.
[151] 26 Mar 2021. Duke Energy Progress LLC, before the North Carolina Utilities Commission. DEP's Interconnection Agreement for Hot Springs Microgrid Project – Public. Docket no. E-2 SUB 1185. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=ed457652-0c12-4bfd-a614-bcd1c8337aff p. 6-7.
[152] 6 Mar 2019. Green Mountain Power, before the Vermont Public Utility Commission. 2018 Integrated Resources Plan – Chapter 2 through Chapter 5. Docket no. 18-4166-PET. https://epsb.vermont.gov/?q=downloadfile/345939/137286
[153] 15 Sep 2023. Green Mountain Power website: Home Energy Storage, Tesla Powerwall. https://www.greenmountainpower.com/rebates-programs/home-energy-storage/powerwall/

6. Conclusions and Key Findings

1) States often have not formalized BCA practices for including non-USIs of DR, DG, and DS systems. Even fewer states use consistent practices to evaluate non-USIs across all DERs.

The research identified wide variation in BCA practices for the reviewed DERs – though DR programs are sometimes considered as part of EE programs and may be subject to some formalized and consistent BCA practices. In addition to states where BCA practices have been formalized, many other states likely include consideration of non-USI elements in project approvals, tariffs, and other DER proceedings. In many cases, BCA practices may be embedded in individual rate cases, making them difficult to identify and posing challenges for consistent methodologies across utilities and DERs. This lack of formalized BCA practices makes it difficult to compare results across different utility filings, and likely results in incomplete consideration of the full range of societal and host-customer costs and benefits for DERs.

Of the states which do include non-USIs for DERs in BCA practices, there are often inconsistent practices across DERs. A few states are an exception, where regulatory proceedings have led to the development of a consistent BCA test to be applied to all DERs, as well as in different regulatory contexts. Maryland adopted a UBCA framework which will address all DERs consistently (to the extent practicable), and Michigan is also in the process of developing and instituting a consistent BCA for all DER pilot programs, though specific valuation practices in both states remain in process. The District of Columbia is also developing a BCA practice to apply to all DERs, but this also remains in work. These emerging examples of UBCA practices can provide lessons and guidance to other states seeking to implement uniform BCA practices across DERs.

2) GHG emissions reduction is the most frequent societal impact across states.

GHG emissions impacts are the most common societal impact included in DER cost-effectiveness tests, and the most commonly quantified. The District of Columbia and at least six states -- California, Colorado, Connecticut, Maryland, Maine, and New Jersey – include GHG emissions in consideration of one or more DERs. GHG emissions tend to be quantifiable based on easily accessible data, and they often align with existing and clearly defined policy goals, making these impacts easier to include in BCA practices. Most of the states quantifying GHG impacts focus on a specific subset of air pollutants, of which CO_2 is the most common. States like New Jersey and DC have more expansive pollutant lists, including SO_2, NO_x, CH_4, and others. DC's list will continue expanding as it works through the development process for its BCA.

Some states conceptualize public health as improvements to air quality more broadly, such as Colorado and Illinois, but include GHGs in their lists of air pollutants. States must be careful to ensure they avoid double counting public health and GHG emissions impacts when quantifying their BCA.

3) Many states are seeking information on non-USIs of programs but have not incorporated them into formal decision-making.

Many states require some consideration of non-USIs in other regulatory contexts, without formalizing or quantifying the results in a BCA. Reporting of metrics generally requires less effort to quantify or monetize and allows the parties to develop regular reporting schedules and procedures before there are consequences for programs. The requirements for data submission and metrics demonstrate current

concern by utilities and regulators to develop methods to quantify non-USIs of DERs. States which are collecting metrics and data on non-USIs without currently quantifying them will be well positioned to apply BCA practices as further examples of quantification methods develop.

4) Quantification of societal and host customer non-USIs remains a challenge, even after determining that such impacts should be included in a BCA.

The NSPM multi-step process to develop a jurisdiction's primary test includes ensuring that "benefits and costs are properly addressed," including relevant and materials impacts even if hard to quantify.[154] While there are a range of options for quantifying non-USIs, this process takes time as it requires prioritizing which impact categories to address and when, determine whether to either research or study the impact, use an existing tool to calculate, or develop a reasonable proxy adder, as well as determine the time and resources needed to develop impact value streams. [155] Michigan, Maryland, and the District of Columbia have determined what impacts are to be included in their 'jurisdiction specific tests' developed using the NSPM, and will be addressing the impact methodology stage in 2025, which will likely be staggered over time as methods and values are developed through stakeholder processes.

6.1 Areas for Future Research

There are myriad approaches to measuring and evaluating non-USIs of DERs being utilized across the country, and these processes continue to evolve rapidly across many ongoing regulatory proceedings. As this effort was not a comprehensive evaluation, there are extensive opportunities for future research, such as:

- **Additional Research on EV and BE Practices:** This review focused on DR, DS, and DG BCA practices; current practices for EV and BE non-USIs would be worth exploring further. Both DERs are likely to become more important as EVs and home electrification become more prevalent, and as tax credits and other incentives for EVs and heat pumps continue to spur expansion.
- **Further Review of DR and EE BCA Alignment:** Many states include DR programs as part of their EE programs, but it is not clear the extent to which the BCA processes utilize the same or different non-USIs and quantification methods. Further research could explore ways in which states have utilized common BCA practices across DR and EE programs as a guide for further consistency across DERs.
- **Comprehensive Tracking of BCA for non-USIs of DERs:** This research identified selected states including non-USIs of DERs in their BCA practices, but did not comprehensively review and track all 50 states across all DERs. While the status of BCAs for the full range of DERs is still evolving, and is not sufficiently robust to develop a comprehensive database such as the DSP for EE, this

[154] National Energy Screening Project, National Standard Practice Manual (NSPM), www.nationalenergyscreeningproject.org/national-standard-practice-manual/. P. 58.
[155] New Jersey uses adders for low income and non-energy benefits, noting that "the studies needed to develop values can be costly, time consuming, and difficult for hard to quantify impacts. Adders provide a simpler method to account for NEIs in the absence of specific evaluations that precisely measure their values. See Oct 2023. New Jersey Board of Public Utilities. Triennium 2, New Jersey Cost Test (NJCT). See https://njcleanenergy.com/files/file/BPU/2023/Market%20Analysis%20Baseline%20Studies/QO23030150-%20Tri2%20EE1%20+%20EE2-%20Order%20Attch%20F-%20NJCT.pdf. P.14

may be an area for future research as more states deploy BCA for DERs and look for best practices and lessons learned from other states.

- **Policy Direction Best Practices**: Many of these programs and pilots are responsive to legislation directing the establishment of DER programs and strategies to meet goals and objectives that are specific to non-USIs; other policy direction also stems from regulatory proceedings undertaken by public utility commissions, sometimes in the absence of specific top-level policy guidance. The NSPM includes a core principle to align BCA tests with articulated energy policies to ensure the policy goals and objectives can be met, though policy direction can sometimes be ambiguous and may not clearly articulate specific impacts for consideration. Future research could focus on identifying policy best practices, for both state legislatures and utility commissions, in how policy direction addresses inclusion and accounting for non-USIs.
- **Sharing Best Practices for Quantifying non-USIs of DERs:** Research on methods for quantifying non-USIs of DERs will be important to inform ongoing proceedings and encourage uniform BCA practices consistent with the NSPM. As states increasingly develop and implement cost-effectiveness tests for DERs and the body of states quantitatively accounting for non-USIs grows larger, the methodologies for valuing non-USIs will become more comprehensive and consistent across state programs.

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Abbreviations

ACC: Avoided Cost Calculator

BCA: benefit-cost analysis

DER: distributed energy resources

DG: distributed generation

DIC: disproportionately impacted communities

DR: demand response

DS: distributed storage

DSP: Database of Screening Practices

EE: energy efficiency

EV: electric vehicle

GHG: greenhouse gas

JST: jurisdiction-specific test

NSPM: National Standard Practice Manual

Non-USI: non-utility system impact

NWA: non-wires alternative

PDR: peak demand reduction

PSC: public service commission (also, state corporation commission, SCC; public utility commission, PUC)

RGGI: Regional Greenhouse Gas Initiative

SCC: Social Cost of Carbon

SCT: Societal Cost Test

TRC: Total Resource Cost test

UBCA: unified benefit-cost analysis