New Terrain: Accounting for Community Benefits in Power System Planning

Scott Reeves, Energy Futures Group
Elizabeth Font, Resource Innovations
Bachir Salpagarov, Portland General Electric

ABSTRACT

Historically, utility integrated resource planning (IRP) has prioritized least-cost decision making, where resources with lower levelized costs are selected while non-energy attributes may be acknowledged but rarely influence portfolio decisions. Although demand side management (DSM) has long considered non-energy impacts (NEIs), several recent developments have shifted its emphasis and importance. First, emerging energy products (e.g., time-varying rates, demand response, and DERs) offer distinct non-energy benefits at scale. Second, growing emphasis on equity has prioritized benefits to underserved and environmental justice communities. Third, decarbonization policies increasingly mandate broader investment in clean energy solutions. However, considering NEIs only at the program design or evaluation stage, after IRP has determined resource investment levels, systematically undervalues these impacts in planning decisions, particularly disadvantaging DSM resources.

This report presents a case study of a utility required to incorporate community benefits into its IRP process. Through research and stakeholder engagement with local community-based organizations, we identified 30 community benefit indicators (CBIs) reflecting quantitative and monetizable metrics spanning five priority areas: economic impacts, environmental impacts, energy equity, health and community wellbeing, and reliability and resiliency. We developed a framework for integrating different CBI types into IRP analysis based on the ability to easily monetize impacts, which was subsequently incorporated by the utility in its IRP filing. As utilities face increasing demand growth and pressure to develop equitable, clean energy solutions, this framework demonstrates how community benefits can be systematically incorporated into power system planning to enable more holistic valuation of resources that optimize both system and societal outcomes.

Introduction

In January 2022, the Oregon Public Utility Commission (OPUC) staff launched an investigation (docket UM 2225) into Clean Energy Plans (CEP) required pursuant to Oregon HB 2021.[1] As of August 2022, the UM 2225 Workplan Update provided an overview of the stakeholder process regarding the CEP, including guidance on the development of community benefit indicators (CBIs) for use in the first IRP/CEP filings.[2] Here, OPUC staff recommended:

---

[1] OPUC. 2022. *HB 2021 Investigation into Clean Energy Plans: Investigation Launch Announcement*. (Docket UM 2225).
[2] OPUC. 2022. *Investigation into Clean Energy Plans. Work Plan Update and Straw Proposals.* (Docket UM 2225).

- Portland General Electric (PGE) develop a set of interim community benefit and impact metrics in coordination with representatives of communities impacted by the plan, including environmental justice (EJ) communities.
- CBIs should be incorporated into portfolio scoring as part of the IRP process to help inform the selection of the preferred portfolio.
- CBIs should be quantifiable and measurable, and cover the following five topic areas:
    - Resilience (system and community)
    - Health and community well-being
    - Environmental impacts
    - Energy equity (distributional and intergenerational equity)
    - Economic Impacts

OPUC Order 22-390 issued guidance on CBIs and their application to the IRP, which established the five CBI categories (noted above) and included feedback from energy advocates regarding a set of 20 CBIs to be considered.[3] It also defined three types of CBIs that should be included in its CEP:

- 1 | Portfolio CBIs (pCBIs) – CBIs corresponding to various energy resources considered within the portfolio planning process, with CBIs including both monetizable benefits and quantitative metrics.
- 2 | Resource CBIs (rCBIs) – include a subset of CBIs reflecting specific benefits associated with individual community-based renewable energy (CBRE) systems[4]
- 3 | Information CBIs (iCBIs) – quantitative metrics used to assess and track the impacts of existing resources or the existing portfolio within tracked communities (e.g., the percentage of program participants above/below income-eligibility threshold)

In 2023, PGE filed its first CEP as part of the IRP, including a set of CBIs responsive to these three CBI categories. OPUC staff provided recommendations to improve quantification and inclusion of CBIs in future IPR/CEP filings.[5] Beginning in 2024, Cadeo conducted a study to provide a more comprehensive analysis to include CBIs in the IRP process prior to the 2025 IRP filing.

The next sections present the methodology applied, the framework developed, and the limitations found within the analysis. The research provides options for practical application of CBIs and the ability to compare associated benefits across portfolios and resource types. Further research is needed to improve the framework and effectively account for all the benefits of different potential actions in PGE's jurisdiction.

---

[3] OPUC. 2022. *Near-Term Guidance on Roadmap Acknowledgement and Community Lens Analysis the First Clean Energy Plans*. (Docket UM 2225). Order No. 22-390.
[4] Note, definition of rCBIs in the current research is expanded to monetizable CBIs applicable to any resource being considering within IRP, not only CBREs, and included as a component of the levelized cost for a given resource.
[5] OPUC Staff. 2023. *Initial Comments. PGE 2023 Clean Energy Plan and Integrated Resource Plan*. (Docket No. LC 80); OPUC Staff. 2023. *Opening Comments. PGE 2023 Clean Energy Plan and Integrated Resource Plan*. (Docket No. LC 80).

Background

Utilities have historically conducted IRPs as an exercise of considering the least cost of procurement for meeting their power planning needs. Typically, these studies consider a variety of different forecasts and scenarios, which are evaluated based on levelized cost metrics and have not traditionally considered what are commonly considered to be “benefits.” Within IRPs, utilities determine power planning needs based on cost, risk, and availability of resources on the supply side, involving power generation facilities (e.g., natural gas turbines) and renewables (e.g., utility-scale wind and solar), and the demand side, including customer-sited resources such as energy efficiency (EE), demand response (DR), and distributed energy resources (DERs).

DSM programs are typically evaluated using cost-effectiveness tests that weigh a defined set of costs and benefits to estimate benefit-cost ratios for different cost-test perspectives. When these demand-side resources are incorporated into IRP modeling, however, they are typically represented within resource bundles using a levelized cost metric, which is a cost per unit of energy ($/kW) spread over an assumed time horizon, so they can be compared consistently against supply-side options. The broader benefits associated with DSM programs have historically been left out of IRPs, which are structured to optimize for least cost.

In Oregon, the OPUC has directed utilities to incorporate community benefits into their IRP processes — a significant departure from the traditional least-cost focus. With no established blueprint, utilities and their stakeholders are now responsible for solving this novel challenge, which includes defining, identifying, and categorizing community benefits, and developing a framework for integrating them into resource planning studies.

Study Approach

In advance of the 2025 IRP, Cadeo conducted a CBI study based on the following steps. This report summarizes several of these steps, including proposed CBI applications for IRP and alternative approaches considered.

- ***1 | Develop Draft CBI List*** – develop an initial list of CBIs based on literature review of community-based metrics and stakeholder priorities.
- ***2 | Catalog CBIs and Map to Resources*** – characterize CBIs by various factors, including category, monetizable vs. trackable metrics, and resource applicability.
- ***3 | Identify Monetizable CBIs and Valuation Approaches*** – research valuation methods and benchmark approaches from other jurisdictions for a subset of monetizable CBIs.
- ***4 | Identify CBIs for IRP application*** – develop a framework for including a subset of CBIs in PGE’s IRP process.
- ***5 | Stakeholder Engagement*** – present research methods and preliminary findings to, and solicited early feedback from, PGE’s IRP Roundtable, Oregon Public Utility Commission (OPUC) staff, and the Community Benefit and Impact Advisory Group (CBIAG).

CBI Development and Categorization

As a first step, Cadeo conducted a literature review to explore the landscape of community benefit impacts, from which the team would develop a unique list for PGE. Sources reviewed in this research include:

- OPUC dockets, including stakeholder feedback reflective of local community-based organizations (CBOs),
- Past PGE and Energy Trust of Oregon (ETO) research focused on non-energy impacts,
- National sources providing an inventory of non-energy benefits from societal and customer perspectives (e.g., the National Standard Practice Manual [NSPM], etc.), and
- Other engagement efforts and utility dockets yielding jurisdiction-specific CBI lists (e.g., Washington Utility Clean Energy Implementation Plans).

Based on the literature review, we identified an initial set of 30 CBIs, illustrated in Figure 1 below. This graphic presents these CBIs along with the five OPUC CBI categories (Economic Impacts, Energy Equity, Health and Community Wellbeing, Resilience/Reliability, and Environmental) and contains the 20 CBIs previously identified by the Stakeholder CBI Proposal.[6] Individual CBIs are not exclusive to one category but instead often fall into more than one category. For example, a reduction in greenhouse gas emissions reflects an environmental impact that also has a direct impact on public health.

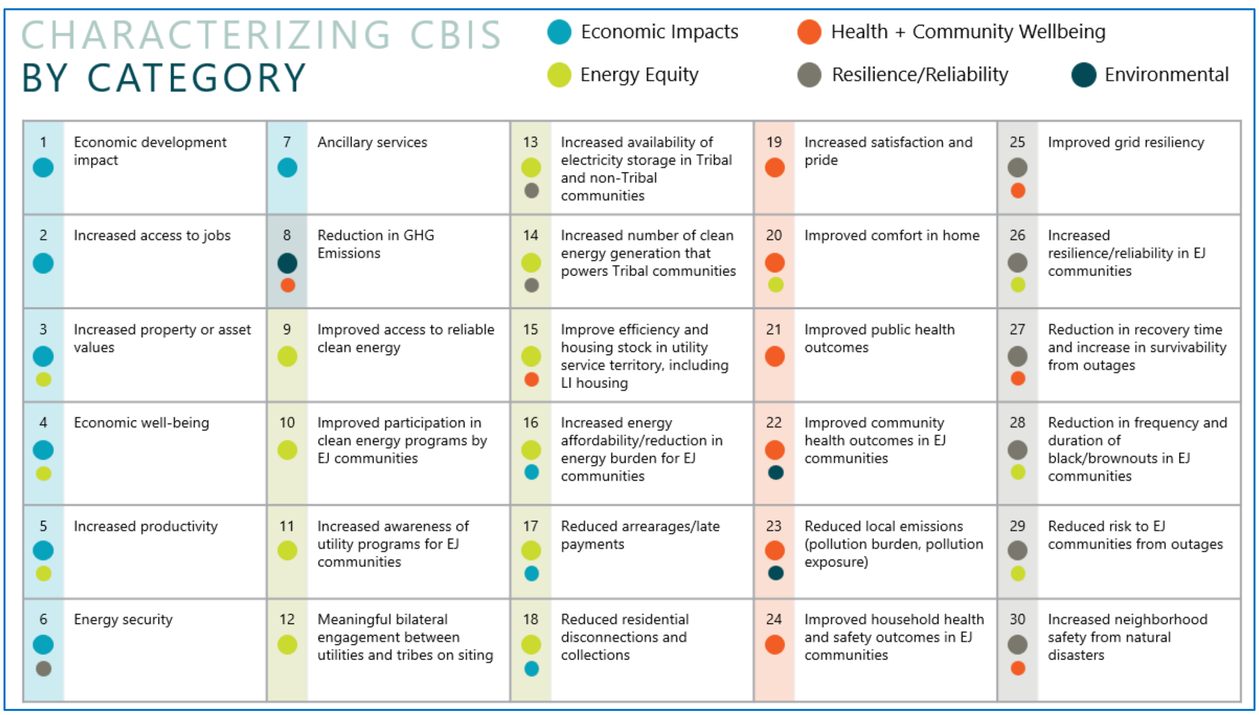

Figure 1. Draft CBI list characterized by OPUC Category. *Source:* Cadeo 2025.

Mapping CBIs to Energy Resources

The relationship between individual CBIs and energy resources represents a critical distinction in our framework. Each resource's potential community benefits will vary based on multiple factors – the following represent some of these factors and examples relevant to various resources:

[6] OPUC. 2022. *Near-Term Guidance on Roadmap Acknowledgement and Community Lens Analysis the First Clean Energy Plans*. (Docket UM 2225). Order No. 22-390.

- ***Program Design*** – ex. Asset location and ownership of resources (such as solar or batteries).
- ***Measure Attributes*** – ex. Comfort benefits associated with a subset of energy efficiency measures (i.e., shell and HVAC).
- ***Location*** – related both to customer location (e.g., within EJ communities) and grid attributes (e.g., savings occurring in areas of higher grid constraints or need for T&D upgrades).
- ***Delivery Strategy*** – ex. Programs targeting marketing or deployment to a specific geographic area.
- ***Savings Potential*** – ex. The relative size of community benefit may vary based on the scale of savings potential.

Figure 2 illustrates how different CBI groups correlate with various resource types. This mapping shows which CBIs are likely to result from specific resources, accounting for certain resource characteristics and assumptions about programmatic delivery.

CBI Type	EE	DR	CBRE PV	CBRE Microgrid	CBRE Hydro	Supply Side Gen.
Economic Impacts (development/jobs)	●	●	●	●	●	●
Property Value	●		●	●		
Economic Wellbeing (affordability, arrearages, disconnections)	●	● TOU	●			
Productivity	●	● Batteries	●	●	●	
Public Health	●	● Batteries		●	●	●
Household Health / Safety	●		●			
Comfort	●					
Resilience (reliability, risk)	●	●	●	●	●	●

● Economic Impacts ● Health + Community Wellbeing
● Energy Equity ● Resilience/Reliability ● Environmental

Figure 2. Mapping CBIs to energy resource type. *Source:* Cadeo 2025.

Understanding how CBIs map to energy resources is key to delivering programs and portfolios that effectively achieve community benefit priorities. The realization of achieving the goals associated with CBIs is directly linked to the savings potential of a given resource, whether those resources are selected within the preferred IRP portfolio, and how effective the design and deployment of these resources or programs are in optimizing individual or combinations of CBIs.

Proposed CBI Applications in IRP

To support PGE's IRP filing, Cadeo evaluated several approaches for incorporating CBIs into resource planning. In collaboration with PGE, we selected an approach that:

- 1 | ***Aligned with specific IRP parameters***, including constraints regarding where in the modeling process CBIs can be incorporated, established resource bundles, and definitions of pCBIs and rCBIs.
- 2 | ***Balanced different types of benefits***, including (a) those with sufficient data for monetization across all applicable resource types, and (b) those that are either non-monetizable (based on trackable metrics, like location of delivery) or are potentially monetizable, but currently require proxy approaches due to limited data or variations across applicable resource types.

Integration of CBIs into the IRP relied on two pathways (rCBI vs. pCBI), which informed the method in which a given CBI is recognized within the planning model.

- ***rCBI pathway*** – CBIs that have sufficient data to be both monetized and estimated for all applicable resources. These benefits are incorporated for individual energy resources in the form of a discount to the levelized cost and occur at an early stage of the IRP modeling sequence in resource development. Given the units in which these benefits are estimated in the source data (e.g., dollar per participant, percentage of energy savings or benefits), they have been converted for applicability in the IPR (i.e., $/kW).
- ***pCBI pathway*** – Other CBIs that are more difficult to quantify, monetize, or do not have sufficient data for all eligible resources are then applied as proxy values at the backend of the IRP modeling sequence after resource bundles are established. While rCBIs allow for a reduction of the levelized cost, pCBIs serve as a scorecard-based approach, allowing for assignment of CBI and posterior comparison across portfolios.

Resource-specific applicability must be carefully considered when accounting for CBIs. The research team has provided detailed applicability requirements for all CBIs applied across either rCBI or pCBI pathways as they relate to specific resource types or bundles. These requirements relate to factors including measure characteristics, program design, geographic targeting, and baseline conditions. For example, comfort benefits often relate to specific efficiency measures, such as weatherization or HVAC improvements, but would be inappropriate for another resource without that causal relationship (e.g., rooftop solar). IRP resource bundles for energy efficiency will include various technologies, for which comfort benefits only apply to a subset of the measures bundled under efficiency resources. Additionally, some CBIs focused on equity outcomes require geographic considerations, such as savings occurring within locations designated as environmental justice or tribal communities. Other CBIs aimed at achieving customer-level economic impacts related to energy affordability will be contingent upon resources that can achieve higher levels of bill savings.

Going forward, all CBIs proposed for IRP application have the potential to be quantified and monetized in the future. There is value for broader discussion with stakeholders regarding refining both (1) the discrete set of CBIs to include and (2) the methods of valuation to consider in future IRPs. Ideally, there is consistency across the state in how utilities are defining approaches for IRP application and valuation, along with education and awareness regarding the complexity of this exercise. Furthermore, given the lack of primary research, there are opportunities to conduct state-level or jurisdiction-specific studies to estimate regional values, allowing research to be scoped with more transparency and around priorities for which there is consensus.

Applied Approach

The research team provided PGE an Excel template with details assigning CBIs to specific IRP resources for each rCBI and pCB categories. PGE provided a list of the unique resources being considered in the current IRP, including CBREs (e.g., in-conduit hydropower, microgrids, solar), DSM (e.g., EE, DR), and supply-side options (e.g., wind, batteries, hydrogen). For each CBI, we considered the relevant IRP resource bundles and associated applicability assumptions necessary to account for the associated community benefits through the selection of a given resource.

To assign CBIs using the pCBI path, we defined five pCBI categories to reflect OPUC categories for economic impacts, energy equity, health and community well-being, resilience, and environmental impacts. For each pCBI category there is a subset of associated monetizable CBIs. When assigning proxy values to individual resources and resource bundles for a given pCBI category, we considered whether a given resource (accounting for a unique set of applicability assumptions) has the potential to yield any of the underlying community benefits associated with that CBI category.

In this exercise, we assumed the following underlying monetizable CBIs to be associated with each pCBI category:

- ***pCBI1: Economic*** – economic development, increased access to jobs, economic well-being, increased property value, increased productivity
- ***pCBI2: Energy Equity*** – improved access, awareness, and participation in clean energy programs by environmental justice and tribal communities; improved affordability; increased efficiency of hosing stock; reduced arrearages and disconnections
- ***pCBI3: Health and Community Well-Being*** – increased comfort; improved public health outcomes; reduced local emissions; improved home health and safety (including indoor air quality)
- ***pCBI4: Resiliency / Reliability*** – improved grid resiliency, including reduced recovery time, outage frequency, and associated cost/hardship of power disruption
- ***pCBI5: Environmental*** – reduced greenhouse gas emissions, including CO2 and criteria pollutants.

For proxy values, we implemented a binary approach (1 or 0) rather than a weighted scale across CBIs and resources (considered as an alternative approach). While weighted scoring could offer more nuance, it presents several challenges, including subjectivity in assigning CBI weights by different resource bundles, data gaps for specific CBIs/resource combinations, and complexity in normalizing weights across different CBI types. Alternative methods considered involved weighting approaches to establishing a proxy value for an rCBI levelized cost adjustment; however, we recommend exploring this method further through stakeholder workshops, as well as including rate impact assessments to understand the equity implications of how these investments impact different customer segments.

Figure 4 provides lists related to the CBIs flagged for each of the pCBI categories associated with a given resource bundle.[7]

[7] A similar process was applied for supply-side resources, for which impacts are primary economic and environmental.

Resource Bundle	pBCI1: Economic Impacts	pCBI2: Energy Equity	pCBI3: Health and Community Wellbeing	pCBI4: Resilience / Reliability	pCBI5: Environmental Impacts
CBRE_hydro	✓	✓ Applicable with regard to access if these are targeted to EJ and tribal communities; applicable with regard to affordability if the resource can result in bill reduction		✓ Applicable for CBREs that provide redundancy (spare capacity and backup systems)	✓ Applicable if the alternative was fossil fuel back up or baseload
CBRE_micro			✓ Applicable if microgrid offsets the use of a diesel generator or similar.		
CBRE_solar					
Curtail_Sum and Win				✓ Applicable for resources that provide resourcefulness (system flexibility) - assume all DR resources apply	✓ Applicable if resource is dispatched to offset fossil fuel generation within PGE territory or through market purchases
EE_1-5			✓ Applicable for some EE measures and delivery, such as whole-home retrofits, involving weatherization, ventilation improvement, replacement of old equipment/appliance; some EE delivery, such as LI weatherization programs, will include budget for specific health/safety measures, such as remediating home health hazards, installing smoke/CO detectors, and other repairs that contribute to improved health/safety outcomes.	✓ Applicable for EE measures that yield resilience benefits (ride-through via weatherization) or foster flexible load resources (DR enabled HVAC/equipment)	✓ Applicable if EE is offsetting load served by dispatching fossil fuel generation

Figure 4. CBI categorization for pCBIs within the PGE IRP – demand-side resources and community-based renewable projects. *Source:* Cadeo 2025.

For rCBIs, Cadeo identified and adapted findings from benchmarked research to quantify percentage adjustments to reduce the levelized cost of capacity ($/kW) for several resource bundles. Figure 5 provides a list of rCBIs included in the IRP application, showing the percentage reduction to levelized cost, benefit metric and source, and then applicability assumptions detailing the conditions under which a given benefit should be considered.

CBI	Resource Category	CBI % Reduction to Levelized Cost	CBI Benefit Metric	Source	IRP Application Assumptions
Property Value	CBRE Solar	**269%**	6.8% increase in property value	Zillow 2024	Assumes 5 kW residential solar install; applicable to behind the meter projects; dependent on ownership structure (i.e., assumes value occurring at time of sale for home/property owner)
Property Value	Curtailable (summer, winter)	**64%**	2.3% increase in property value	Adapted from Zillow 2024 study, assuming 1/3 of the value of solar for a standalone battery in the residential sector.	Assumes applicability for 5kW/13.5kWh residential battery, behind the meter installation and 1 cycle per day
Property Value	EE	**45%**	0.5% increase in property	LBNL 2022	Applicable for home performance projects (e.g., HPwES, whole-house weatherization); reflecting Residential study.
Comfort (Shell)	EE	**10.6% LI; 7.2% non-LI**	$62/project (LI); $42/project (non-LI)	EmPOWER Maryland (2023)	Applicable for projects with shell measures (insulation, air sealing); benefit accrue annually over measure lifetime
Comfort (HVAC)	EE	**5%**	Average of $30/project (3%) and $100/project (7%)	MA Residential NEI Study (2023); EmPOWER Maryland (2023)	Applicable for HVAC replacements using heat pumps; benefits accrue annually over measure lifetime; assuming 2000 kWh annually, 18 year EUL, and project cost of $15,000.

Figure 5. CBI valuation for rCBIs within the PGE IRP. *Source:* Cadeo 2025.

As noted, community benefits used in the rCBI approach required two key conditions: (1) access to existing research with adaptable, quantified benefits, and (2) available data across all applicable resources for a given benefit. This consistency requirement is key for maintaining balanced resource comparisons, as including monetized benefits with the levelized costs for only some eligible resources would create an uneven evaluation framework. Our approach prioritized consistency, meaning we only applied CBIs through the rCBI pathway when complete data existed across all applicable resources.

Alternative Approach Options Considered

Before establishing the protocol for how rCBIs and pCBIs are incorporated into the IRP, the study team proposed four distinct approaches to calculate and account for CBIs in IRP applications. These proposed options included:

- **1 | Create composite CBI indicator** to highlight portfolios with higher versus lower levels of associated CBIs (general, non-specific).
- **2 | Create individual CBI indicator** to flag portfolios with higher versus lower associated potential for a given CBI.
- **3 | Translate monetizable CBIs** from existing studies and apply to a limited set of specific resource types as a negative levelized cost.
- **4 | Composite proxy approach** to assign a maximum percentage reduction of a levelized cost for a bundle of applicable CBIs of a given resource.

Option 1 – Create Composite CBI Indicator

This approach quantifies the average number of CBIs associated with each resource (or resource bundle) in the portfolio, weighted by the number of megawatts of each resource (or resource bundle). This weighted average pCBI value can be compared across different portfolios; the one with the highest pCBI value indicates greater benefits to the community.

Figure 6 provides an example comparing two portfolios, each summing to a total of 100 MWs (only for illustrative purposes). The first portfolio (P1) is more heavily weighted to supply-side resources, while the second portfolio (P2) has higher levels of CBREs and demand-side resources. The CBI count column provides a value representing the number of associated CBIs – in this case, we have estimated a count of CBIs by resource, with additional detail for this calculation provided in Figure 7. As shown, while each portfolio provides an equal amount of capacity, the calculated CBI Weight value (using a weighted average of MWs by CBI Count) shows that a relative CBI amount is higher for P2 (4.75) compared to P1 (2.36).

Resource Name	P1 (MW)	P2 (MW)	CBI Count /resource
CBREs			
CBRE Solar	2	10	6
CBRE Solar Microgrid	2	5	5
CBRE Small Hydro	2	5	4
DSM			
Energy Efficiency	2	30	8
Demand Response	2	10	5
Supply Side			
Battery (2hr-24hr)	10	5	2
In-state Wind	20	10	2
In-state Solar	15	10	2
Out-of-state Solar	20	0	2
Solar-Storage Hybrid	5	5	2
Combustion Turbine	20	10	2
MW TOTAL	***100***	***100***	
CBI Score – Overall CBI Indicator	***2.36***	***4.75***	

Figure 6. Example: CBI Approach for IRP Application – Option 1: Portfolio Scoring. *Source:* Cadeo 2025.

Resource Name	Total CBI Count	Comfort	Econ Impact	Econ Wellbeing	Health / Safety	Public Health	Productivity	Property Value	Resilience
CBREs									
CBRE Solar	6		1	1	1		1	1	1
CBRE Solar Microgrid	5		1			1	1	1	1
CBRE Small Hydro	4		1			1	1		1
DSM									
Energy Efficiency	8	1	1	1	1	1	1	1	1
Demand Response	5		1	1		1	1		1
Supply Side									
Battery (2hr-24hr)	2		1						1
In-state Wind	2		1						1
In-state Solar	2		1						1
Out-of-state Solar	2		1						1
Solar-Storage Hybrid	2		1						1
Combustion Turbine	2		1						1

Figure 7. Example: CBI Approach for IRP Application – Option 1: CBI Count by Resource. *Source:* Cadeo 2025.

Selecting a portfolio of resources with higher counts of CBIs will be the best indicator of those portfolios likely to derive actual community benefits in practice. This option provides a simplistic approach to consider portfolios based on the count of CBIs for a given resource, giving preference to portfolios with resources where MWs are concentrated in those with a higher number of associated CBIs. This option also expands from the prior CEP in considering CBIs for resources beyond only CBREs and considering a broader set of individual CBIs. However, a drawback of this approach is that it does not account for differences between CBIs, such as perceived community value or priority, or differences in the relative benefit across different CBIs.

Option 2 – Create Individual CBI Indicator

An alternative option is to utilize a similar approach that allows for the identification of portfolios that maximize for a given CBI by estimating a CBI-specific portfolio score. Like Option 1, Option 2 identifies whether a resource is associated with an individual CBI and then estimates a weighted CBI value for a portfolio. The result is a CBI-specific portfolio value that allows for comparison between portfolios based on individual CBIs.

Figure 9 provides an example of Option 2 for two individual CBIs (Economic Wellbeing and Property Value). Here, there are similarly two portfolios with a mix of resource capacity, each summing to 100 MW. To estimate the CBI score for Economic Wellbeing, we calculate a CBI score based on the weighted capacity for those resources with the associated CBI (i.e., EE, DR, CBRE Solar). As shown, P2 has a higher CBI score (0.50) compared to P1 (0.06), due to P2 having higher MWs of EE, DR, and CBRE Solar. Similarly, a CBI score for property value shows P2 with a higher score than P1, reflective of a portfolio with a higher amount of resources (in MWs) with potential to increase property value.

Note, it is likely that not all the capacity for a given resource will have attributes necessary for yielding the CBI outcomes. For example, resources impacting Economic Wellbeing will be those that maximize bill savings or target a specific customer segment. In practice, it will be important to account for the portion of a bundle that is oriented at achieving a specific CBI outcome. For example, if a quarter of the energy efficiency bundle is expected to derive impacts associated with Economic Wellbeing, the CBI indicator could be changed from 1 to 0.25. The same principle also applies for Option 1 above.

Resource Name	P1 (MW)	P2 (MW)	CBI: Econ Wellbeing	CBI: Property Value
CBREs				
CBRE Solar	2	10	1	1
CBRE Solar Microgrid	2	5		1
CBRE Small Hydro	2	5		
DSM				
Energy Efficiency	2	30	1	1
Demand Response	2	10	1	
Supply Side				
Battery (2hr-24hr)	10	5		
In-state Wind	20	10		
In-state Solar	15	10		
Out-of-state Solar	20	0		
Solar-Storage Hybrid	5	5		
Combustion Turbine	20	10		
MW TOTAL	***100***	***100***		
CBI Score: Econ Wellbeing	***0.06***	***0.50***		
CBI Score: Property Value	***0.06***	***0.45***		

Figure 9. Example: CBI Approach for IRP Application – Option 2: Portfolio Scoring. *Source:* Cadeo 2025.

An advantage of this approach is that scoring for individual CBIs allows flagging portfolios that maximize a given CBI. For example, if there were several portfolios with similar general CBI score (as noted in Option 1), this approach would allow differentiation of portfolios that maximize individual CBIs, some of which may have higher priority reflecting stakeholders' and community priorities. Limitations of this Option are associated with some CBIs being applicable to a limited set of resources, such as property value being associated with energy efficiency and behind-the-meter applications of solar and battery storage. While this method provides an opportunity to prioritize areas of importance to the community, it doesn't optimize for a set of CBIs, and instead highlights portfolios with higher weight on a specific priority area.

Option 3 – Translate Monetizable CBIs

The objective of this Option is to discount the benefit value from the cost of the resource directly. To this end, we identify NEI studies that provide valuation of benefits (often for individual energy resources), translate the study-specific benefit value (e.g., \$/participant, % energy benefit adder) into a \$/kW, and then discount the CBI benefit from the IRP's levelized cost of a given resource. This approach is also consistent with rCBI applications for the IRP ultimately selected.

The advantage of this Option is that it allows for an explicit quantification, valuation, and inclusion of benefits in portfolio selection. Incorporating benefit values by directly reducing the levelized cost of a resource ensures consideration of monetizable benefits during portfolio selection. As a result of this approach, the portfolios with more benefits will be competitive against alternatives. Ideally, the selected least-cost portfolio will be the one that includes the most benefits to the customers. Additionally, this approach limits the subjectivity of assigning weights to CBIs or determining the level of CBI impact of different resources on a more qualitative approach. Alternatively, this Option faces some limitations, including the following:

- 1 | ***Inclusion of benefits resulting in negative resource costs***. While IRP has historically been an exercise of considering least cost for procurement and has not included traditional benefits, there is precedent for IRP modeling to account for a transmission and distribution deferral value for resources like DR as a negative levelized cost. Under Option 3, the translation of some CBIs into a $/kWh could easily result in benefits exceeding total resource cost. The implication is that a set of resources with net negative levelized costs have a sufficient set of underlying benefits that they should be selected in any IRP. However, those costs will still need to be borne by ratepayers and the preferred portfolio accounting for CBIs may be one that is not truly least cost from a procurement perspective. A separate rate impact assessment would help to provide perspective on how these portfolios may affect different customer segments and identify any rate-based adjustments regarding how to fund the portfolio.
- 2 | ***Research limitations impacting application across resources***. As noted, most of the non-energy impact research we identified is focused on energy efficiency, with limited research on a broader range of energy resources like demand response or battery storage. Thus, adjusting levelized costs for one resource but not for others that also yield a given benefit creates inconsistencies, which limit the use of this option to only CBIs that have valuation data across all relevant resources.
- 3 | ***CBI impact dependent on composition of resource bundles***. CBI impact will vary by resource bundle composition. Some CBIs may be associated with a subset of end-use measures or programs under EE or DR resource bundles. For example, comfort benefits are associated with insulation and HVAC measures within the EE portfolio, yet the IRP considers several bundles of EE with varying levels of savings associated with those end uses. In PGE IRP, there is a single bundle for Curtailable resources that includes all types of DR, including direct load control of devices, managed charging, and time of use pricing – each of which has a different set of applicable CBIs.
- 4 | ***Data variation in secondary sources***. There are a range of secondary sources that have used different approaches across different geographies and customer segments to quantify and monetize a given CBI. Given a range of values, it is difficult to align on which could be considered the "correct" value to use for PGE. There is value in a stakeholder engagement process or regulatory guidance to (1) establish key policy priorities for the PGE or state-level jurisdiction, and (2) methods or metrics to use for valuing a given CBI for a given resource going forward. As part of this process, we encourage alignment on a jurisdiction-specific cost test, as described in the NSPM, to establish a set of non-energy or community benefits to be included. Consider conducting jurisdiction-specific research to quantify and monetize the value of given CBIs that reflect local conditions and preferences. This process will increase the legitimacy of the selection and valuation of CBIs across different applications.

Option 4 – Composite Proxy Approach

Based on some of the limitations of Option 3, we had considered an Option 4 approach that creates a composite score across CBIs for a given resource and establishes a cap on the cumulative CBI benefit. This approach intends to continue inclusion of all applicable CBIs for a given resource, while setting a maximum threshold and creating a relative score for this adjustment across resources. This is effectively establishing a proxy value for a composite set of applicable CBIs. This proxy value in percentage terms can then be applied at the point of resource valuation as a cost adjustment, discounting it from the resource levelized cost (similar to Option 3).

Figure 10 provides an example illustrating a few scenarios by which PGE can customize this composite approach. We developed these scenarios as examples to show different versions of an Option 4 approach – ultimately, PGE (and its stakeholders) would need to select a single scenario for Option 4 and make decisions regarding key factors, such as the maximum CBI threshold (e.g., 30% used in the example below), how to establish tiered scoring (see scenario 2) and the priority weighting of different CBIs (see scenario 3).

CBIs / Scenario	EE	DR	CBRE PV	CBRE MG	CBRE HY	Utility Scale: Batteries	Utility Scale: Renewables	Utility Scale: FF Gen	CBI Priority
Scenario 1: Weight by Count									
Count of CBIs	8	3	5	5	4	3	2	1	
Pct of Max CBI Value	**100%**	**38%**	**63%**	**63%**	**50%**	**38%**	**25%**	**13%**	
Proxy CBI Score	**30%**	**11%**	**19%**	**19%**	**15%**	**11%**	**8%**	**4%**	
Scenario 2: Weight by CBI Sum									
Property Value	1	0	1	1	0	0	0	0	5
Economic Impacts	1.5	0.5	1	1	1	1	1	1	1
Econ Well-Being	1	1	1	0	0	0	0	0	4
Productivity	1	0.5	1	1.5	1.5	0	0	0	2
Public Health	1.5	0	0	0.5	0.5	1	1	0	5
Household H&S	1.5	0	0	0	0	0	0	0	4
Comfort	1.5	0	0	0	0	0	0	0	3
Resilience / Reliability	1	1.5	1	1.5	1.5	1.5	0	0	1
Sum of CBIs Impact Values	***10***	***3.5***	***5***	***5.5***	***4.5***	***3.5***	***2***	***1***	
Pct of Max CBI Value	**100%**	**35%**	**50%**	**55%**	**45%**	**35%**	**20%**	**10%**	
Proxy CBI Score	**30%**	**11%**	**15%**	**17%**	**14%**	**11%**	**6%**	**3.0%**	
Scenario 3: Weight by CBI Value + Priority									
Sum of CBI Impact + Priority Weight	***31.5***	***7***	***13***	***13***	***8***	***7.5***	***6***	***1***	
Pct of Max CBI Value	**100%**	**22%**	**41%**	**41%**	**25%**	**24%**	**19%**	**3%**	
Proxy CBI Score	**30%**	**7%**	**12%**	**12%**	**8%**	**7%**	**6%**	**1.0%**	

Figure 10. Example: CBI Approach for IRP Application – Option 4: Portfolio Scoring. *Source:* Cadeo 2025.

Scenario 1 presents a simplistic approach to develop a proxy value based on the count of applicable CBIs and establishing a maximum CBI value, which could then be applied as an adjustment to the levelized cost of a given resource. In this example, we have capped the proxy value at 30%, consistent with maximum percentage adders found in the literature. As shown, energy efficiency has the highest CBI count (8) and receives 100% of the CBI value, which translates to the cap of 30%. Other resources with varying levels of CBIs receive a weighted adjustment based on the relative count of CBIs. Again, as noted above, it will be important for the count of any individual CBI to be further adjusted based on the total applicability of the resource capacity to achieve a given CBI (e.g., if 25% of EE MWs are associated with the Economic Wellbeing, the count for that CBI could be adjusted accordingly as 0.25 rather than 1.0).

Scenario 2 presents a similar approach to estimating a proxy value, though it uses a tiered ranking based on CBI impacts rather than a simple flag (1/0) to designate an associated level of CBIs for a given resource. For example, several resources may have the potential to yield Economic Impacts (e.g., job creation), but some will have a higher impact than others. In our example, we have assigned a ranking of high (1.5), medium (1.0), and low (0.5) tiers of CBI impact. The scale of the ranking could be structured in many ways. The objective is to reflect the relative impact of a given CBI and how the associated magnitude of that impact varies across individual resources (or resource bundles). In the example of Economic Impacts, EE is shown to have a higher value (1.5) compared to DR (0.5) due to increased potential for jobs created through administration and program delivery, as well as induced economic effects through disposable income through bill savings. Note that these values have been developed purely for illustrative purposes and actual values would need to be developed using a more rigorous framework. Similar to Scenario 1, a maximum threshold is established (30%) and the CBI count is used to create a relative CBI proxy score.

Scenario 3 leverages the tiered CBI impact values of Scenario 2, with the addition of a CBI priority weight (shown in the far-right column in Table 9). Here, we have assigned priority values that may reflect policy objectives of stakeholders or regulatory guidance (again, purely illustrative for this example), which can then be used to weigh the relative importance of a given CBI in determining the final score. In this example, we have assigned CBIs of Public Health and Property Value as those with the highest priority, which in turn weights resources with higher impact values of those CBIs at slightly higher levels.

Regardless of the scenario selected under Option 4, the establishment of an upper limit is consistent with other proxy approaches for applying non-energy impacts (either individual or a composite mix) to benefit cost analyses. Additionally, there is simplicity in creating a single CBI value for a resource that represents a range of applicable CBIs. However, the normalization and capping of CBI values might undermine the actual, quantified impact of CBIs that demonstrate higher benefits.

In summary, there are a variety of pathways to value and consider CBIs within power system planning. Several tradeoffs between approaches, additional research requirements, and opportunities for regulatory guidance need to be considered in selecting a path forward.

References

ACEEE. 2019. *ACEEE State Policy Toolkit: Guidance on Measuring the Economic Development Benefits of Energy Efficiency*. https://www.aceee.org/sites/default/files/Jobs%20Toolkit%203-8-19.pdf

Cadmus. 2023. *Empower Maryland Limited-Income Energy Efficiency Programs Evaluation Report*. Prepared for Maryland Department of Housing and Community Development.

Efficiency Vermont. 2021. *Analysis of State Approaches to Cost-Effectiveness Testing*. Analaysis_of_State_Approaches_to_Cost-Effectiveness_Testing.pdf

EmPOWER MD. 2023. *EmPOWER BCA Cost Benefit Summary 08.14.2023: Avoided Arrearage Financing Costs - Limited Income Programs.* 2023.

LBNL. 2024. *Distributional Equity Analysis for Energy Efficiency and Other Distributed Energy Resources – A Practical Guide*. May. https://eta-publications.lbl.gov/sites/default/files/bto-distributed-equity-analysis-guide_may2024.pdf

NEEP (Northeast Energy Efficiency Partnership). 2017. *Non-Energy Impacts Approaches and Values: an Examination of the Northeast, Mid-Atlantic, and Beyond*. Non-Energy Impacts Approaches and Values: an Examination of the Northeast, Mid-Atlantic, and Beyond

NESP (National Energy Screening Project). 2020. *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources.* August. https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-24-2020.pdf.

NMR Group, and Three[3], DNV. 2023. *Residential Heat Pump NEIs Study (MA21X21-E-RHPNEI)*. July. https://ma-eeac.org/wp-content/uploads/MA21X21-E-RHPNEI_Residential-Heat-Pump-NEIs-Study-Final-Report_2023.07.21.pdf

OPUC (Oregon Public Utility Commission). 2022. *HB 2021 Investigation into Clean Energy Plans: Investigation Launch Announcement*. (Docket UM 2225). January 11. https://edocs.puc.state.or.us/efdocs/HAA/um2225haa142050.pdf

OPUC. 2022. *Investigation into Clean Energy Plans. Work Plan Update and Straw Proposals.* (Docket UM 2225). August 9. https://edocs.puc.state.or.us/efdocs/HAH/um2225hah11736.pdf

OPUC. 2022. *Near-Term Guidance on Roadmap Acknowledgement and Community Lens Analysis the First Clean Energy Plans*. (Docket UM 2225). Order No. 22-390. October 25. https://apps.puc.state.or.us/orders/2022ords/22-390.pdf

OPUC Staff. 2023. *Initial Comments. PGE 2023 Clean Energy Plan and Integrated Resource Plan.* (Docket No. LC 80). May 4. https://edocs.puc.state.or.us/efdocs/HAC/lc80hac10830.pdf

OPUC Staff. 2023. *Opening Comments. PGE 2023 Clean Energy Plan and Integrated Resource Plan*. (Docket No. LC 80). July 27. https://edocs.puc.state.or.us/efdocs/HAC/lc80hac114559.pdf

OPUC. 2024. *PGE 2023 Clean Energy Plan and Integrated Resource Plan*. Order No. 24-096. April 18. https://apps.puc.state.or.us/orders/2024ords/24-096.pdf

SolarReviews. 2024. *Homes with Solar Sell for 6.8% More [2024 Zillow Data Study]*. https://www.solarreviews.com/blog/solar-home-value-report

Tetra Tech. 2018. *Non-Energy Impact Framework Study Report*. Submitted to Massachusetts Program Administrators. January. https://ma-eeac.org/wp-content/uploads/NEI-Framework-Study-Report.pdf

Zillow. 2019. *Homes With Solar Panels Sell for 4.1% More.* https://www.zillow.com/research/solar-panels-house-sell-more-23798/