A recording of the June 2, 2022 Introduction to Community Benefits Workshop is available at:

https://oregonpuc.granicus.com/MediaPlayer.php?view_id=2&clip_id=962

UM 2225 Investigation Into Clean Energy Plans

Introduction to Community Benefits Workshop

June 2, 2022

Logistics

Thank you for joining us today!

- For discussion and comments, use "Raise Hand“ button to get in the queue; if joined by phone press *9
- Include your affiliation in your Zoom name
- Say your name and affiliation before speaking
- Engage with the main dialogue
- Move around and take care of yourself as needed

Meeting Protocols

Introductions in the chat

- Name
- Organization
- Favorite thing about community-based resources

Honor the agenda and strive to stay on topic

Provide a balance of speaking time

Listen to understand and ask questions to clarify

Stay engaged and be open about your perspective and experience

Address issues and questions - focus on substance of comments without attacking others

Bring concerns and ideas up for discussion at the earliest point in the process

Meeting Objectives

- Begin developing a shared understanding of Non-Energy Impacts (NEIs) of clean energy resources in planning context
- Start building a common base from which to discuss which benefits to consider and how to quantify and how to integrate into Clean Energy Plan analysis and decision making
- Identify areas for further learning and discussion

Agenda

*Pacific Time

Oregon Public Utility Commission

Welcome (1:00pm)

National Perspectives (1:10 – 2:05 pm)

Steve Schiller, Lawrence Berkeley National Laboratory
Elaine Prause, Regulatory Assistance Project
Juliet Homer, Pacific Northwest National Laboratory

BREAK (2:05-2:15 pm)

Oregon Perspectives (2:15 – 3:30 pm)

Colin McConnaha, DEQ
Sarah Hall, OPUC
Angela Long, PGE
Erik Anderson, PAC

Wrap up discussion (3:30 - 4:00 pm)

Oregon Public Utility Commission

National Perspectives

Considering Non-Energy Impacts in Clean Energy Plans

Steve Schiller, LBNL

ELECTRICITY MARKETS & POLICY

BERKELEY LAB

Considering Non-Energy Impacts in Clean Energy Plans

Community-Based Renewables, Efficiency, and Other Distributed Energy Resources

Presented by Steve Schiller

Berkeley Lab Senior Advisor/Affiliate

Oregon Public Utility Commission

Community Lens Workshop

June 2, 2022

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

Berkeley Lab – Electricity Markets and Policy Department

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

Technical Assistance to PUCs

- Berkeley Lab provides technical assistance to PUCs with funding from the U.S. Department of Energy.
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Some of the materials in this presentation are from research and products prepared for E4TheFuture's National Energy Screening Project, including the National Standard Practice Manual. We appreciate the sharing of this information.
https://www.nationalenergyscreeningproject.org

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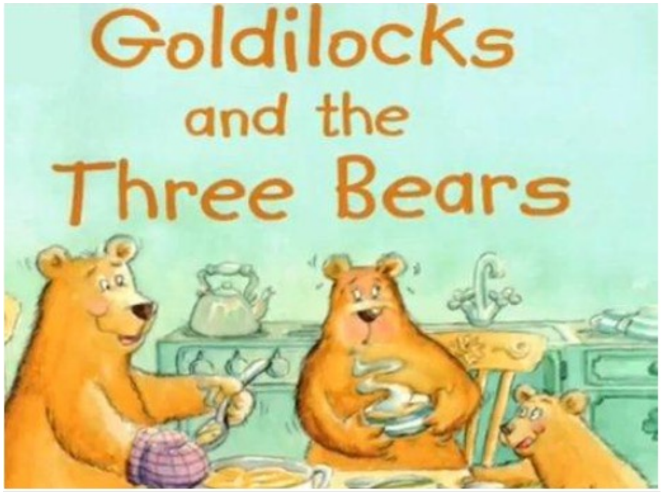
Topics

- Resource Options and Benefit-Cost Analysis (BCA) Concepts and Principles
- Non-Energy Impacts (NEIs)
  - Definition of NEIs
  - NEI categories
  - Importance of NEIs for BCA
- Determining NEI values
- Examples: NEI Calculation Methods and Values
- Summary of Key Points

Resource Options and Benefit-Cost Analysis Concepts and Principles

Resource Options Analysis

- Don't have too many resources
- Don't have too few resources
- Have "just the right amount" of resources



The "right amount" means not only the quantity developed, but the timing of their development and the mix (type) of resources for providing energy, capacity, and ancillary services with consideration of Oregon policy mandates – from resilience to public health – as well as risk management.

Adapted from Tom Eckman

Resource Planning - Overall BCA Context

- Utility investments should:
  - Align with their jurisdiction's policies, goals and regulations
  - Are cost-effective
- While various methods can be used to determine cost-effectiveness, the basic concept is to **compare the monetized impacts** of different resource options – using tools from standardized tests to integrated resource plans (IRPs).
- Traditionally, policy and program impacts have been categorized into three groupings of costs and benefits: **Utility System, Participant**, and **Societal.**

Utility System Impacts *examples*	**Participant Impacts** *examples*	**Societal Impacts** *examples*
Avoided generation, transmission and distribution costs	Contractor costs	Pollution reduction and public health improvement
Financial incentives and program administrative costs	Energy cost reductions	Increased economic development (jobs)
Improved energy system reliability and resilience	Improved comfort, health, and reliability/resilience	Poverty alleviation, environmental justice

Non-Utility Impacts – importance referenced in HB 2021

BCA is Not a "One-Time" Thing.

It is an ongoing process, providing feedback for improvement.

Use Cases	Target Audiences	Time Horizons
Planning	PUC, utilities, grid operator	Years ahead
Implementation	Utilities, grid operator, aggregators	Days ahead to 5 minutes ahead
Evaluation	PUC, utilities, grid operator, aggregators	Historic to near real time

Figure source: EPA 2018.

National Energy Screening Project (NESP) Resources

Documents for BCA of Distributed Energy Resources

- NESP is a stakeholder organization that is open to all organizations and individuals with an interest in working collaboratively to improve cost-effectiveness screening practices for distributed energy resources (DERs).
- NESP work is funded by E4TheFuture and in part by U.S. Department of Energy.

https://nationalenergyscreeningproject.org/

- Products include:

National Standard Practice Manual (NSPM) for DERs (2020)

Framework for cost-effectiveness assessment of DERs. The manual offers a set of policy-neutral, non-biased principles, concepts, and methodologies to support single- and multi-DER BCA.

Database of State Screening Practices (regularly updated — last update April 1, 2021)

Information for 52 jurisdictions (50 states, District of Columbia, and Puerto Rico)

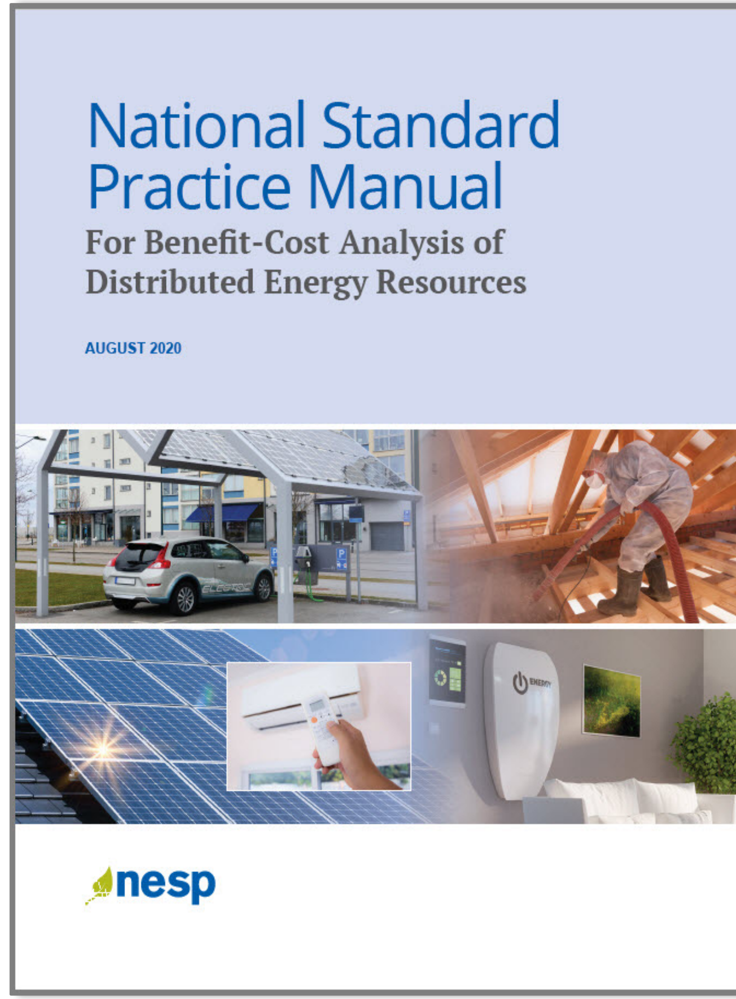
Methods, Tools and Resources (2022)

Handbook for Quantifying Distributed Energy Resource Impacts for Benefit-Cost Analysis

Case Studies (2022)

BCA Principles – from NSPM

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



Principle #1 – Treating All Resources Consistently Across the Planning Continuum

- Bulk Power System Planning
  - Integrated resource planning
  - Transmission planning
  - ISO/RTO planning
- Distribution Planning
  - Distribution reliability
  - Grid modernization
  - Non-wires alternatives
- Distributed Energy Resources (DER) Planning
  - Renewables (including community-based)
  - Energy efficiency
  - Demand Response/Flexibility
  - Storage

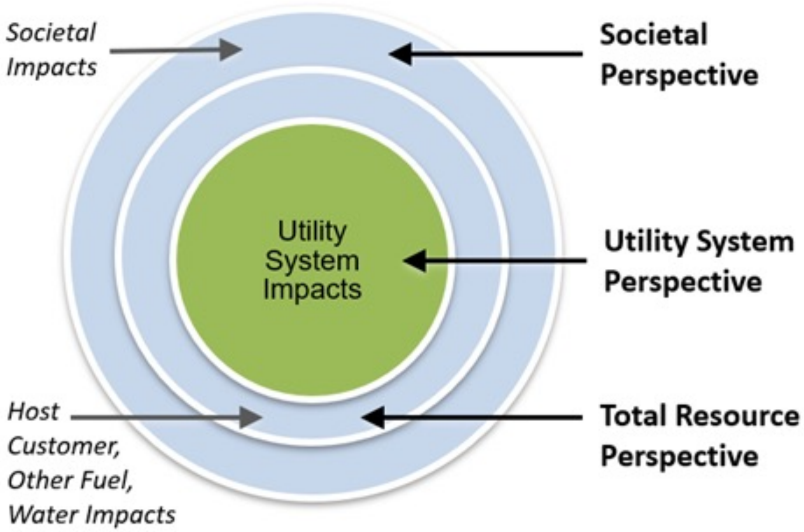
Consistent application of BCA principles, concepts and impacts applied across all resources

BCA is about answering the fundamental question: “As compared to what?”

Also see Eckman et al. 2020 and resources for the NARUC/NASEO Task Force on Comprehensive Electricity Planning: https://www.naruc.org/taskforce/

Principle #2 – Aligning BCA With Oregon Policies
The "Regulatory Perspective"

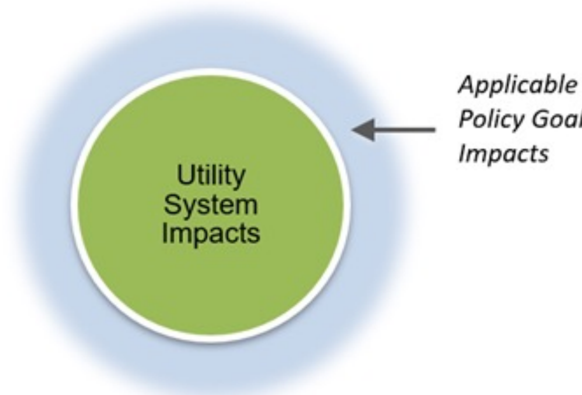
Traditional Perspectives



- Three perspectives define the scope of impacts to include in the most common traditional cost-effectiveness tests.

Jurisdiction Specific Test

Regulatory Perspective



- Perspective of public utility commissions, legislators, muni/coop boards, public power authorities, and other relevant decision-makers.
- Accounts for utility system plus impacts relevant to a jurisdiction's applicable policy goals (which may or may not include host customer impacts).
- Can align with one of the traditional test perspectives, but not necessarily.

Principle #4 – Account For Relevant, Material Impacts

- Cost-effectiveness tests should include all relevant (according to applicable policy goals) material impacts, including those that are difficult to quantify or monetize.
  - *Relevant* impacts are those defined by utility system benefits and costs and any non-utility system impacts (or NEIs) identified based on applicable policy goals.
  - *Material* impacts are those that are expected to be of sufficient magnitude to affect the result of a BCA. If an impact is determined to be immaterial, it should be noted in the BCA reporting.
- Using best available information to approximate hard-to-quantify impacts, or accounting for impacts qualitatively, is preferable to assuming that those benefits or costs do not exist or have no value.
- Methods to quantitatively or qualitatively include these impacts are discussed later in this presentation and the cited references.

It is better to use the best available approximation for a relevant, material impact than to assume it does not exist or that its value is zero — i.e., avoid errors of omission as well as errors of commission.

This presentation emphasizes 3 of the 8 NSPM BCA principles as ones most related to the NEI topic, but of course all 8 are important.

Non-Energy Impacts

Defining Non-Energy Impacts

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

Efficiency, Renewables, and Other DER Energy and Non-Energy Impacts (health and economic examples)

Figure I-2: The Multiple Benefits of Energy Efficiency and Renewable Energy

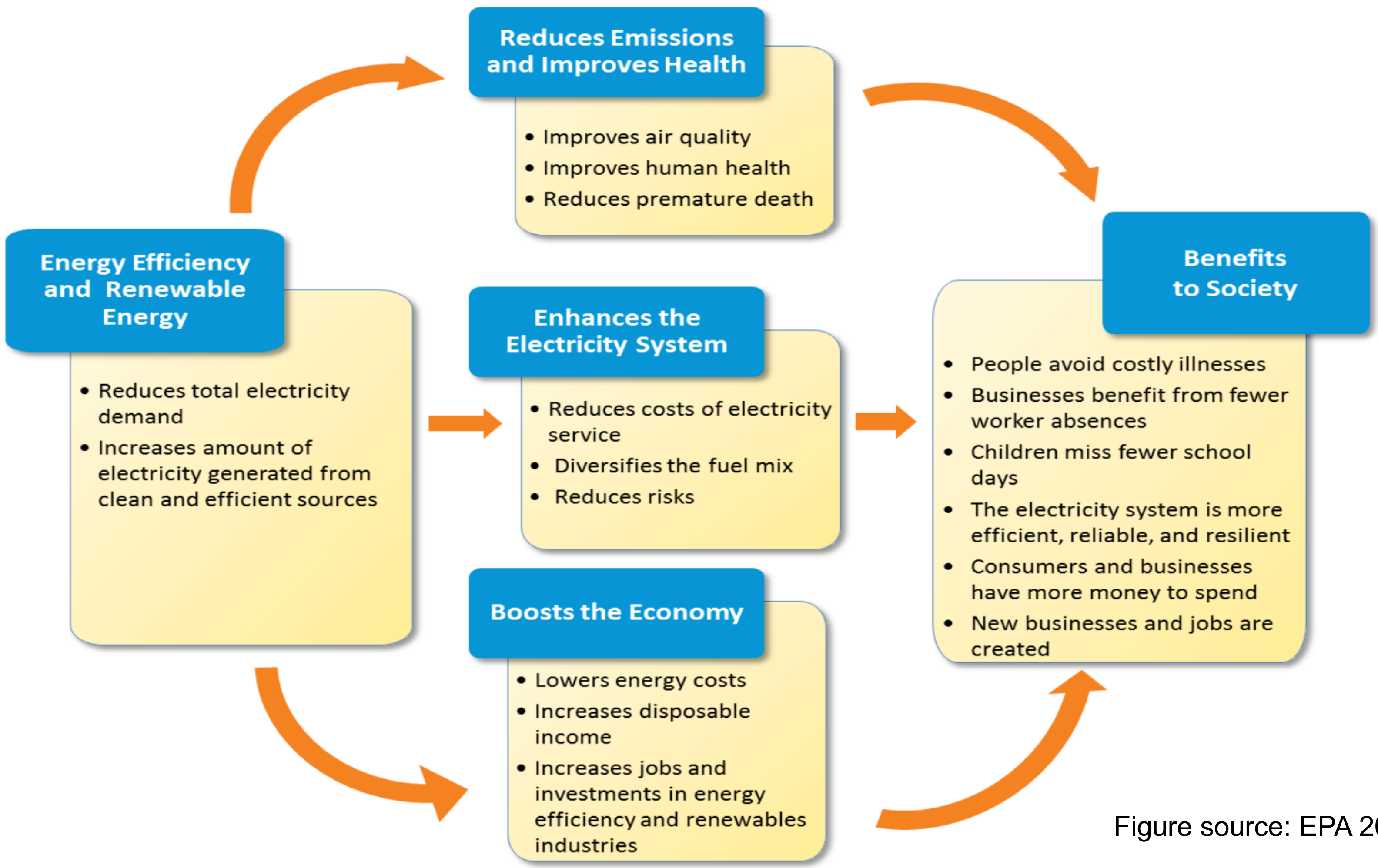


Figure source: EPA 2018

HB 2021 – NEI-Related Impacts to Be Considered

- Section 4(4)(c) - Include a risk-based examination of **resiliency opportunities** that includes costs, consequences, outcomes and benefits based on reasonable and prudent industry resiliency standards and guidelines established by the Public Utility Commission;
- Section 5(2) - The Public Utility Commission shall acknowledge the clean energy plan if the commission finds the plan to be in the public interest and consistent with the clean energy targets set forth in section 3 of this 2021 Act. In evaluating whether a plan is in the public interest, the commission shall consider:

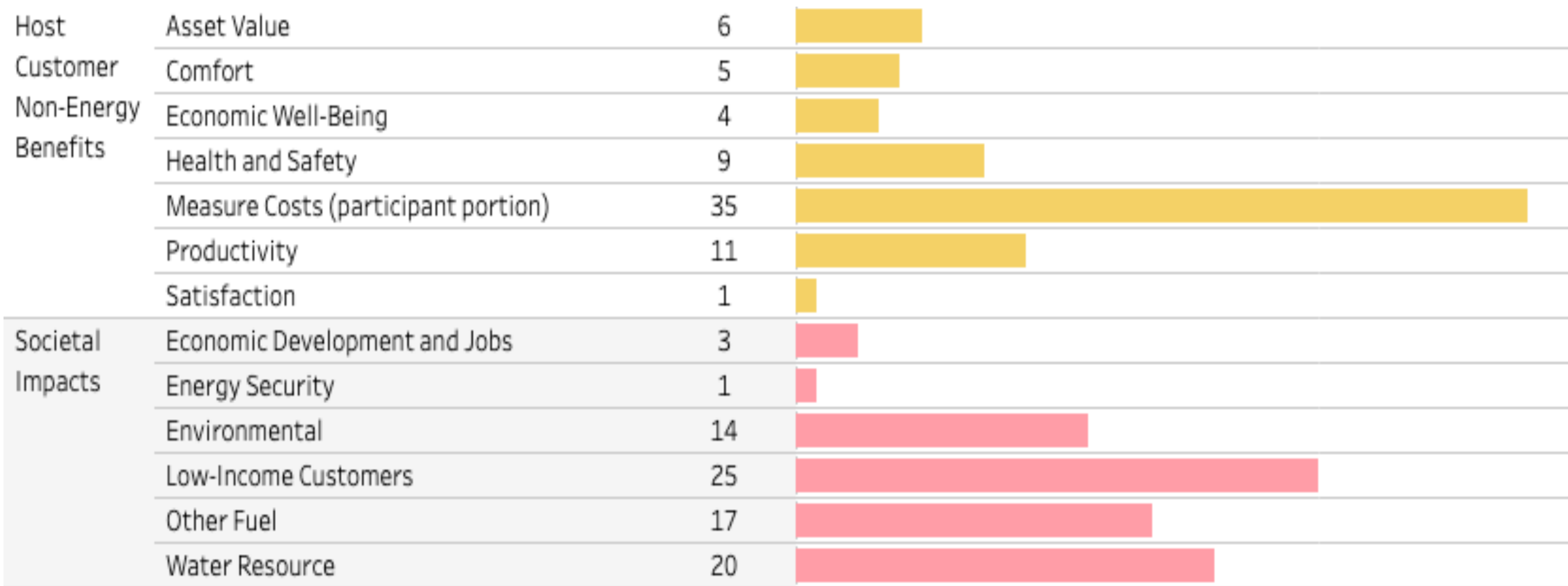
  (a) Any reduction of greenhouse gas emissions that is expected through the plan, and **any related environmental or health benefits**;

  (b) The economic and technical feasibility of the plan;

  (c) The effect of the plan on the reliability and resiliency of the electric system;

  (d) Availability of federal incentives;
  (e) Costs and risks to the customers; and
  (f) **Any other relevant factors as determined by the commission**.

Database of Energy Efficiency BCA Screening Practices
Example of Practices



Source: Database of State Screening Practices, National Energy Screening Project. Data from April 2021 for 50 states, District of Columbia, and Puerto Rico

Commonly Applied NEIs

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

Source: Schiller et al. 2020

Commonly Applied NEIs (continued)

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

Source: Schiller et al. 2020

Host Customer Energy Efficiency NEIs
(or at least non-direct utility energy impacts)

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

Table Adapted from NSPM

Societal Energy Efficiency NEIs

(or at least non-direct utility energy impacts)

Societal NEI	Description
Resilience	Resilience impacts beyond those experienced by utilities or host customers
GHG Emissions	GHG emissions created by fossil-fueled energy resources
Other Environmental	Other air emissions, solid waste, land, water, and other environmental impacts
Economic and Jobs	Incremental economic development and job impacts
Public Health	Health impacts, medical costs, and productivity affected by health
Low Income/Vulnerable Populations/Equity: Society	Poverty alleviation, environmental justice, reduced home foreclosures, etc.
Energy Security	Energy imports, energy independence, cybersecurity

Environmental Impacts

- It is important to distinguish between societal air emission impacts and environmental compliance impacts included in the cost of energy (e.g., included in avoided energy costs in BCA).
- Societal air emissions represent emissions that occur above the levels that comply with air emission requirements.

Table Adapted from NSPM

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

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

Determining Non-Energy Impact Values

Basic Concepts for Determining NEI Values

- Benefits and costs of investments may be estimated with:
  - Monetary or non-monetary quantitative terms, or
  - Qualitative values.
- Using current, monetary values that are specific to the jurisdiction are the best approach, providing for accurate and consist comparison of options.
- However, some impacts are hard to monetize, and jurisdictions can face constraints to conducting rigorous jurisdiction-specific impact studies.
- Thus, some jurisdictions choose to apply other approaches – such as applying values from other jurisdictions, using broad adders applied to energy benefits, or taking into consideration qualitative factors.*
- To some degree, all impact values are approximations and include some uncertainties. Approximating hard-to-quantify impacts is usually preferable to assuming relevant costs and benefits do not exist or have no value.

How good is good enough?
The answer depends on:
- Which NEIs
- Level of accuracy expected
- What resources ($, people) and data are available

Five Approaches to Valuing NEIs

The NSPM defines five approaches to account for relevant impacts, including approaches for hard-to-monetize NEIs.

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

Database of Energy Efficiency Screening Practices

Examples of Benefits Included in State BCAs

Participant Impacts

	Asset Value	Economic Well-Being	Comfort	Health and Safety	Satisfaction	Productivity
New Mexico						
New York						
North Carolina						
North Dakota						
Ohio	Quantitative and quali..	Quantitative and quali..	Quantitative and quali..	Quantitative and quali..	Quantitative and quali..	Monetized
Oklahoma						
Oregon	Proxy		Proxy	Proxy	Proxy	Proxy
Pennsylvania						Monetized
Puerto Rico						
Rhode Island	Monetized	Monetized	Monetized	Monetized		Monetized
South Carolina						
South Dakota	Monetized					
Tennessee	Calculation method un..	Calculation method un..	Calculation method un..	Calculation method un..	Calculation method un..	Calculation method un
Texas						
Utah						
Vermont	Proxy	Proxy	Proxy	Proxy	Proxy	Proxy
Virginia						
Washington				Alternative Threshold		
West Virginia						
Wisconsin				Monetized		
Wyoming						

Societal Impacts

State	Low-Income Customers	Other Fuel	Water Resource	Environmental	Public Health	Economic Development and J..	Energy Security
New Mexico	[illegible]						
New York			Monetized	Monetized			
North Carol..							
North Dako..							
Ohio		Monetized	Monetized	Quantitative and q..	Quantitative and q..	Quantitative and q..	Quantitative and q..
Oklahoma	Alternative thresho..						
Oregon	Proxy	Proxy	Proxy	Monetized			
Pennsylvan..		Monetized	Monetized				
Puerto Rico							
Rhode Island	Monetized	Monetized	Monetized	Monetized		Monetized	Monetized
South Carol..							
South Dako..							
Tennessee	Calculation method ..	Calculation method ..	Calculation method ..	Calculation method ..	Calculation method ..	Calculation method ..	Calculation method .
Texas	Alternative thresho..						
Utah							
Vermont	Proxy	Monetized	Monetized	Monetized	Proxy	Proxy	Proxy
Virginia	Alternative thresho..						
Washington	Alternative thresho..	Monetized	Monetized				
West Virgin..							
Wisconsin			Monetized	Monetized			
Wyoming	Calculation method ..						

Jurisdiction-Specific Studies

- ***Basic methods*** (e.g., spreadsheet analyses, trend extrapolations) are simple approaches using activity data (e.g., changes in generation levels) and factors (e.g., emission factors). Some factors and other inputs require relatively little time or expense to develop.
- ***Intermediate methods*** require more technical expertise and allow flexibility to make adjustments and reflect different assumptions around the underlying systems, populations, etc. These methods typically do not require software licensing fees and are computationally simpler than sophisticated methods.
- ***Sophisticated methods*** (e.g., system dispatch or capacity expansion modeling, air dispersion modeling) are characterized by extensive underlying data and relatively complex models. They are computationally intensive and may require considerable time and resources.

Less Cost

More Rigor

- **Temporal** analyses (when impacts occur) are important consideration for the modern grid
- Very important for community-based renewables BCA are **locational** analyses (where impacts occur) and **distribution** analyses (for whom the impacts occur).

Applying NEI Values From Other Jurisdictions
Berkeley Lab Resource

- Berkeley Lab reviewed how 30 jurisdictions calculated NEIs.
- We looked at 16 NEI categories:
  - Focused on methods used to calculate energy efficiency NEIs and how values or methods could be applied in other jurisdictions.
  - Documented multiple resources with NEI calculations and values.

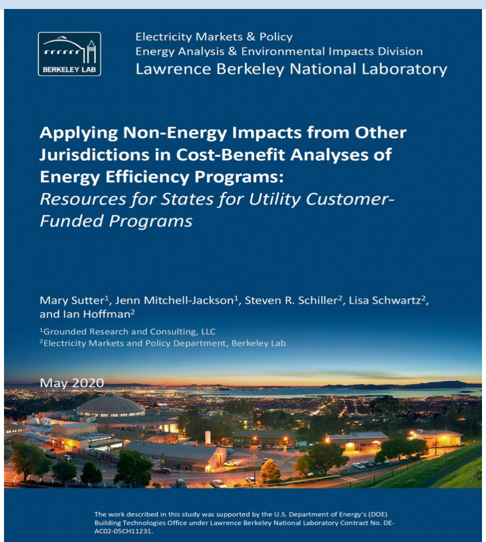


Table 1. Transferability Rating Scale

Use the per-unit NEI value		Use the study method	
Icon	**Key**	**Icon**	**Key**
1	**Use as Is** - NEI value is most likely similar across multiple jurisdictions and can be transferred as is	3	**Easy Method -** NEI value is unique to the researched jurisdiction and should not be transferred, but analytical staff in a different jurisdiction could apply the relatively easy method deployed by the underlying study
2	**Use with Caution** - NEI value is most likely similar across multiple jurisdictions and can be transferred, but should be explored and used with caution as potential underlying differences could affect the value	4	**Easy Method, Specialized Expertise** - NEI value is unique to the researched jurisdiction and should not be transferred, but a different jurisdiction could use analysts with specialized expertise to apply the relatively easy method deployed by the underlying study
		5	**Complex Method, Specialized Expertise** - NEI value is unique to the researched jurisdiction and should not be transferred, but a different jurisdiction could use analysts with specialized expertise to apply the complex method deployed by the underlying study

Reference: Schiller et al. 2020

Using Alternative Thresholds and Proxies

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

Considering Qualitative Values

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

Examples: Non-Energy Impact Calculation Methods and Values

Simple Example

Adders in Maryland's Benefit-Cost Test

Adder	Accounts for	Applies to
10% Health and Safety Adder	Improved health outcomes and avoided respiratory risks that are not currently captured in EmPOWER cost-effectiveness testing and are difficult to quantify	Residential programs including home performance, new construction, and HVAC fuel savings (i.e., excluding electric-to-electric replacements).
20% Limited Income Adder	Non-comfort health and safety benefits as well as a general basket of non-specific economic benefits.	The LI 20% benefit applies to all LI programs and is inclusive of health and safety benefits for those programs (therefore, the 10% H&S benefit does not apply). However, the LI benefit would be applied in addition to the 10% of avoided energy adder.
10% Avoided Energy Benefit	A range of avoided energy supply costs and risks not otherwise included in the MJST. It may be necessary to further characterize what this adder represents.	All programs

Source: 2021 – 2023 *EmPOWER* Maryland Program, Future Programming Work Group Report, April 15, 2022. See Page 51:

> *"The adder would serve as a proxy to account for improved health outcomes and avoided respiratory risks that are not currently captured in EmPOWER cost- effectiveness testing and are difficult to quantify."*
>
> *"The Work Group recommends the Commission include a 10% health and safety adder be applied to the MJST…."*

More Complex Example

Low-Income Weatherization NEIs – Massachusetts

Consultant utilized US DOE's Weatherization Assistance Program studies – based on pre- and post-weatherization surveys, estimates of weatherization measures installed, secondary databases containing national estimates of healthcare costs, and other secondary data and literature. First four estimated are societal impacts:

- Reduced Need for Food Assistance
- Increased Ability to Afford Prescriptions
- Increased Productivity at Home Due to Improvements in Sleep
- Reduced Heat or Eat Choice Dilemma Faced by Pregnant Women
- Reduced Carbon Monoxide Poisonings
- Reduced Home Fires
- Reduced Thermal Stress on Occupants From Being Too Hot or Cold
- Reduced Asthma-Related Healthcare and Costs
- Increased Productivity at Work Due to Improvements in Sleep
- Fewer Missed Days at Work
- Reduced Use of High Interest, Short-Term Loans

Table E.1. Estimated MA Low-Income Household and Societal NEIs Per Weatherized Unit both With and Without Avoided Death Benefit—Annual per Unit

NEI Value	Annual Per Unit Benefit*				
	Household	Household W/O Avoided Death Benefit	Societal	Total	Total W/O Avoided Death Benefit
Tier 1					
Reduced asthma symptoms	**$9.99**	$9.99	$322.01	**$332.00**	$332.00
Reduced cold-related thermal stress	**$463.21**	$4.67	$33.73	**$496.94**	$38.40
Reduced heat-related thermal stress	**$145.93**	$8.28	$27.00	**$172.93**	$35.28
Fewer missed days at work	**$149.45**	$149.45	$37.36	**$186.81**	$186.81
Tier 2					
Reduced use of short-term, high-interest loans	**$4.72**	$4.72	$0	**$4.72**	$4.72
Reduced CO poisoning (5-year life)	**$36.98**	$0.25	$1.87	**$38.85**	$2.12
Tier 3					
Increased home productivity	**$37.75**	$37.75	$0	**$37.75**	$37.75
Reduced home fires	**$93.84**	$9.77	$17.87**	**$111.71**	$27.37**
Annual Total—per weatherized home	**$941.87**	**$224.88**	**$439.84**	**$1,381.71**	**$664.45**

Reference: Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study, 2016, https://ma-eeac.org/wp-content/uploads/Low-Income-Single-Family-Health-and-Safety-Related-Non-Energy-Impacts-Study.pdf

EPA Guide Overview

Addressing Emissions, Health and Economic Benefits (in addition to direct electricity impacts)

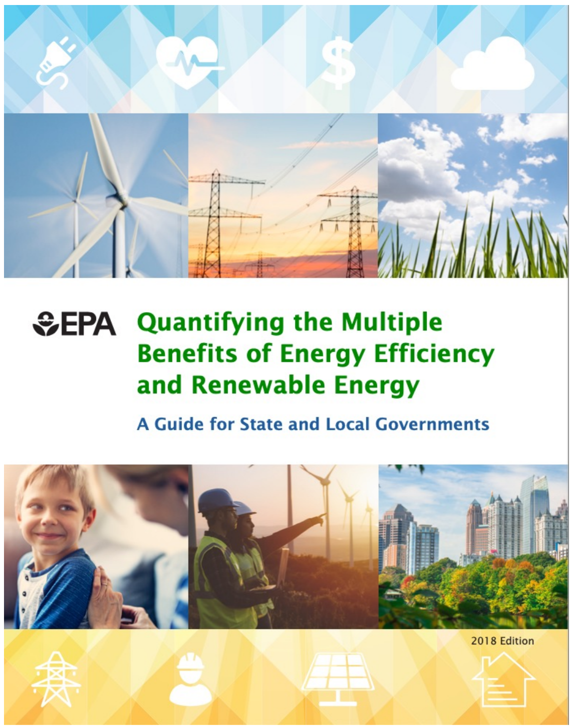
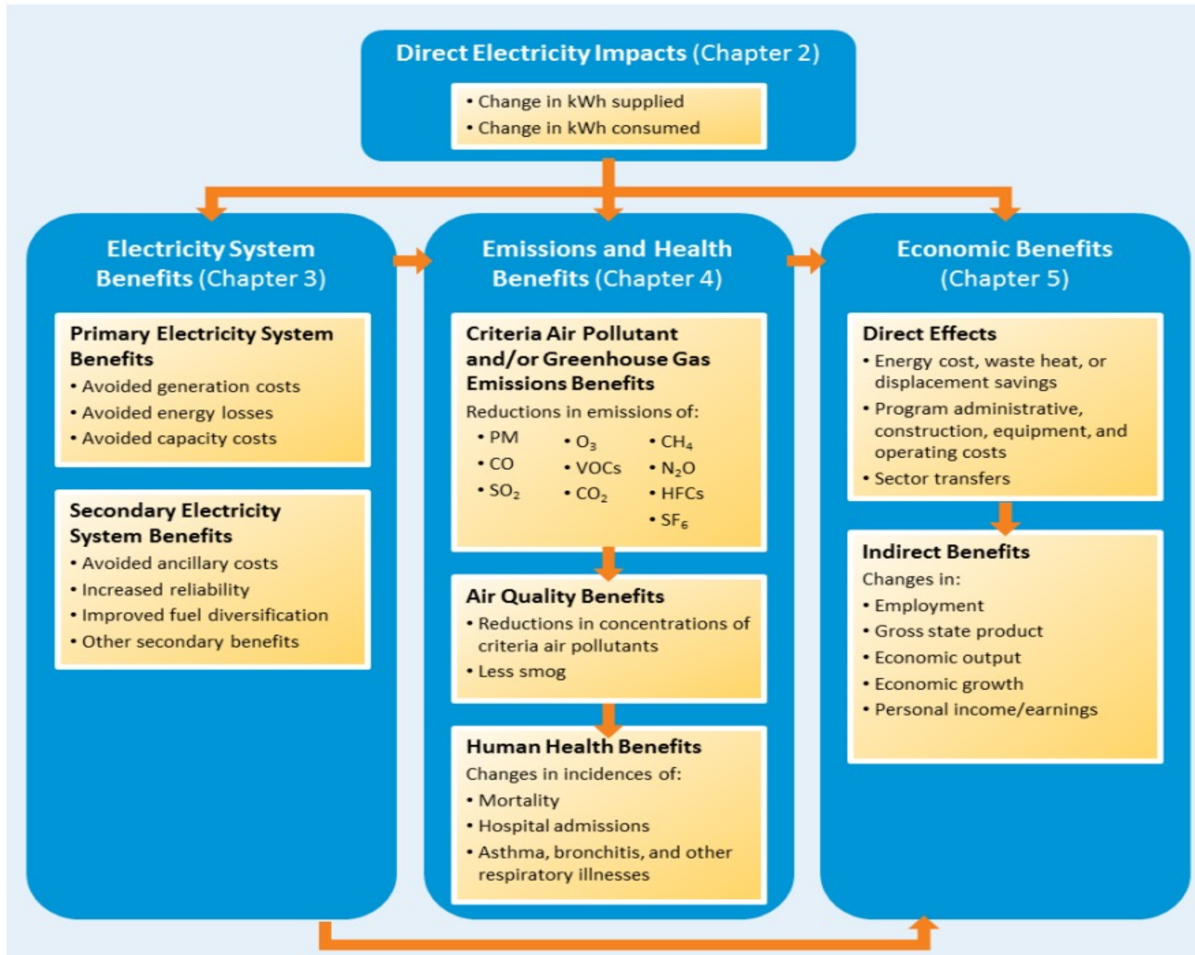


Figure 1-3: Mapping Out the Relationships Between Direct Electricity Impacts and the Benefits of Energy Efficiency and Renewable Energy Initiatives



US EPA Guidance on Determining Health Impacts of Efficiency and Renewables – Air Quality Impacts

According to EPA: Air pollution-related health effects include, but are not limited to:

- Premature death (i.e., mortality)
- Chronic and acute bronchitis
- Non-fatal heart attacks
- Respiratory or cardiovascular hospital admissions
- Upper and lower respiratory symptom episodes
- Asthma-related health effects
- Asthma emergency room visits
- Minor restricted activity days
- Work or school loss days

General Method (EPA has models/estimates for these steps – such as *AVERT* for emission factors)

- Determine projected energy saved or generated
- Quantify the air emission impacts
- Calculate changes in air quality
- Quantify public health impacts of changes in air quality
- Determine dollar values of those health impacts
- Calculate health impacts per unit of energy consumption or emission
  - Per ton values (e.g., EPA 2025 value for PM2.5 from electric generating units (EGUs) is $137,000/ton)
  - Sophisticated modeling

Benefit per kWh Method (Electricity)

- Use U.S. EPA's developed values of public health benefits associated with each kWh of electricity generation
- Establish energy impact of the DER (in kWh)
- Calculate dollar value of the health impact ($) by multiplying energy impact (kWh) by Benefit-per-kWh ($/kWh) – for example, EPA Northwest 2019 values for Distributed Solar, with 3% discount factor: 0.013 to 0.0254 $/kWh

US EPA Guidance on Determining Economic Impacts of Efficiency and Renewables

One way to categorize (macro) economic impacts:

- ***Direct effects***: Jobs and economic activity associated with constructing, installing, and operating the energy resource
- ***Indirect effects***: Jobs and economic activity associated with additional work and revenue that such programs funnel to the supply chains associated with the direct impacts. These supply chains include contractors, builders/developers, equipment vendors, product retailers, distributors, manufacturers, and other elements.
- ***Induced effects***: Jobs and economic activity created by the re-spending of the newly hired workers who gained employment in the direct or indirect impacts categories

Method	Description	Typical Use
Rules-of-thumb factors	Generic rules-of-thumb factors are simplified factors that represent relationships between key policy or program characteristics (e.g., financial spending, energy savings) and employment or output.	High-level screening analysis
Input-output models	Input-output models, also known as multiplier analysis models, can also be used to conduct analyses within a limited budget and timeframe, but provide more rigorous results than those derived from rules of thumb.	Short-term analysis of investments with limited scope and impact
Econometric models	Econometric models use mathematical and statistical techniques to analyze economic conditions both in the present and in the future to forecast how investments might affect income, employment, gross state product, and other common output metrics.	Short- and long-term analysis of investments with an economy-wide impact
Computable general equilibrium models (CGE)	CGE models use equations derived from economic theory to trace the flow of goods and services throughout an economy and solve for the levels of supply, demand, and prices across a specified set of markets.	Long-term analysis of Investments with an economy-wide impact
Hybrid models	Hybrid models typically combine aspects of CGE modeling with those of econometric models and may be based more heavily on one or the other.	Short- and long-term analysis of investments with a limited or economy-wide impact

Economic Impacts: Investments in energy resources can have both positive and negative macroeconomic impacts. First, there is the positive impact caused by installing, operating, and maintaining an energy resource. Second, there may be a negative macroeconomic effect caused by avoiding or displacing other energy resources. [As compared to what…]

Impacts from U.S. EPA Guidance

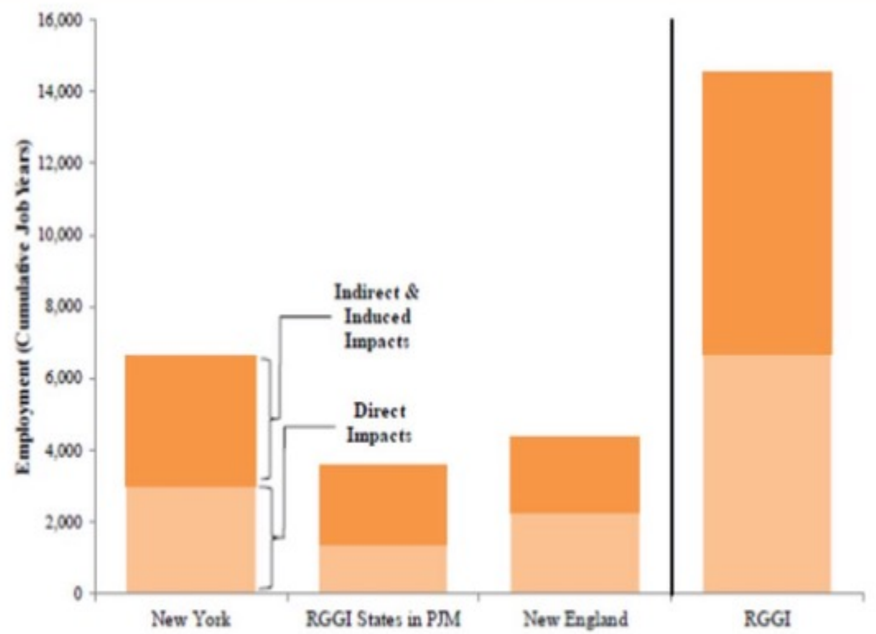
Health and Economic Impact Examples

Health Impacts – U.S. EPA analysis:

- Improvement in residential energy efficiency measures would result in 320 fewer premature deaths per year due to the reduction in criteria pollutants nationally, representing $2.9 billion in health co-benefits.
- CO_2-related benefits would be $3.8 billion.
- Scenario could result in $11 billion in economic benefits from reduced energy consumption
- An increase of residential energy efficiency equivalent to the scenario modeled would result in national climate and health co-benefits of $49 per ton of EGU CO_2 emissions reduced, with a range across states from $12 to $390 per ton of EGU CO_2 reduced.

Economic Impacts (Jobs) – EPA-cited example

Figure 5-6: Net Employment Impact to RGGI States as a Result of RGGI Implementation During the 2015–2017 Period (Cumulative Job Years)



Source: Analysis Group, 2018.

Framework for Assessing Energy Equity

- Classic BCAs compare an investment's benefits to its costs, without considering who pays the costs nor who receives the benefits.
- Achieving equity, by definition, requires comparing impacts on some groups of utility customers relative to other groups — i.e., assessing *Distributional Equity*

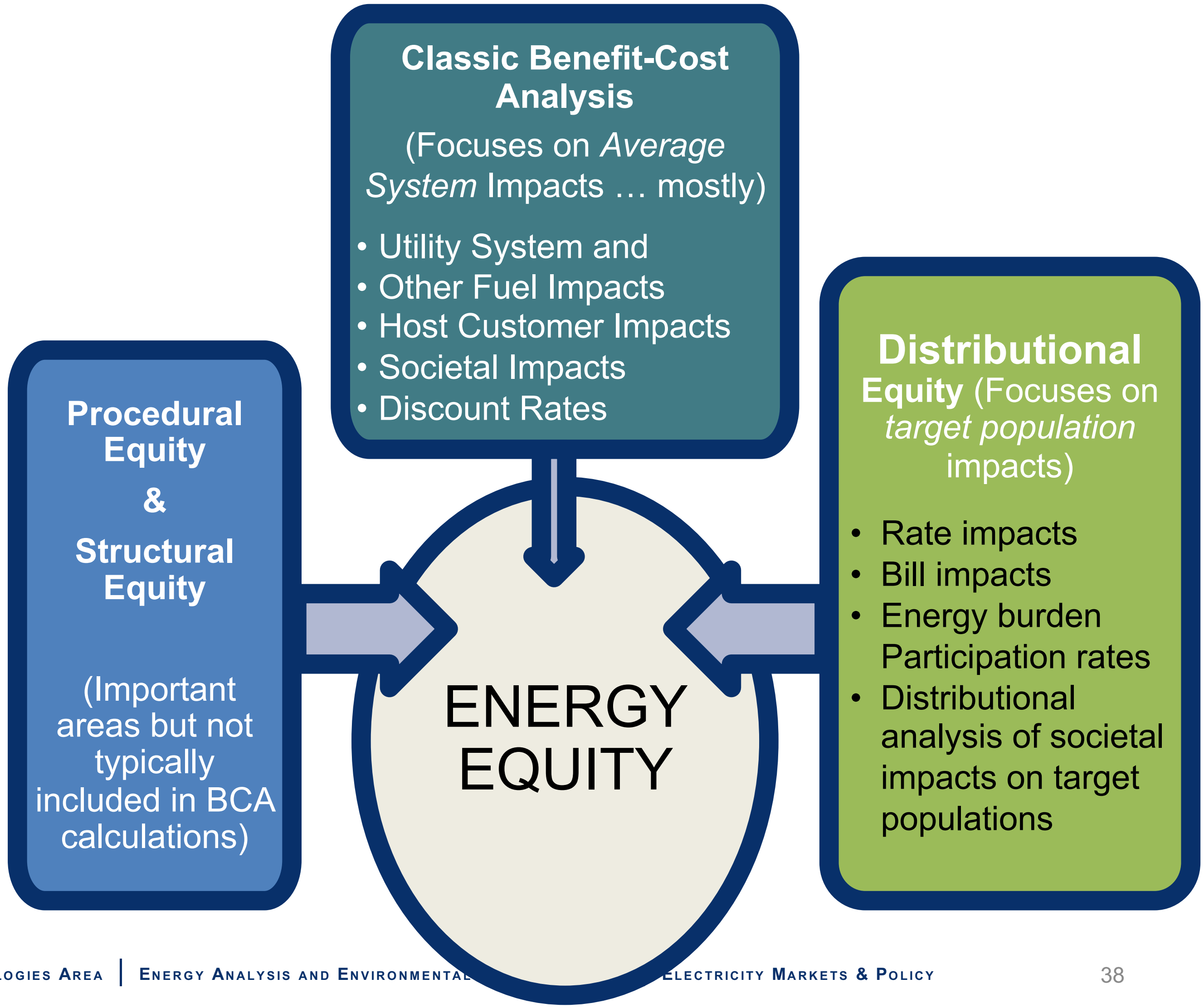


Figure adapted from: NSPM Presentation for Oregon DSP Stakeholder Workshop 2/17/2022

Summary: NEIs Are Important

- On balance, researchers have found that DER NEIs have positive impacts for utility systems, consumers, and society, sometimes representing substantial benefits.
- Regulators (and policy makers, utilities and consumers) consider NEIs in resource selection because:
  - NEIs can represent a variety of goals and objectives beyond pure energy concerns — for example, economic development, environmental management, public infrastructure reliability/resilience, and social/economic equity goals.
  - Including NEIs in BCA may lead to acquisition of more cost-effective energy choices than otherwise would be achieved.
- Thus, BCAs and the inclusion of NEIs — should:
  - Account for applicable policy goals and objectives consistently across all resources
  - Avoid bias by consistently assessing all relevant, material benefits across all resources
- While NEIs can be more difficult to quantify than direct energy impacts, there are multiple sources and methods for determining NEI values.

References

- Schiller, S., L. Schwartz and S. Murphy. 2020. *Applying Non-Energy Impacts from Other Jurisdictions in Cost-Benefit Analyses of Energy Efficiency Programs: Resources for States for Utility Customer-Funded Programs*. Berkeley Lab.
- Eckman, T., L. Schwartz and G. Leventis. 2020. *Determining Utility System Value of Demand Flexibility From Grid-interactive Efficient Buildings*. Berkeley Lab.
- National Energy Screening Project: https://www.nationalenergyscreeningproject.org/
  - National Standard Practice Manual (NSPM) for DERs (2020)
  - Database of State Screening Practices (April 1, 2021)
  - Methods, Tools and Resources (2022)
  - Case Studies (2022)
- National Standard Practice Manual (NSPM) Presentation for Oregon DSP Stakeholder Workshop, Overview of Key Concepts and Relationship to Distribution System Planning, presented by Julie Michals and Tim Woolf, 2/17/2022
- EPA. 2018. *Quantifying the Multiple Benefits of Energy Efficiency and Renewable Energy: A Guide for State and Local Governments*.
- EPA. 2021. *Public Health Benefits per kWh of Energy Efficiency and Renewable Energy in the United States: A Technical Report*.
- NARUC/NASEO Task Force on Comprehensive Electricity Planning: https://www.naruc.org/taskforce/

Thank You

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Oregon Public Utility Commission

National Perspectives

Understanding Energy Equity Benefits

Elaine Prause, RAP

June 2, 2022

Considering Equity in Clean Energy Planning

UM 2225 – Community Benefits and Impacts Workshop #1

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Examples of Equity in Clean Energy Policy

- **Michigan**: 2020 Executive Order requires PUC to expand its environmental review of IRPs to evaluate whether utilities are meeting state decarbonization goals and consider environmental justice and health impacts

- **Washington**: 2019 Clean Energy Transformation Act requires IRPs to include an assessment of energy and non-energy benefits and reductions of burdens to vulnerable populations

- **Connecticut**: 2019 Executive Order requires the Public Utilities Regulatory Authority to analyze decarbonization pathways consistent w/ the state's goal of 100% carbon-free electricity by 2040 and ensure energy affordability and equity for all ratepayers during the resource planning process (but this is loosely outlined)

- **California**: 2018 CPUC decision requires IRPs with LSEs to assess their impacts on disadvantaged communities

Source: PNNL Advancing Energy Equity in Grid Planning, https://netl.doe.gov/sites/default/files/netl-file/Advancing%20Energy%20Equity%20in%20Grid%20Planning.pdf

Defining Energy Equity

Equity is just and fair inclusion, and ***energy equity*** is the fair distribution of the benefits and burdens of energy production and consumption. (Partnership for Southern Equity)

Energy equity recognizes that disadvantaged communities have been historically marginalized and overburdened by pollution, underinvestment in clean energy infrastructure, and lack of access to energy-efficient housing and transportation. **An equitable energy system is one where the economic, health, and social benefits of participation extend to all levels of society, regardless of ability, race, or socioeconomic status. Achieving energy equity requires intentionally designing systems, technology, procedures, and policies that lead to the fair and just distribution of benefits in the energy system.**(PNNL)

Four Dimensions of Energy Equity

How Can We Achieve an Equitable Energy System?

Structural	Procedural	Distributional	Trans-generational
Decisions made with recognition of historical, cultural and institutional dynamics and structures that resulted in disparities	Inclusive, accessible, authentic engagement and representation in processes to develop or implement programs and policies	Programs and policies result in fair distributions of benefits and burdens across all segments of a community, prioritizing those with highest need	Decisions consider generational impacts and don't result in unfair burdens on future generations

Source: Adapted from the Urban Sustainability Directors Network's 2014 report written by A.Park, Equity in Sustainability: An Equity Scan of Local Government Sustainability Programs

Connections to Energy Planning

Structural/Restorative	Recognition in assumptions, tools, methods of planning that have resulted in disparities
Procedural	Expanding access, transparency, inclusion, input in planning processes
Distributional	Design of clean energy programs, rates, project siting, etc.
Intergenerational	Future customers impacted by compounding effects of today's decisions

Defining Equitable Outcomes

Understanding the inequities

- Energy burden
- Disconnections
- Limited participation in programs
- Service reliability

Understanding where inequities exist and why

- Identification of Target Population
  - Disadvantaged / highly vulnerable communities, income level, rural communities, tribal communities… varies by jurisdiction, utility service territory, community
  - Some states specify target populations within legislation, creates common focus

Graphic Source: https://www.efficiencyvermont.com/news-blog/whitepapers/vermont-energy-burden

Community Engagement

- Key component of Procedural Equity – fair and just inclusion, equitable access, transparency, and input in planning
- Stakeholders inform the public interest for decision makers
- Community/customer input informs definition of target populations, equitable outcomes and metrics, program designs, solutions and more
- Best practices for engagement – Authentic Intent*

**Resource guide on public engagement.* https://www.ncdd.org/uploads/1/3/5/5/135559674/ncdd2010_resource_guide.pdf; and Institute for Local Government. (2015). *Principles of local government public engagement.* https://www.ca-ilg.org/sites/main/files/file-attachments/principles_of_public_engagement_jan_2015.pdf?1497552327

Distributional Equity in Planning

- What are the long-term bill impacts of the plan on target population customers?
- Does the plan provide equitable reliability and resilience benefits?
- Does the plan provide equitable access to DERs & grid services

Community Benefits of Clean Energy Actions

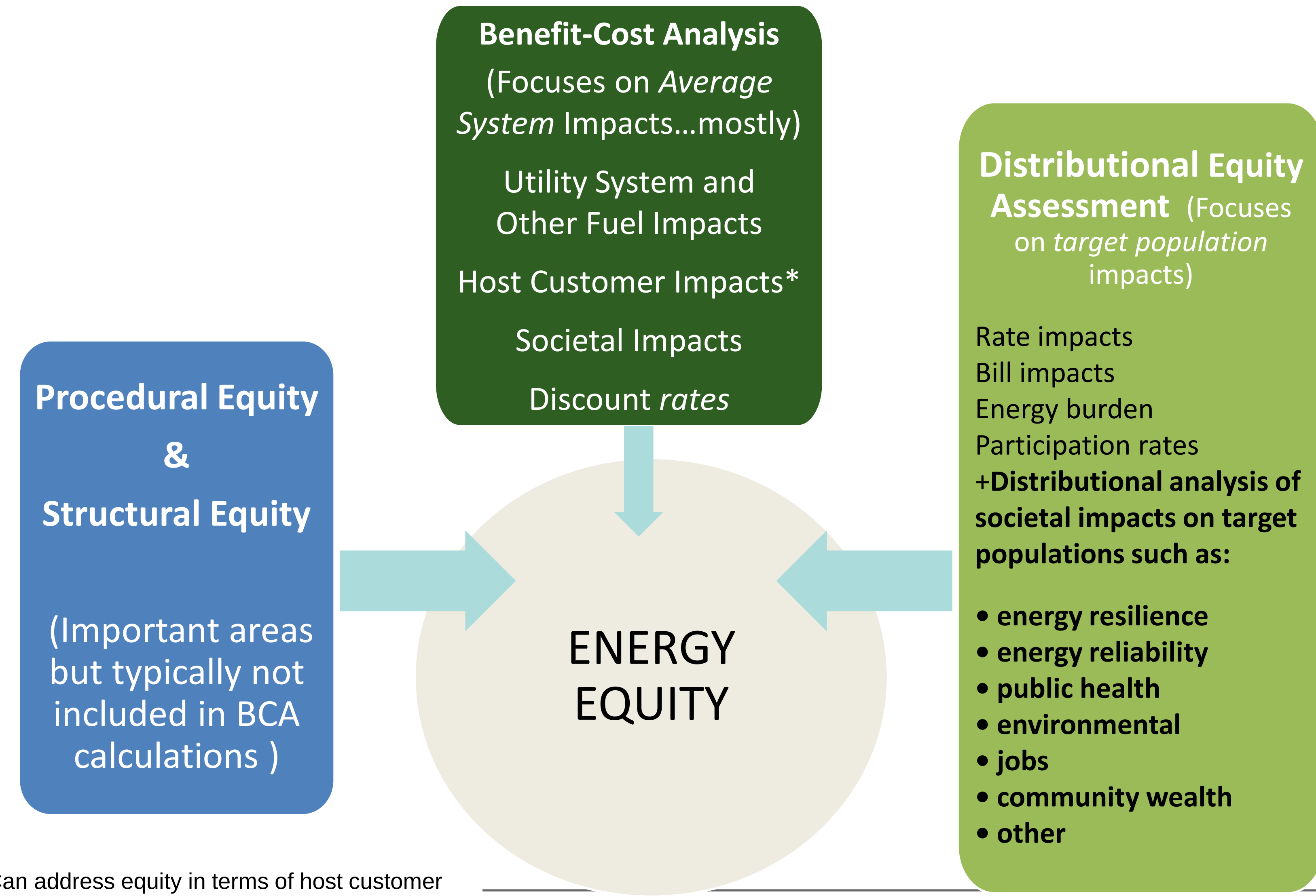
Combination of Host and Societal NEIs

Societal NEIs
Resilience
GHG Emissions
Other Environmental
Economic and Jobs
Public Health
Poverty alleviation
Energy Security

Host Customer NEIs
Transaction costs
Asset value
Productivity
Economic well-being
Comfort
Health & safety
Empowerment & control
Satisfaction & pride
Power/Quality
DER integration
Reduced Utility Bills

Source: Methods, Tools and Resources: A Handbook for Quantifying Distributed Energy Resource Impacts for Benefit-Cost Analysis, NESP

NSPM-Framework for Assessing Energy Equity



*Can address equity in terms of host customer benefits for programs targeted to specific sectors, communities or populations (e.g., low income)

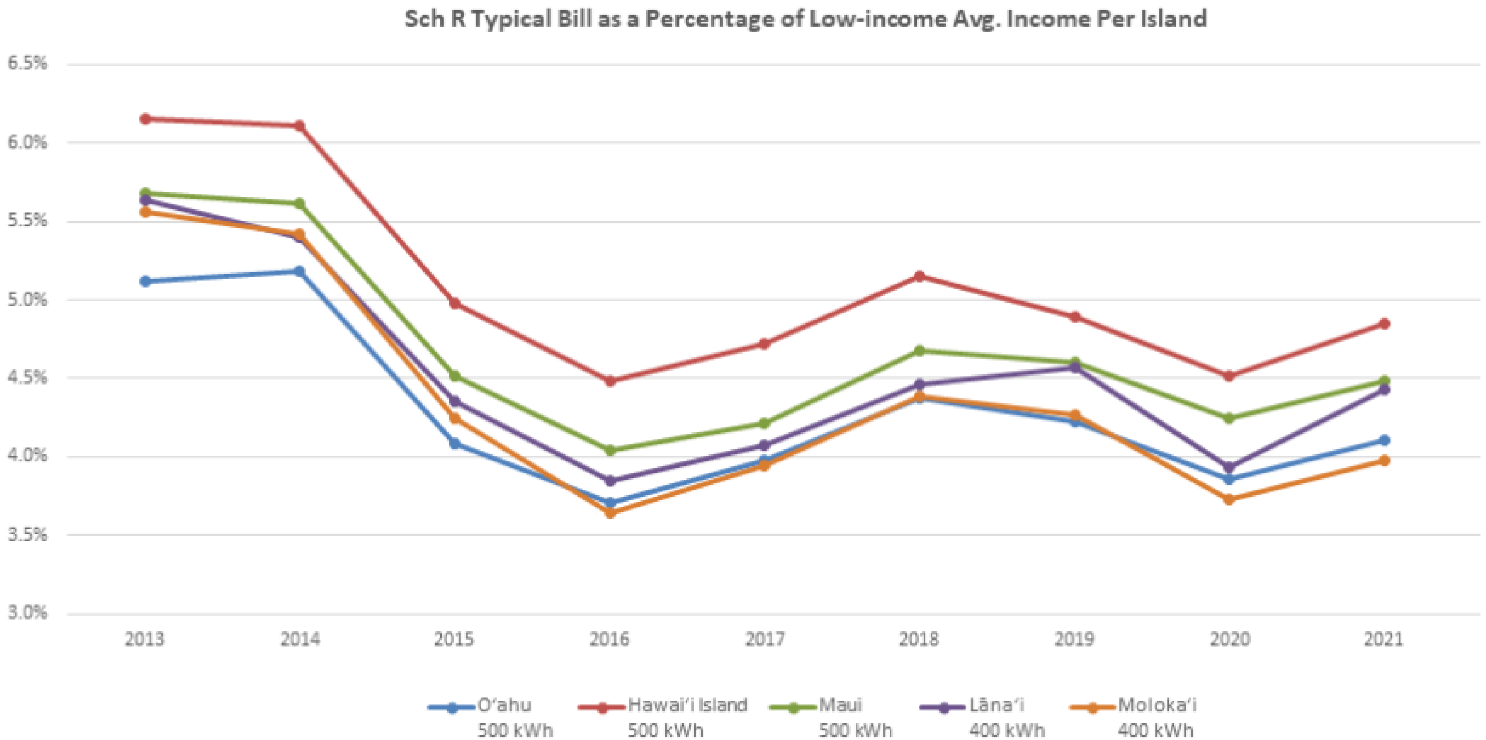
Source: National Standard Practice Manual (NSPM) Presentation for Oregon DSP Stakeholder Workshop, Overview of Key Concepts and Relationships to Distribution System Planning, presented by Julie Michals and Tim Woolf, 2/17/2022

Distributional Equity Analysis

- Compares impacts for target populations vs. other customers
  - **Expands** the rate, bill, and participation analysis;
  - **Adds** equity metrics such as energy burden, reliability, public health, arrearages, etc.…
- Design equity metrics to address jurisdiction policy goals
- Complements BCAs

Equity in Performance Metrics

- Hawaii
  - Energy burden, arrearages, disconnections
  - Participation in utility programs (LMI as % total)
- Minnesota
  - Equity in reliability
- Illinois
  - Energy burden by demographic
  - Reduction in total arrearages by zip code/census tract level



https://www.hawaiianelectric.com/about-us/performance-scorecards-and-metrics/affordability

Key Takeaways

- Every jurisdiction will have different equity goals/outcomes
- Authentic engagement in energy planning includes considering diverse viewpoints to shape desired outcomes and design solutions
- Distributional equity analyses are complementary to BCAs – each answers different questions
- Integrating equity into planning is evolving, additional research needed, collaborative engagement ongoing

Resources

- Participating in Power: How to Read and Respond to Integrated Resource Plans, Institute for Market Transformation and RAP
- Methods, Tools and Resources: A Handbook for Quantifying Distributed Energy Resource Impacts for Benefit-Cost Analysis, NESP
- Advancing Energy Equity in Grid Planning, PNNL
- Advancing Equity in Utility Regulation, LBNL
- Energy Infrastructure: Sources of Inequities and Policy Solutions for Improving Community Health and Wellbeing, Synapse and RAP

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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Equity in State Clean Energy Legislation

State	Equity in Legislation
CA	(SB 89, 2000) requires EJ achievements to be part of the state's mission, (SB 350, 2015) prioritizes disadvantaged communities in integrated resource planning, (SB 512, 2016) requires additional outreach and new approaches to reach communities affected by Commission decisions
CO	Commission to formally consider equity in decision-making processes and achievement of state decarbonization goals. 2021 "PUC Modernization" legislation (link to SB-272)
CT	Framework for an Equitable and Modern Grid, embedding strengthened equity provisions into several customer-facing electric vehicle (EV) and storage programs.
IL	The Climate and Equitable Jobs Act (CEJA) in **Illinois** directs the Illinois Commerce Commission to study the potential for developing low-income customer rates while overseeing a broad expansion of utilities' low-income energy efficiency programs

State / Fed	Equity in Legislation
ME	bill passed this year in **Maine** requires its Public Utilities Commission to explicitly consider mitigating undue energy burdens on environmental justice communities
MA	**equity leg** - Commission to formally consider equity in decision-making processes and achievement of state decarbonization goals; MA AG workgroup on better access to DPU proceedings; 2022-2024 EE plan;
OR	(HB 2475, 2021) recently added the following factors the Public Utility Commission may consider for classifying utility services for retail rates: "differential energy burdens on low-income customers and other economic, social equity or environmental justice factors that affect affordability for certain classes of utility customers."
WA	CETA – equitable distribution of benefits and cost of clean energy transition and the reduction of burdens to vulnerable populations and highly impacted communities...." – development of customer benefit indicators
Federal	Justice40 initiative to ensure that Federal agencies work with state and local governments to "deliver at least 40 percent of the overall benefits from Federal investments in climate and clean energy to disadvantaged communities."

National Perspectives

Introduction to Resilience Values

Juliet Homer, PNNL

Introduction to Resilience Values

Juliet Homer

Pacific Northwest National Laboratory

UM 2225 – Community Benefits and Impacts Workshop #1

6/2/2022

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Agenda

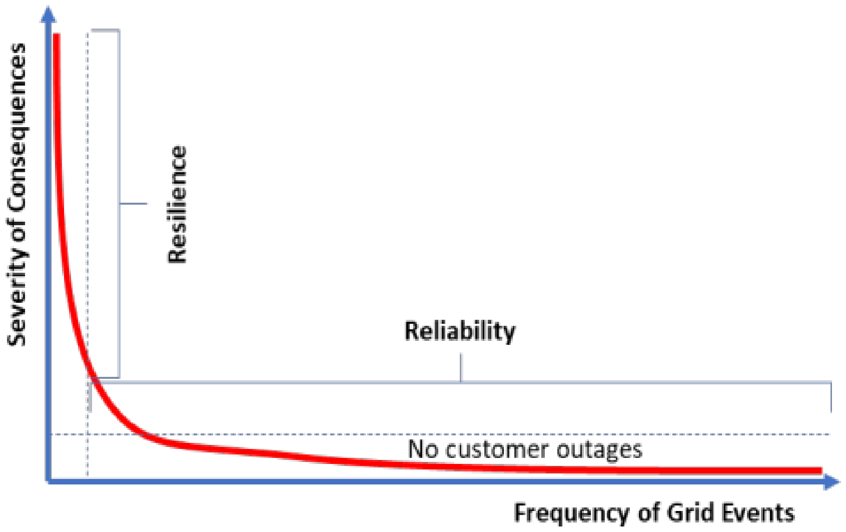
- Resilience context
- Resilience definitions
- From literature:
  - Grid investments with potential resilience benefits
  - Resilience costs and benefits
- Community-focused resilience
  - Core common elements of community resilience
  - Threat, Susceptibility, and Hardship Model
  - Resilience hubs
  - Example project

Resilience

- Oregon House Bill 2021, Section 4
  - "Include a risk-based examination of resiliency opportunities that includes costs, consequences, outcomes, and benefits based on **reasonable and prudent industry resiliency standards and guidelines** established by the Public Utility Commission."
- Oregon's House Bill 2021 includes the following contextual definitions for resilience:
  - **"Energy resilience"** means the ability of energy systems, from production through delivery to end-users, to withstand and restore energy delivery rapidly following non-routine disruptions of severe impact or duration.
  - **"Community energy resilience"** means the ability of a specific community to maintain the availability of energy needed to support the provision of energy-dependent critical public services to the community following non-routine disruptions of severe impact or duration to the state's broader energy systems.
  - **"Community energy resilience project"** means a community renewable energy project that includes utilizing one or more renewable energy systems to support the energy resilience of structures or facilities that are essential to the public welfare.

Resilience

- FERC definition:
  - "The ability to withstand and reduce the magnitude and/or duration of disruptive events, which includes the capability to anticipate, absorb, adapt to, and/or rapidly recover from such an event." (FERC 2018)
- Electric Power Research Institute (EPRI):
  - "Resilience includes the ability to harden the system against – and quickly recover from – high-impact, low-frequency events…. Enhanced resilience of the power system will be based on three elements:
    - Damage prevention: the application of engineering designs and advanced technologies that harden the power system to limit damage
    - System recovery: the use of tools and technologies to restore service as soon as practicable
    - Survivability: the use of innovative technologies to aid consumers, communities, and institutions in continuing some level of normal function without complete access to their normal power sources."

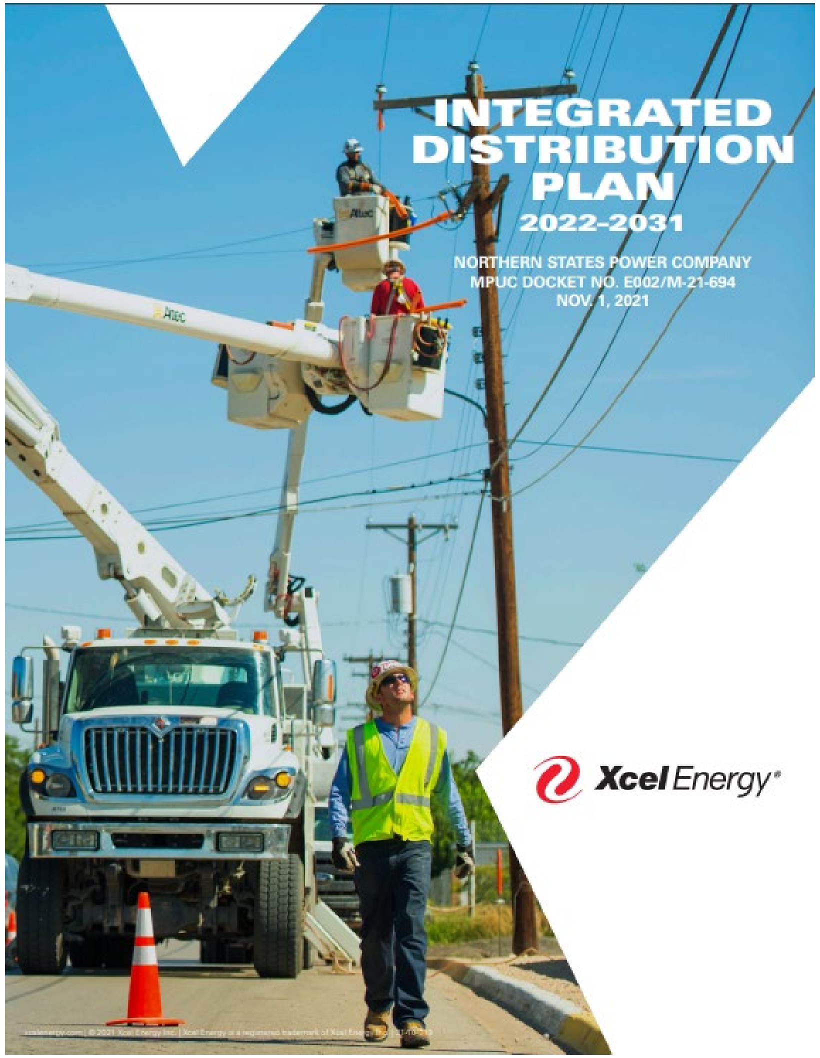


From Hawaii Resilience Working Group 2020

From LBNL Future Electric Utility Regulation 2019: Utility Investments in Resilience of Electric Systems

Community-focused resilience

- Xcel Energy Integrated Distribution Plan 2022 - 2031
- In describing a proposed Resilient Minneapolis initiative focused on improving communities' resilience to crises while advancing the Commission's objectives for Integrated Distribution Plans (IDPs), Xcel Energy states (emphasis added):
  - *"The term "resiliency" is used in different ways in different contexts. Sometimes, it is used to refer to the ability of the electric grid or other infrastructure to recover quickly from an outage or other disruption, and/or "hardening" of electricity assets to withstand increasing extreme weather. <u>At other times</u>, the term is used to refer to that communities' own ability to withstand and recover from a variety of disruptions… by ensuring continued access to electricity and other critical services. This proposal addresses primarily the latter sense of resiliency."*



From Xcel Energy 2021: Integrated Distribution Plan 2022-2031

Grid investments with potential resilience benefits

Investments	Description	Utility-Side	Customer-Side
Transmission and Distribution System			
Grid Hardening	Pole, wire, transformer, circuit, feeder, and substation upgrades or replacements	X	
Physical Security	Fencing, locks, enclosures, platforms, building extensions, monitoring systems, and alarms, among other investments that protect transmission and distribution system assets	X	
Replacement Parts	Local store of replacement parts that are in high demand and/or difficult to procure on short notice	X	
Physical Spacing and Barriers	Undergrounding, relocation, elevation, and enclosures to prevent threats from jeopardizing critical equipment	X	
Vegetation Management	Tree and brush trimming, removal, and planting of utility-friendly varieties	X	
Generation			
Distributed Energy Resources	Energy efficiency, demand response, load curtailment, electric vehicles, distributed generation, and distributed storage that serve the critical load, reducing the utility resources required to restore that load immediately after a resilience event	X	X
Supplemental Heating and Hot Water Systems	Electric, fossil, solar, or biomass fueled supplemental water and heating systems that provide a secondary or alternate source of water and/or space heating during a resilience event		X
Backup Generation	Diesel and natural gas generators, fuel cells, or renewable energy paired with storage that provide a secondary or alternate source of power during a resilience event		X
Physical Security	Fencing, locks, platforms, building extensions, monitoring systems, and alarms, among other investments that protect generation assets		X
Replacement Parts	Local store of replacement parts that are in high demand and/or difficult to procure on short notice	X	X
Physical Spacing and Barriers	Relocation, elevation, and enclosures to prevent threats from jeopardizing critical equipment	X	X

From Sandia National Laboratory & Synapse Energy Economics May 2021 Report:
Application of a Standard Approach to Benefit-Cost Analysis for Electric Grid Resilience Investments

Investments	Description	Utility-Side	Customer-Side
Automation & Controls			
Transmission and Distribution Grid Automation and Controls	Advanced distribution management systems (ADMS), flexible AC transmission system (FACTS) devices, geographic information systems (GIS), distribution system supervisory control and data acquisition (DSCADA), outage management systems (OMS), distributed energy resource management systems (DERMS), fault location, isolation and service restoration systems (FLISR), volt-var optimization (VVO), voltage stabilization (for example, SVC STATCOM), and network monitoring devices	X	
Meters	Customer electric meters that provide outage and restoration notification and/or on-demand data (e.g., advanced meter infrastructure (AMI))	X	
Metering Controls	Communication networks and data management systems	X	X
Cyber Protection System Controls	Communications between control centers, cyber system categorization, system security management and controls, electronic security perimeters, configuration change management, and information protection	X	X
Cross Cutting			
Microgrids	A group of interconnected electricity generators and users operating as part of the larger grid normally, but able to operate in islanded mode during resilience events	X	X
Threat and Vulnerability Assessments	Studies of risks and consequences to inform planning	X	X
Mapping of Hosting Capacity	Electric grid impact evaluation of changes to load	X	X
Critical load identification and prioritization	Definition, list, and restoration sequence for priority customers, load, and the substations and feeders that serve priority customers	X	X
Planning	Facility management planning, community emergency preparedness, cyber and physical system response, restoration, and recovery planning	X	X
Training	Classroom instruction for key staff and practice drills on threat response	X	X
Performance Measurement and Evaluation	Defining and reporting resilience performance metrics	X	X

Energy Resilience

Costs

Type	Impact	Utility System	Host Customer	Community	Society[28]
Project Implementation	Installation, Operation, and Maintenance	X	X	X	
	Transaction	X	X	X	
	Interconnection	X	X	X	
	Financial Incentives	X			X
	Program Administration	X			
	Utility Performance Incentives	X			

Benefits

Type	Impact	Utility System	Host Customer	Community	Society[31]
Generation, Transmission & Distribution: Energy and Capacity	Reducing Emergency Staff Deployment Costs	X			
	Avoiding Energy Infrastructure Damages	X			
Non-Energy: Economic[32]	Avoiding Damages to Goods and Infrastructure		X	X	X
	Avoiding Lower Revenues from Lower Production and Fewer Sales of Goods and Services		X		X
	Reducing Emergency Staff Deployment Costs		X	X	
	Avoiding Departure of Customers Important to the Community			X	
	Avoiding Lost Economic Development, Education, and Recreation Opportunities			X	X
Non-Energy: Public Health, Safety, and Security	Reducing Medical and Insurance Costs	X	X	X	X
	Avoiding Loss of Quality of Life	X	X	X	X

From Sandia National Laboratory & Synapse Energy Economics May 2021 Report:
[Application of a Standard Approach to Benefit-Cost Analysis for Electric Grid Resilience Investments]

Benefit Type	Benefit Amount	Source
Avoided Legal Liabilities	$87,100 per mile - reduced litigation from fewer contact fatalities and serious accidents	PSI (2006)
Avoided Vegetation Management Costs	$3000 - $12,000 per mile for distribution; $300 - $9000 per mile for transmission	PUCT (2009)
Avoided Revenue Loss	$0.09-$0.32 per kWh (Range of System Average Rates Across U.S.; average SAR = $0.13)	EIA (2019)
Avoided Short-Duration Customer Interruption Costs: Medium/Large C&I (>50,000 annual kWh)	$12-$37 per unserved kWh (interruptions lasting 30 minutes - 16 hours)	Sullivan et al. (2015)
Avoided Short-Duration Customer Interruption Costs: Small C&I (<50,000 annual kWh)	$214-$474 per unserved kWh (interruptions lasting 30 min - 16 h)	
Avoided Short-Duration Customer Interruption Costs: Residential Customers	$1.3-$5.9 per unserved kWh (interruptions lasting 30 min - 16 h)	
Avoided Long-Duration Customer Interruption Costs	$1.20/kWh (for high priority services) to $0.35 (for low priority services) (interruptions lasting 24 h; Allegheny County, PA)	Baik, et al., (2018)
	$190M-$380 M (24 -h interruption) $4.4B-$8.8B (7-week interruption) (downtown San Francisco)	Sullivan and Schellenberg (2013)
Safety: Avoided Injuries and Fatalities	Fatality: $7.4 million ($2006) Injury: up to $7.4 million ($2006)	EPA (2019) Rice et al. (1989)
Avoided Aesthetic Costs	Avoided loss in property values due to overhead electricity being undergrounded: 5-20 percent increase in property value	Des Rosiers (2002); Sims and Dent (2005); Larsen (2016a) (2016b)
Ecosystem Benefits	Depends on ecosystem, location and other factors	
Avoided Emissions	$5800 per ton - SO_2 from coal plants	NAS (2012)
	$1600 per ton - NOx from coal plants	
	$460 per ton - PM-10 from coal plants	

From Zamuda et al., 2019: Monetization methods for evaluating investments in electricity system resilience to extreme weather and climate change

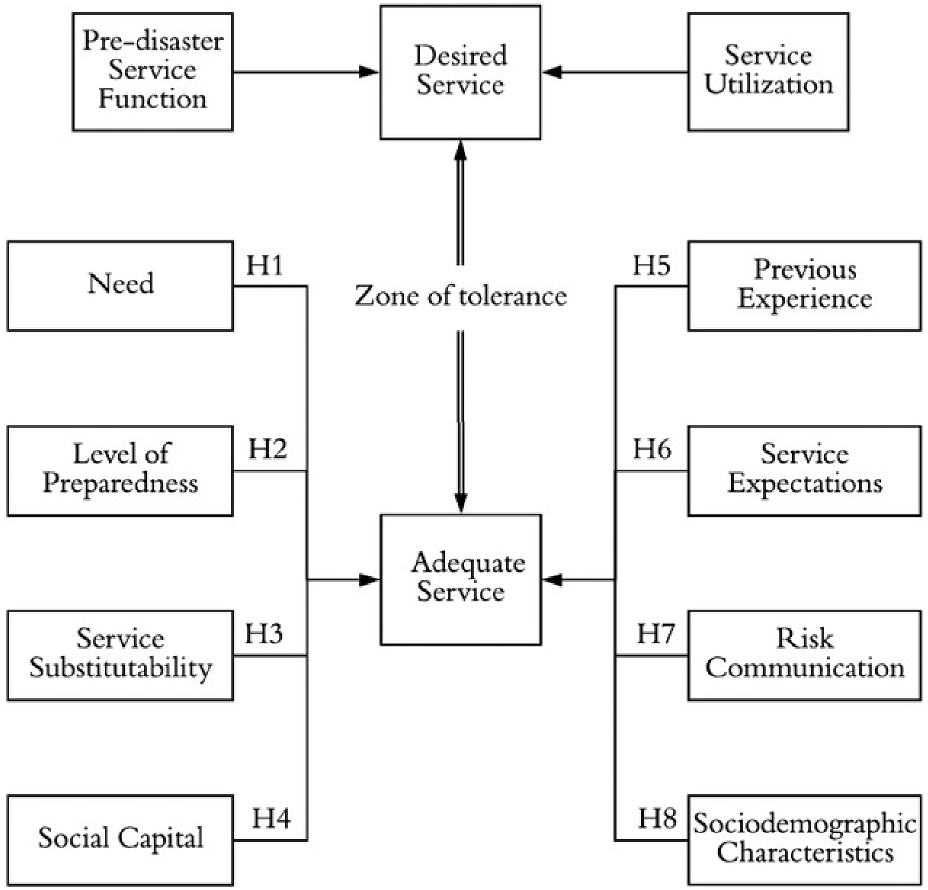
Core common elements of community resilience

- Patel et al. (2017) reviewed 80 relevant papers and concluded that there was no evidence of a common, agreed-upon definition of community resilience there was evidence of nine core elements of community resilience that were common among the definitions.
  - **Local Knowledge**: "The effects of a disaster, whether short-term or long-term, could be mitigated if a community understands its existing vulnerabilities."
  - **Community Networks and Relationships**: "Positive effects on a community and its members can occur during a crisis when its members are well connected and form a cohesive whole."
  - **Communication**: Effective communication includes common meanings for all to understand and community-provided opportunities for open dialogue.
  - **Health:** "Understanding and addressing health vulnerabilities can build resilience before a disaster and mitigate long-term issues after a disaster."
  - **Governance/Leadership**: "Governance and leadership shape how communities handle crises."
  - **Resources**: "It is important to have resources widely available and distributed in the community."
  - **Economic Investment**: "If not addressed, the direct and indirect economic costs of a disaster can plague an affected community long after it has occurred."
  - **Preparedness**: "The outputs of the planning, mitigation measures, and overall preparedness were intended to enable a sustainable response and recovery by the community, and to reduce the likelihood of harm to community members."
  - **Mental Outlook**: "Important in shaping the willingness and ability of community members to continue on in the face of uncertainty."

From Patel et al. 2017: What Do We Mean by 'Community Resilience'? A Systematic Literature Review of How It Is Defined in the Literature

Community Resilience – threat, susceptibility, and hardship model

- Esmaliann et al. (2021) assesses and identifies factors affecting risk disparity due to infrastructure service disruptions in extreme weather events.
- They propose **model** that characterizes societal risks at the household level
- The concept of "zone of tolerance" for the service disruptions identified to account for different capabilities of the households to endure the adverse impacts.
  - Sociodemographic characteristics, such as race and residence type, are shown to influence the zone of tolerance, and hence the level of hardship experienced by the affected households.
  - Findings highlight the importance of integrating social dimensions into the resilience planning of infrastructure systems.
  - The proposed model and results enable human-centric hazards mitigation and resilience planning to effectively reduce the risk disparity of vulnerable populations to service disruptions in disasters.



From Esmalian et al. 2021. Determinants of Risk Disparity Due to Infrastructure Service Losses in Disasters: A Household Service Gap Model

Xcel's proposed Resilient Minneapolis Project

- Project is proposed as part of the Xcel Energy's 2022 -2032 Integrated Distribution Plan
- Three Minneapolis project locations proposed in partnership with Black, Indigenous, and People of Color (BIPOC)-led partner organizations
- At each site, Xcel plans to work with partners to install rooftop solar, battery storage systems, microgrid controls, and necessary distribution system modifications to integrate these technologies.
- Xcel developed a request for applications and developed evaluation criteria
  - Four minimum criteria that all projects must meet (geographic location, safety, regulatory compliance, and physical site requirements)
  - Eight scoring criteria, with definitions, scores, and weights assigned to each:
    a) Scope of benefits
    b) Geographic location preference
    c) Impact on distribution infrastructure
    d) Maturity of proposed technology and innovation of application of technology
    e) Project timing
    f) Experience of project lead
    g) Strength of project team
    h) Additional resources leveraged

From Xcel Energy 2021: Integrated Distribution Plan 2022-2031

Resilient Minneapolis Projects

	Units	North Minneapolis Community Resiliency Hub	Sabathani Community Center	Minneapolis American Indian Center	Aggregate
COSTS					
Capital					
Total Capital Cost	$	$3,911,367	$2,644,276	$2,383,235	$8,938,878
O&M					
Annual O&M Cost	$	$23,861	$19,091	$19,091	
NPV of Annual O&M Costs (10 years)	$	$172,662	$138,146	$138,146	$448,953
Total Capital and O&M	**$**	**$4,084,029**	**$2,782,421**	**$2,521,381**	**$9,387,831**
BENEFITS					
Resilience/Value of Lost Load	$	$575,076	$575,076	$460,060	$1,610,212
Bulk System Capacity Value	$	$111,344	$54,384	$65,643	$231,371
Generation & Carbon Emissions		$133,138	$25,417	$22,997	$181,551
Arbitrage	$	$62,174	$3,173	$12,417	$77,764
Lifetime Benefit	**$**	**$881,732**	**$658,050**	**$561,117**	**$2,100,899**
BENEFIT:COST RATIO		**0.22**	**0.24**	**0.22**	**0.22**

"Some of these benefits are **quantifiable** in dollar terms…others are **non-quantified** but no less important. We urge the Commission to consider the non-quantified benefits as well, even though they are not part of the benefit:cost ratio presented.... Since all costs are quantified, but only a subset of benefits are quantified, the benefit-to- cost ratios presented.. reflect an incomplete picture of the overall benefit of the RMP projects to our communities and customers." (emphasis added)

From Xcel Energy 2021: Integrated Distribution Plan 2022-2031

Juliet Homer
Juliet.homer@pnnl.gov
509-375-2698

Break

Back at 2:15!

Oregon Public Utility Commission

Oregon Perspectives

Incorporating NEIs is a process. Let's get a sense for where are we starting to do this work in Oregon?

What can we learn and leverage for Clean Energy Plans?

Oregon Perspectives

Other state agencies

Colin McConnaha, DEQ

Assessing co-benefits of GHG reduction programs

Colin McConnaha
Manager, Office of Greenhouse Gas Programs
Oregon Department of Environmental Quality

June 2, 2022

Recent evaluations of co-benefits

- Well understood connections between reducing GHGs and reductions in other “co-pollutants”
- However, program-specific evaluation requires considerable effort
- Until recently, DEQ had not done this for our GHG programs
- Now have evaluations of two programs:
  - Climate Protection Program
  - Clean Fuels Program

Climate Protection Program

- Establish limits on GHG emissions from fossil fuels in Oregon
  - Enforceable
  - Declining
- Reduces emissions from:
  - Fuel used for transportation
    - Largest source of emissions
  - Other fossil fuel including
    - Natural gas
    - Diesel in non-road uses
    - Propane

Co-benefits of Climate Protection Program

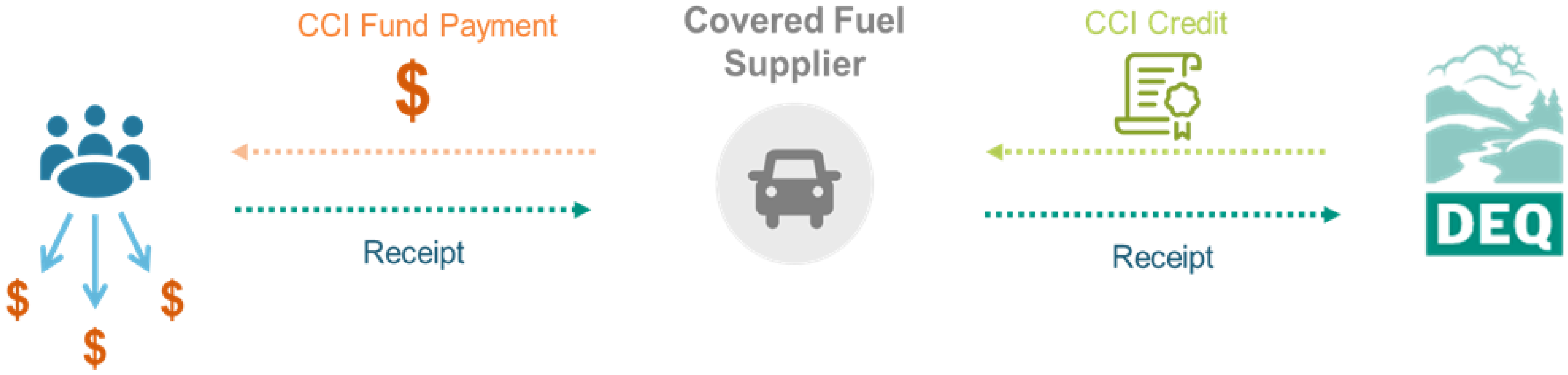
Public welfare benefits: **Monetized health benefits up to $2.3 billion** (cumulative)

- ICF modeling (2022-2050)
  - EPA COBRA Tool
- Reduced statewide adverse health impacts due to changes in criteria pollutant emissions from on-road mobile sources and other sources
  - Avoided hospital visits
  - Reduction in premature mortality
  - Lower respiratory impacts
  - Fewer workdays lost
- May be conservative estimate due to modeling limitations

Community Climate Investments (CCI)

Fuel suppliers invest in projects that reduce GHG emissions to earn CCI credits

- Optional alternative compliance option for CPP
- DEQ, with equity advisory committee, selects and oversees third parties to receive funds and invest in projects to reduce GHG emissions
- Proposed rules set the price to purchase CCI credits for each year of the program



CCI Priorities

- Reduce greenhouse gas emissions by at least one ton GHGs per CCI credits issued
- **Reduce emissions of other air contaminants**, particularly in and near environmental justice communities
- **Promote public health**, environmental, and economic benefits for environmental justice communities
- Accelerate the transition from fossil fuels to lower carbon energy sources

EJ communities face more risks

↑ Greater pollution exposure

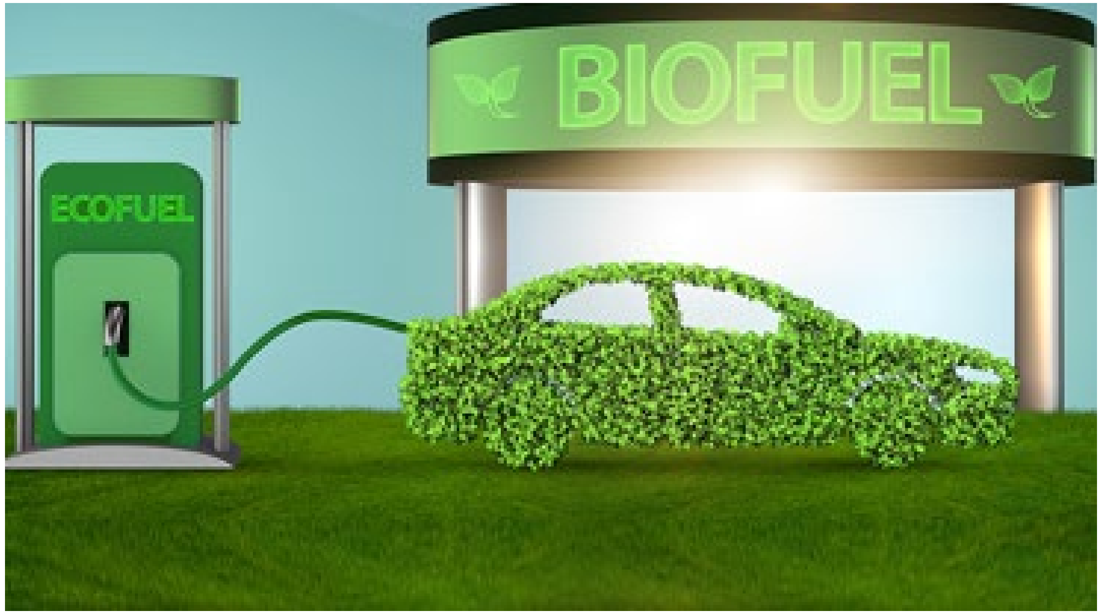
↑ Greater impacts of climate change

↓ Less representation in public processes

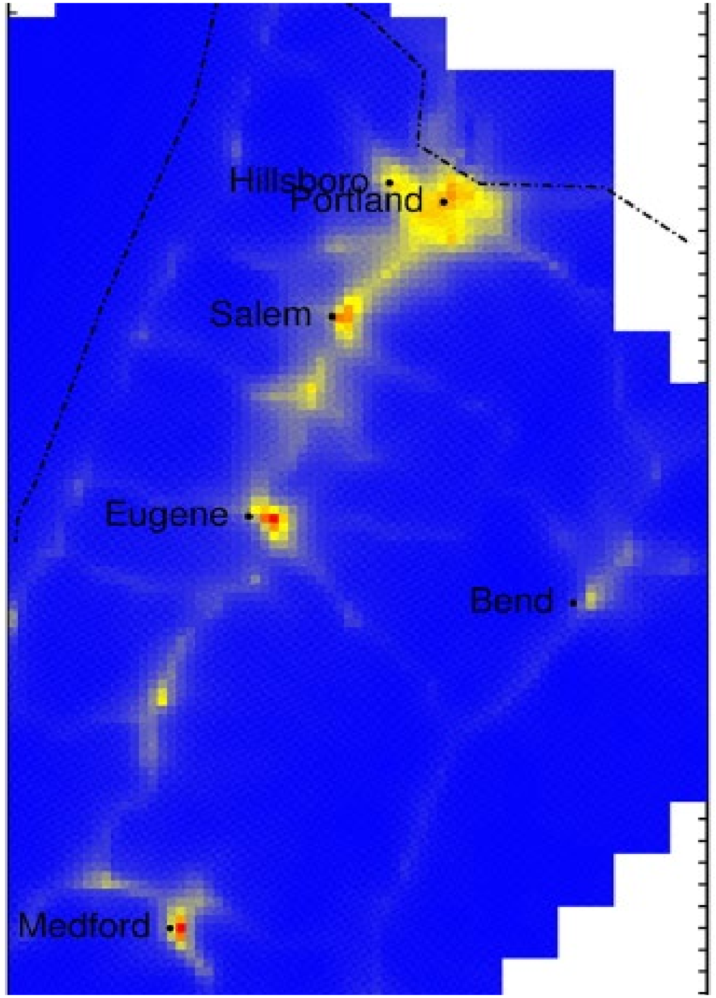
↓ Less access to new, clean technologies

Clean Fuels Program

- **Existing program**: 10% reduction in carbon intensity of transportation fuels
  - 2015 baseline accounts for B5/E10 already required at that point)
  - 10% reduction gradually phased in over 10 years – achieved by 2025
- **Proposed expansion:** 37% reduction by 2035



Health Benefits from an Expanded CFP



- DEQ commissioned modeling of tailpipe pollution implications for an expanded Clean Fuels Program
- Results were intuitive:
  - Largest pollution reductions along transportation corridors and urban areas
  - 15% decrease in diesel pollution in major cities
- Nearly $90 million *per year* in avoided health costs for Oregonians
  - Again, a conservative estimate
- Health benefits are greatest in low-income and BIPOC communities that are more frequently located near highways

Questions?

Climate Protection Program:

https://www.oregon.gov/deq/ghgp/cpp/Pages/default.aspx

CPP.INFO@deq.oregon.gov

Clean Fuels Program:

www.oregon.gov/deq/ghgp/cfp/Pages/default.aspx

OregonCleanFuels@deq.oregon.gov

Oregon Public Utility Commission

Oregon Perspectives

OPUC Dockets

Sarah Hall, OPUC

Caroline Moore, OPUC

Regulatory Use Cases

BCA in Different Regulatory Settings

nesp

You are here

Context	Application	Goal of BCA	Role of Costs & Benefits
Programs	EE, DR, DG, Storage, EVs	determine whether to implement the program	compare program benefits to costs
Procurement	DERs, NWAs, PPAs,	determine the ceiling price	ceiling price should equal the benefits of the procurement
Pricing	Rate design	estimate long-run marginal costs	long-run marginal costs should equal the benefits of modifying consumption
	DER compensation	determine the value of DER	value of DER is the sum of benefits
Planning	Optimize DERs	identify optimal DER portfolio	compare portfolio benefits to costs
	DP, IDP, IRP, IGP	identify preferred resource scenario	compare scenario benefits to costs
	GHG plans	achieve GHG goals at low cost	compare GHG plan benefits to costs
	State Energy Plans	identify resources to meet state goals	compare state plan benefits to costs
Infrastructure Investments	Grid Mod, AMI, EV infrastructure, etc.	determine whether to make the investment	compare investment benefits to investment costs
Prudence Reviews	Retrospective review	determine whether past utility decision was appropriate	compare benefits and costs using test in place at the time the decision was made
	Prospective review	determine whether proposed utility decision is appropriate	compare benefits and costs using test currently in place

NSPM Principle #1: DERs should be compared and treated consistently with other utility resources. This principle applies to all regulatory contexts/mechanisms

IN OREGON: Examples of NEI considerations

Programs

- Energy Trust of Oregon cost-effectiveness exceptions
- Avoided costs in energy efficiency-10%
- ETO Equity metrics – HB 3141
- Avoided costs in energy efficiency – GHGs and more
- Flexible Load/DR
- Transportation Electrification – 'Jurisdiction' societal cost test

Planning/ investments

- Non-wire solution pilots
- DSP investment scoring

Pricing

- Community Solar Program
- Resource Value of Solar (RVOS)
- Bill discount rates and energy assistance
- Storage pilots – value stack

Where we've been ⟷ **Where we're going**

Comment in Chat: Others not listed?

OPUC DOCKETS

Title	Docket	Approach	Non-Energy Impacts	Update Cycle
RVOS	UM 1910, 1911, 1912	12x24 value stack methodology - solar specific - with 11 elements that are mostly utility system costs - no specific use for RVOS adopted by Commission yet	Includes info only element for Environmental Compliance and placeholder future element for RPS Compliance	On hold. Not applied.
Avoided Cost - PURPA	UM 1728, 1729, 1730, 2000, 2001	On and off peak $/kWh avoided cost price for a baseload, wind, or solar QF based on an avoided CCCT or wind resource - future docket to consider methodology changes. Data gathered from IRPs and GRCs	NEIs not under consideration currently	Updated annually or 60 days after IRP.
Energy Efficiency Avoided Costs	UM 1893	On and off peak $/kWh avoided cost price. Data gathered from IRPs and GRCs.	Measurable impacts, such as water savings, are included along with 10% regional credit. Non-measurable impacts can be supported through exceptions to cost-effectiveness.	Methodology and data reviewed and approved annually through stakeholder process.
Net Metering	NA	Simple crediting approach - net excess generation credited at retail rate in form of a kWh credit that rolls over for up to a year	NEIs not under consideration currently	No update required.
Community Solar Program	UM 1930	Simple crediting approach - subscribed generation credited at residential retail rate - although different bill credit rates for low-income, residential and commercial	NEIs not under consideration currently	No update required.

OPUC DOCKETS

Title	Docket	Approach	Non-Energy Impacts	Update Cycle
Distribution System Planning	UM 2005	Currently using CA Standard Practice manual BCAs.	Under consideration	None established yet. Update process to be considered under UM 2005 beginning in 2023.
Transportation Electrification Planning	UM 2165, 2033, 2035, 2056	Currently using CA Standard Practice manual BCAs. New approach will be developed by 2025 through stakeholder process.	Under consideration	None established yet. Update process to be considered under UM 2165 to inform TE Plans submitted in 2025.
Energy Storage Pilots	UM 1751, 1856, 1857, 2078	12 x 24 value stack utilizing 17 elements developed in conjunction with PNNL	NEIs not under consideration currently	None established yet. Still in pilot phase.
Flexible Load/Demand Response *(I.e., PGE Flexible Load Multi-Year Plan, Smart Grid Test Bed, PAC C&I programs)*	UM 2141, UM 1976, UM 1514, 1708, 1827, UE 342	Currently using CA Standard Practice manual BCAs.	Under consideration	None established yet.

Pulling it back to Clean Energy Plans

HB 2021 specifies:

- Environmental and health benefits
- Resiliency costs, risks, benefits
- Offsetting fossil with CBREs costs, risks, opportunities
- Other relevant acknowledgement factors

job creation, tax revenues, create secondary jobs

improved air quality, weatherization, comfort, hospital admissions, reduced wood burning for home heating, reduced health care costs, GHG reduction, pollution reduction, particulates reduction, reduced outages, reduced disconnections

Certain community benefits are not necessarily quantifiable or fungible.

What environmental and health factors should be considered and prioritized in HB 2021 implementation requires greater community engagement beyond the traditional PUC engagement with stakeholder

Oregon Perspectives

Utility Experiences

Angela Long, PGE

Human-centered Planning

Angela Long, Manager of Strategy & Planning

June 2, 2022 | OPUC CEP Workshop

PGE

Co-creating Energy Equity

Equity refers to the fair treatment, access, opportunity, and advancement for all people.

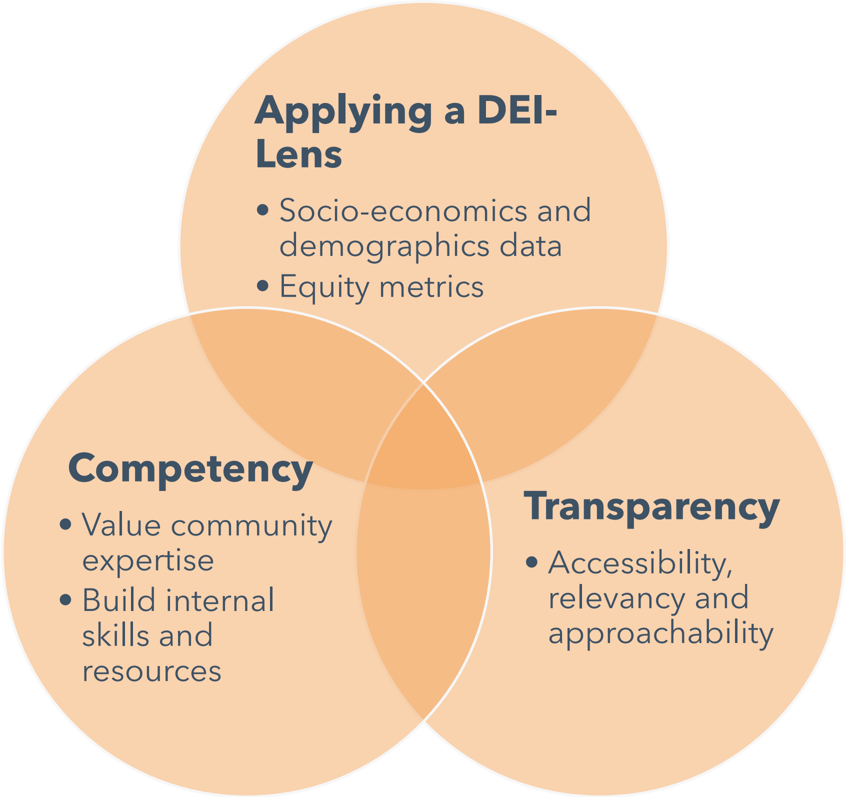
– Department of Energy & Environment (DOEE)

PGE Leading with a DEI-Lens

Enabling equitable participation in the clean energy transition through human-centered planning and community engagement.

Community Engagement

Human-centered planning



Community Touchpoints

Customers / Community Needs

- Affordability
- Reliability
- Neighborhood Impact
- Opportunities for workforce
- Economic development

\+

Grid Needs

- Safety
- Physical needs
- Reliability

=

Identify Possible Burden + Mitigations

- How the grid and community are best served

Co-create utility plans

Environmental Justice

Equal protection from environmental and health hazards and meaningful public participation in decisions that affect the environment in which people live, work, learn, practice spirituality and play. – Oregon House Bill 2021

Prevent Harm
(Who is Burdened?)

Provide Benefit
(Who Benefits?)

Inclusive and Accountable Decision-Making
(Who is at the Table?)

Source: House Bill 2021- https://olis.oregonlegislature.gov/liz/2021R1/Measures/Overview/HB2021

Environmental justice metrics and data sources

Demographic variables

Variable	Data Source
Racial Compositon	ACS
Homeownership	ACS
Households with Above Average, High, or Severe Energy	DOE LEAD
Education	ACS
PGE Pmt/Service Flag	PGE
Poverty level	ACS
Tribal Communities	ACS
Rural Communities	RUCA
Frontier Communities	ACS
Coastal Communities	ACS
Housing Type	ACS
Households with High Living Costs	ACS
Lack of Internet Access	ACS
Income Stress	ACS
Utility Burden	ACS
English Proficiency	ACS
Householder's Age	ACS
Health Insurance Stress	CDC 500 Cities
Eviction Rate	Princeton Eviction La
Electricity Burden	ACS
Gas Burden	ACS
Water Burden	ACS
Asthma	CDC 500 Cities

Environmental variables

Variable	Data Source
Air Quality (AQI)	EPA OAR
Air quality (PM2.5);	EPA EJ Screen
Air quality (O3);	EPA EJ Screen
Air toxics cancer risk	NATA
Respiratory hazard index	NATA
Diesel PM	NATA
Proximity to Traffic (Air quality)	EPA EJ Screen
Proximity to Environmental Hazards	EPA EJ Screen
Superfund Proximity	EPA EJ Screen
RMP Facility Proximity	EPA EJ Screen
Hazardous Waste Proximity	EPA EJ Screen
Underground Storage Tanks (UST)	EPA EJ Screen
Wastewater Discharge	EPA EJ Screen

Resiliency variables

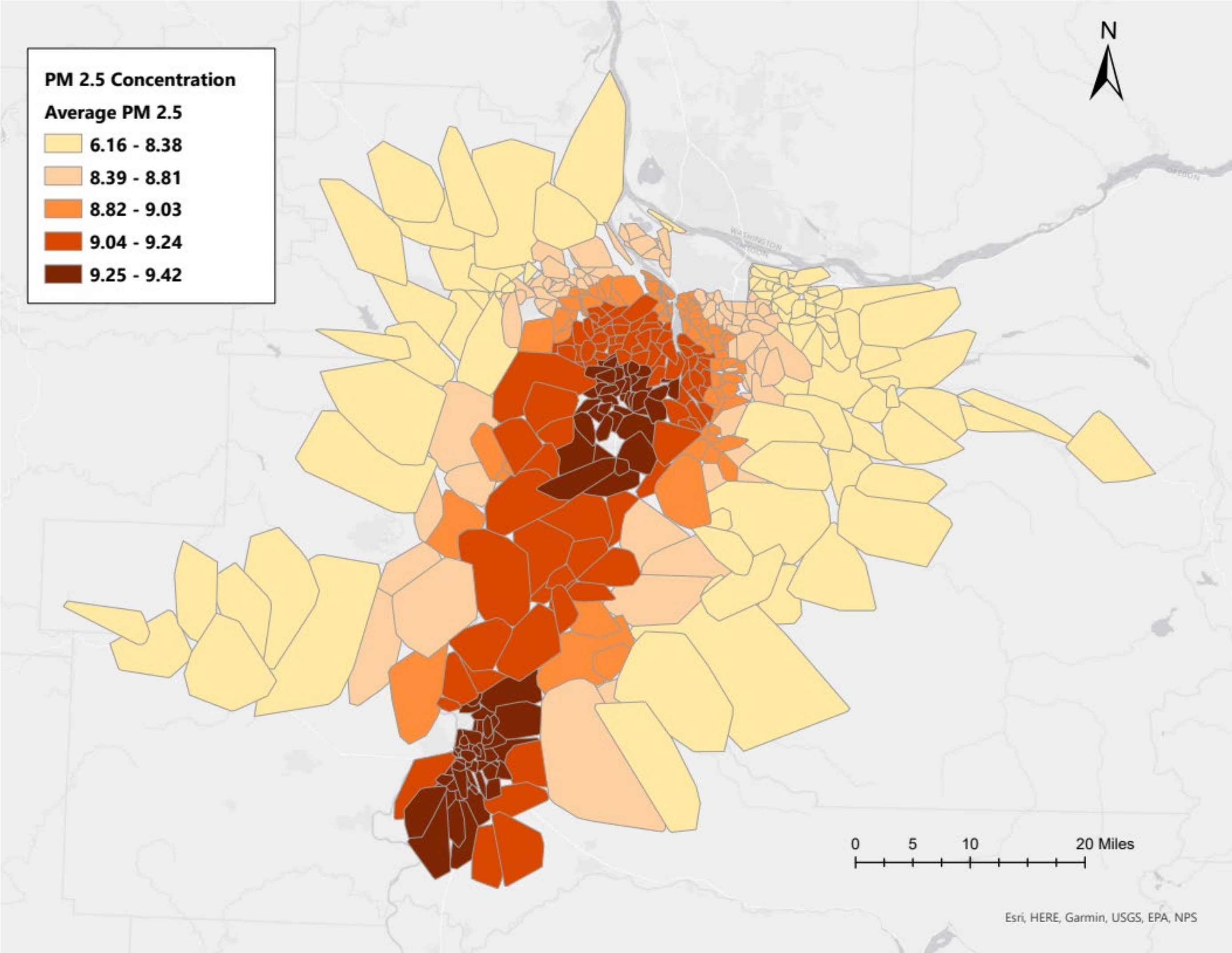
Variable	Data Source
Public Safety Power Shutoff Zone	PGE
Wildfire Risk	Oregon Department
Flood Risk	RLIS-FEMA
Seismic Risk	DOGAMI
CMI	PGE SAM
CELID24	PGE SAM
Loss of supply substation - count	PGE SAM
Loss of supply substation - hours	PGE SAM
Loss of supply transmission - count	PGE SAM
Loss of supply transmission - hours	PGE SAM
MED	PGE SAM
SAIFI	PGE SAM
SAIDI	PGE SAM
Sustained outages	PGE SAM

Example – PM2.5

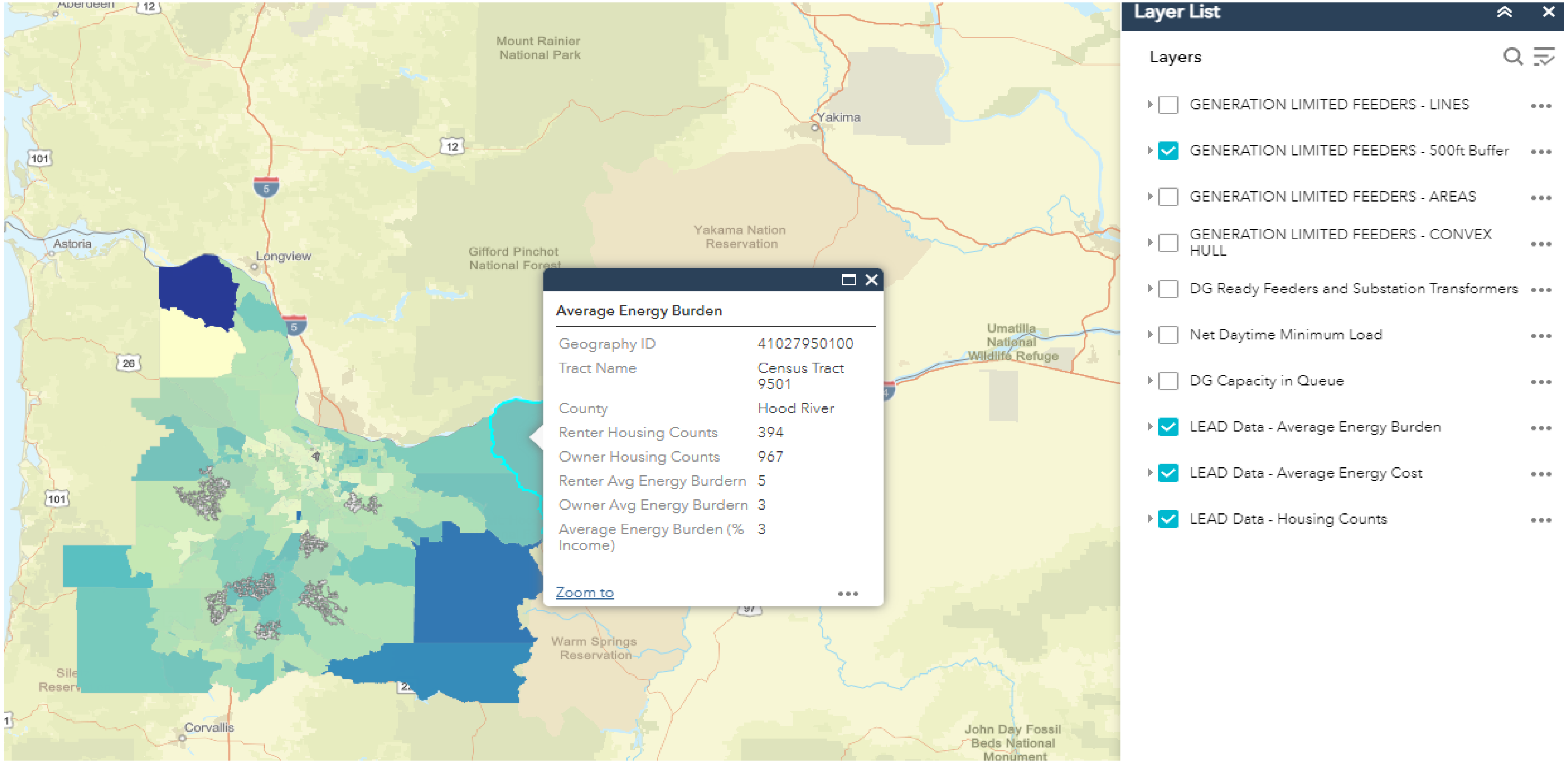
Particulate Matter – PM2.5 measurements come from EPA's EJScreen Tool, also used in Greenlink Equity Map

Mapped PGE service points to census-tract and feeder to correlate data points

Next step: Continue analysis of overlapping variables for any correlations with each other and DER adoption forecasts



LEAD Data Transferred into DG Evaluation Map



[LEAD Data (arcgis.com)](), [LEAD Tool | Department of Energy]()

Additional Material

Community Engagement

Where Are We?

Community Workshops	**Dates and times:** March 16, April 7, May 4 & May 25 from 9-11 am
	Topics to discuss: Equity Data, Community Needs, NWS Pilot Projects
	Audience: Community Based Organizations (CBOs), municipalities, and city gov
CBO Engagement	Clean Energy Project & Energy Trust of Oregon (ETO) Working Together Grant
	Co-development of Community Workshops
Adding Capacity	Community Engagement & Diversity Equity and Inclusion (DEI) roles: - **Samantha Thompson**, Energy Equity Partner - **Walle Brown**, Principal Diversity Consultant

Community Workshop Goals

For stakeholder groups to better understand the technical DSP workspace

- Understand, Advise, Advocate

For PGE to have more effective processes

- Utilizing most effective methods
- Finding most effective tools

For PGE to conduct Community Needs Assessment

- Integrate equity with grid needs
- Better partnerships

Community Workshop Attendees

Organization	Area of Focus – Mission/Values
PGE*	Utility - Contribute to the people, cultures, and communities it serves – all while continuing to provide safe, reliable and affordable energy
Community Energy Project (CEP)**	Education, home & energy repairs, EE solutions - Everyone deserves a safe, healthy, efficient home, regardless of income.
ICF**	Management Consulting - Building a safe and prosperous world for all
NW Energy Coalition	Decarbonized and equitable energy system - Coalition of human, environmental, utilities, and businesses across NW states
Multnomah County Office of Sustainability	Sustainability - Connection between healthy planet and healthy people, achieving social, economic, and environmental justice
Coalition of Communities of Color	Multi-focus including racial justice, decolonizing research, EJ - Right to research, right to know, right to be seen, right to be heard
Verde	Environmental investments - Building environmental wealth thru social enterprise, outreach, advocacy
Unite Oregon	Justice - HUG-led, build a unified intercultural movement for justice
Spark NW	
Metro Climate Action Team (MCAT)	Community of experienced volunteers working within OLCV to steward significant greenhouse gas reduction policy into law in Oregon
Oregon Public Utility Commission (OPUC)	Chief electric, gas and telephone utility regulatory agency of the government of the U.S. state of Oregon. It sets rates and establishes rules of operation for the state's investor-owned utility companies
Citizen	

Topics Covered in Community Workshops

Electric Utility Planning

WHY IT MATTERS

- **Keep the lights on 24/7/365**
- **Safe operations**
- **Keep bills low**
- **Electrify transportation**

PGE Distribution System Plan (DSP) Part 1 (October 2021):
https://assets.ctfassets.net/416ywc1laqmd/i9dxBweWPkS2CtZQ2lSVg/b9472bf8bdab44cc95bbb39938200859/DSP_2021_Report_Full.pdf

PGE

Community Touchpoints

Customers / Community Needs + **Grid Needs** = **Identify Possible Burden + Mitigations**

Customers / Community Needs	Grid Needs	Identify Possible Burden + Mitigations
Affordability Reliability Neighborhood Impact	Safety Physical needs Reliability	How the grid and community are best served

Co-create a Distribution System Plan (DSP)

Environmental Justice

Equal protection from environmental and health hazards and meaningful public participation in decisions that affect the environment in which people live, work, learn, practice spirituality and play. – Oregon House Bill 2021

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(Who is Burdened?)

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(Who Benefits?)

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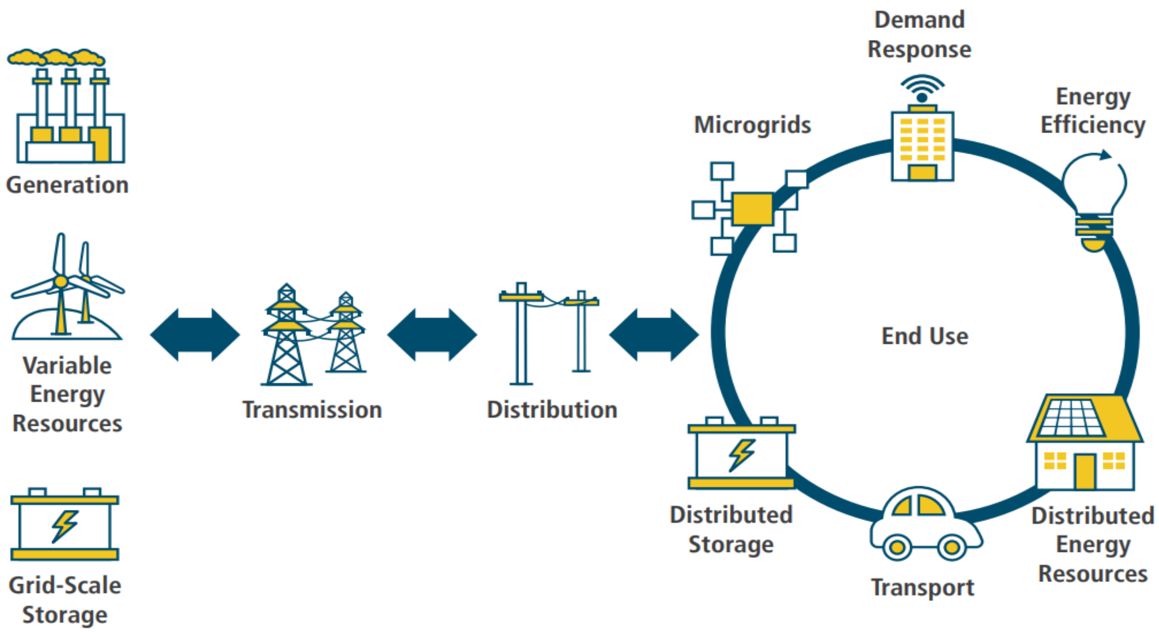
Co-creating Energy Equity

Equity refers to the fair treatment, access, opportunity, and advancement for all people.

– Department of Energy & Environment (DOEE)

Modern Electric Grid

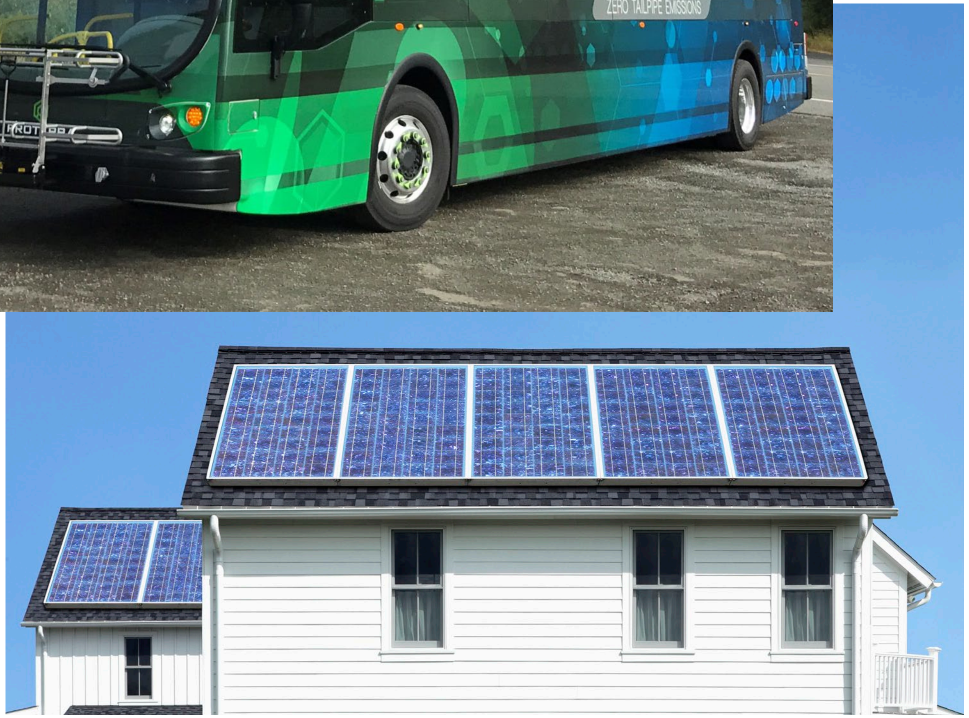
From one-way power flow - large generation facilities to end users/customers



To two-way power flow – end users/customers can also generate power and/or interact with the electric grid

PGE

Distributed Energy Resources (DERs)



Workshops 1 & 2 Takeaways

- COMMUNITY BENEFITS
- RENTERS VS OWNERS' NEEDS
- TRANSPARENCY
- OUTCOMES
- FUNDING / FINANCIAL NEEDS
- EDUCATION / AWARENESS
- COMMUNITY INVOLVEMENT
- TRUST

Community Benefits

Human well-being is fundamental to energy equity and must be reflected in solutions

CBOs want EJ communities to benefit from the energy transition

- Opportunities for workforce
- Economic development

Renter vs Owners' Needs

Distinctions between building owners & tenants

- decision-making power
- cost burden (cost pass-throughs)

Outcomes

Clear communication of goals

Collaboration that leads to actions & benefits for the community

For example, planning with an equity lens to help support environmental justice (EJ) communities' needs.

How community feedback will translate into action by PGE

Funding & Financial Needs

Financial barrier to participate in PGE

- Meetings/ workshops (CBOs)

- Programs
  - In upfront costs
  - Balancing other financial needs, and
  - Realizing program benefits to cover costs

- To offer new options to their constituents through incentives, rebates, and programs

Transparency

PGE's

- Processes
- Responsibilities
- Budget
- Activities
- Rates
- Decisions, etc.

Customers' electric bills

i.e. How customer/DER data will be used, and privacy maintained

Education / Awareness

Distribution System Planning

- Processes
- Resilience
- New technologies
- Ways to work together

CBOs want to learn more about conservation programs

- Rebates
- Incentives
- Grants
- Tax credits

New technologies, how to use them, & PGE’s programs

Trust

A lack of trust was identified as a key barrier to DER participation, given the historical relationship with utilities to prioritize customers' best interests.

Community Workshop # 3

Integrating all the knowledge built from previous workshops

- **Step 1:** Identify a grid need that an NWS could solve (in a location)
- **Step 2:** Identify the community energy needs of the location
- **Step 3:** Conduct a DER stacking exercise to solve the identified community energy needs and grid need

PGE

Next steps – Continue exploring

What it means to co-create

What equity means to CBOs and how it applies to the energy space

How to define community needs

Next steps

Complete Energy Efficiency disaggregation to substation

Write-up report section for DSP Part II – DER and load forecast section

Incorporate results into IRP modeling workflow – resource adequacy and portfolio optimization

Incorporate TE findings and analysis into TE Plan

Continue model refinements

Iterate with Community Workshops on Equity Metrics and incorporation of energy equity data for NWS concept proposals

Oregon Perspectives

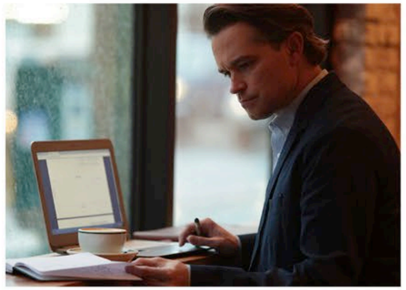
Utility Experiences

Erik Anderson, PAC

Pacific Power Community Resiliency Pilot
UM 2225- Clean Energy Plan Workshop
June 2, 2022








PACIFIC POWER

POWERING YOUR GREATNESS

Today's Agenda

1. Overview of the program
2. Program Timelines
3. Facility Findings
4. Program Findings
5. Research Plan

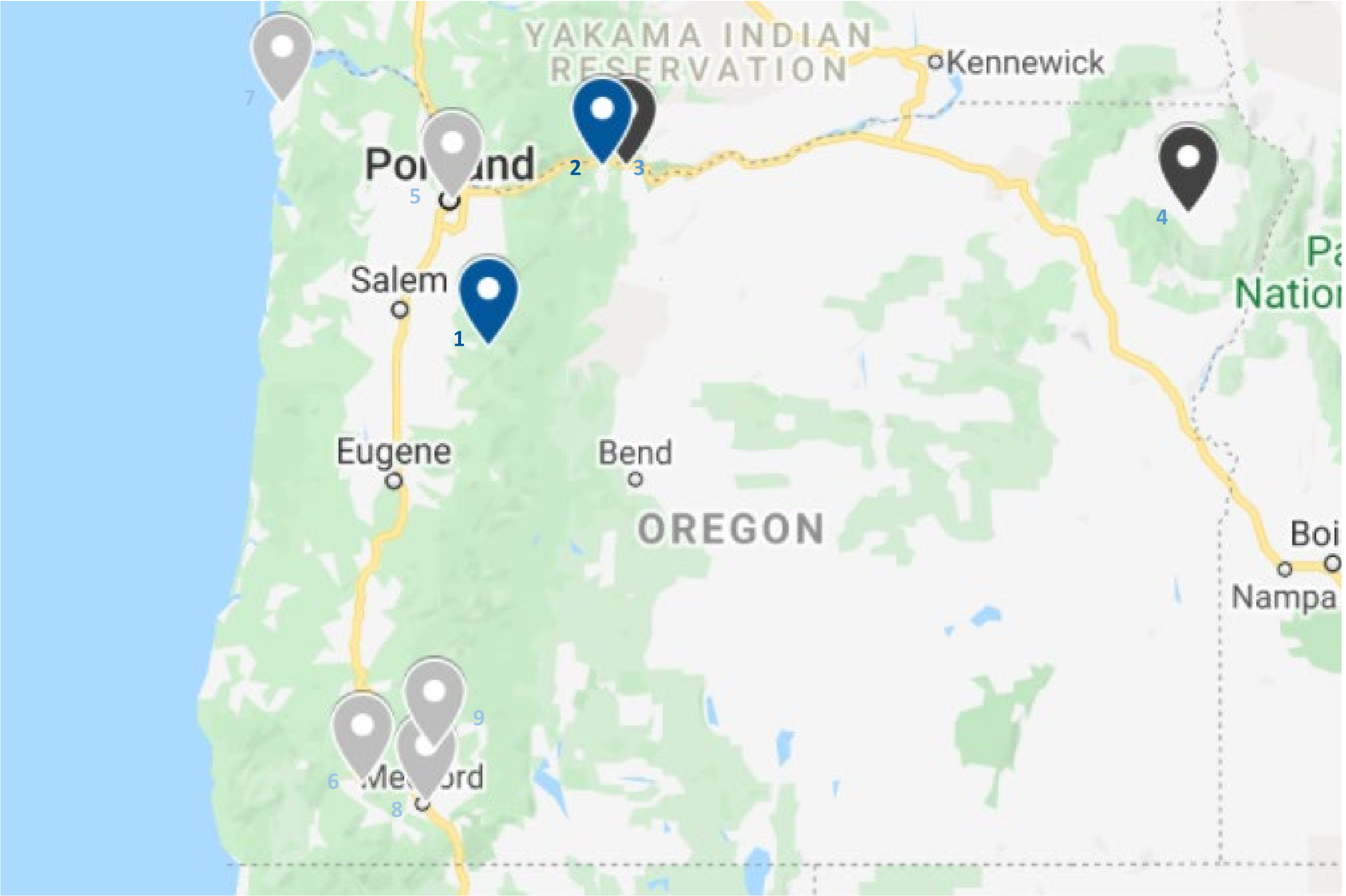
Project Goals & Objectives

Work with communities to test storage opportunities for resiliency during long-term power outages

- Identify the value of energy storage
- Identify value of energy storage for customers and utility during normal grid operations
- Identify market barriers, solutions and additional value streams
- Develop methodologies for balancing the benefits of customer-sited equipment
- Strengthen existing community connections
- Understand how technical assistance informs and motivates customers
- Utilize results to inform future energy storage initiatives
- Likely outcome of expanded program
  - 6-8 Engineering studies
  - 4-8 Installed storage facilities (range in size from 20 -100 kW)

Selected Facilities- Technical Studies

PACIFIC POWER



	Facility Type	FEMA Category
1	Fire Station	B – Emergency Ops.
2	Fire Station	B – Emergency Ops.
3	School	A – Designated Shelter
4	Community Center	A – Designated Shelter

Current Program Timeline

Milestone	Date
Engineering Study Applications Accepted	October 1, 2021
Grant Application Window #1 Opens	October 11, 2021
Grant Application Window #1 Closes	January 14, 2022
Applicant Status Notifications	February 25, 2022
Grant Application Window #2 Opens	**August 1, 2022**
Grant Application Window #2 Closes	**October 28, 2022**
Applicant Status Notifications	December, 2022

Grant Application Window 1 Results

- Feasibility Study
  - One Customer/ Two Projects
    - Wastewater Plant
    - Drinking Water Plant

- Project Development Grants
  - One proposal submitted
  - One proposal selected

Facility Findings

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Tie the technical assistance to funding—grant funding or incentive dollars—to ensure follow-through and adoption.

- Back up storage systems may be more resilient than a standard back up generator, **primarily because it reduces fuel delivery risk.** Battery storage and solar reduce the run time and fuel usage of the backup generator.

- Resiliency Projects are long lead time projects, plans need to be developed, **funding sources secured**, building operations need be modified to reflect the new infrastructure.

- **Understanding the energy systems can be outside the scope of the community facility managers and limit the interest of potential participants.**

Program Findings

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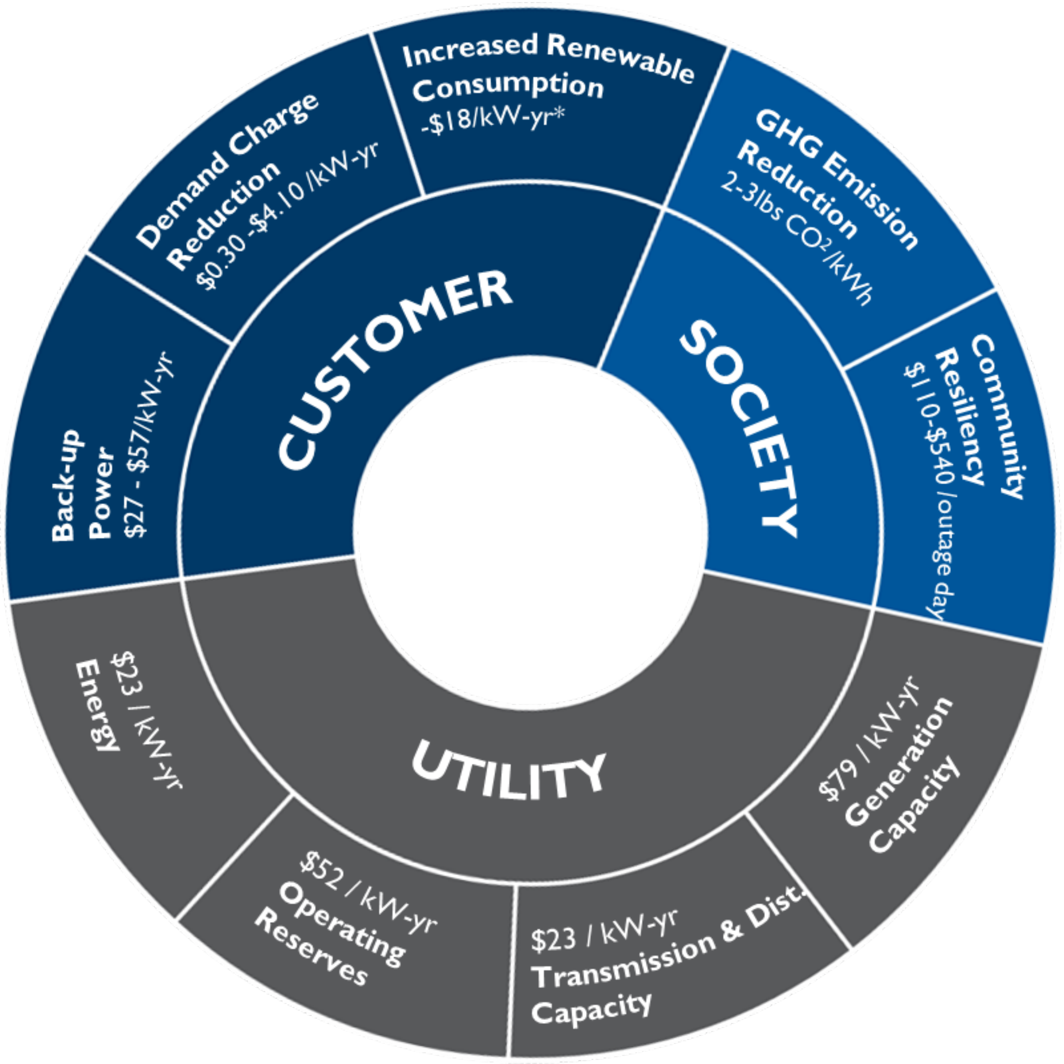
Must consider the balance between "Individual benefit" and "Ratepayer benefit" when designing incentives for resiliency.

Increased understanding of the benefits beyond Utility benefits provides insights into the possible expansion of storage programs.



Primary Research and Program Evaluation

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<u>Operational Learning Opportunities</u>

- What is the process to interconnect commercial storage facilities into the utility distributed battery grid management system
- What challenges are encountered interconnecting commercial scale storage control systems into the existing distributed battery grid management system?
- Can the DBGMS track generator usage as well as renewable generation and storage dispatch and charging for resiliency operations evaluation.
- How do commercial load shapes alter the available capacity for utility dispatch of a storage facility as compared to residential systems?
- How do commercial rate structures that include demand charges impact the dispatch flexibility?

<u>Distribution System Benefits</u>

- Opportunities for engineering study will be based on installed system size and location
- Potential research opportunities will be evaluated as a portion of project selection

Primary Research and Program Evaluation #2

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<u>Customer Impact Evaluation</u>

- Third party evaluation of customer impacts, both financial and resilience
- Compare and contrast pre installation vs post installation customer outcomes
    - Collect pre installation customer usage information to use as a baseline.
        - Commercial projects will typically have15 minute interval data for multiple years through AMI. We will evaluate initiating more granular usage data for selected projects.
    - Ensure collection of post installation usage information and accuracy through utility DBGMS validated through AMI comparison. DBGMS provides visibility into onsite generation, storage charging and discharging, grid export and import amounts.
    - Evaluate demand charge and customer bill impacts for different use cases
        - 100% customer demand management
        - Maximized onsite renewable usage
        - System peak demand dispatch
        - Localized distribution benefit dispatch
        - Voltage regulation dispatch
        - Other?
    - Evaluate reduced disruption and outage minutes at facilities.
    - Evaluate impacts of weather on storage and solar availability for customer and utility dispatch
    - Compare customer financial impacts of utility centric dispatch vs customer centric dispatch
- Extrapolate utility benefit at scale of utility centric, balanced, customer centric dispatch, Define these terms and propose optimized dispatch.

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Questions?

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Customer Program Development Manager
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Wrap Up Discussion

- What would you like to learn more about in this context?
- What's most important?
- Where do you see the most synergy to leverage activities underway—PUC and beyond?

What's next?

- Introduction to Resiliency Planning Workshop
  - June 15, 2022 (1-4p)
  - Education and discussion focused workshop to share and discuss USDOE background materials gathered and the pathway to develop recommendations for "reasonable and prudent industry resilience standards and guidelines."

Thank you!!

Questions/ideas:

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Critical Facility Definition

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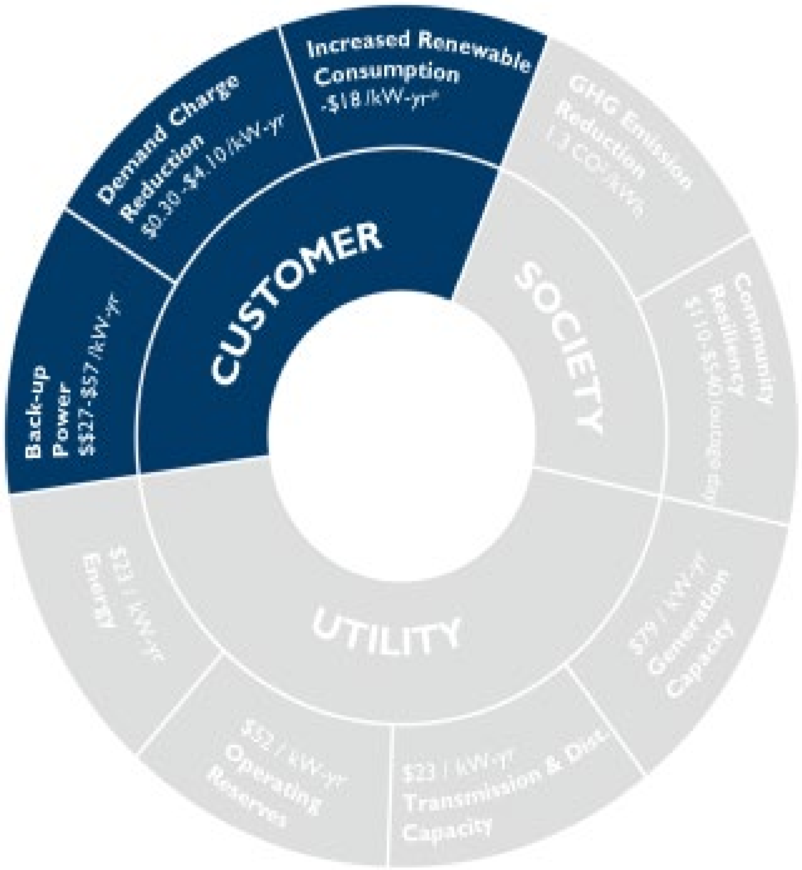
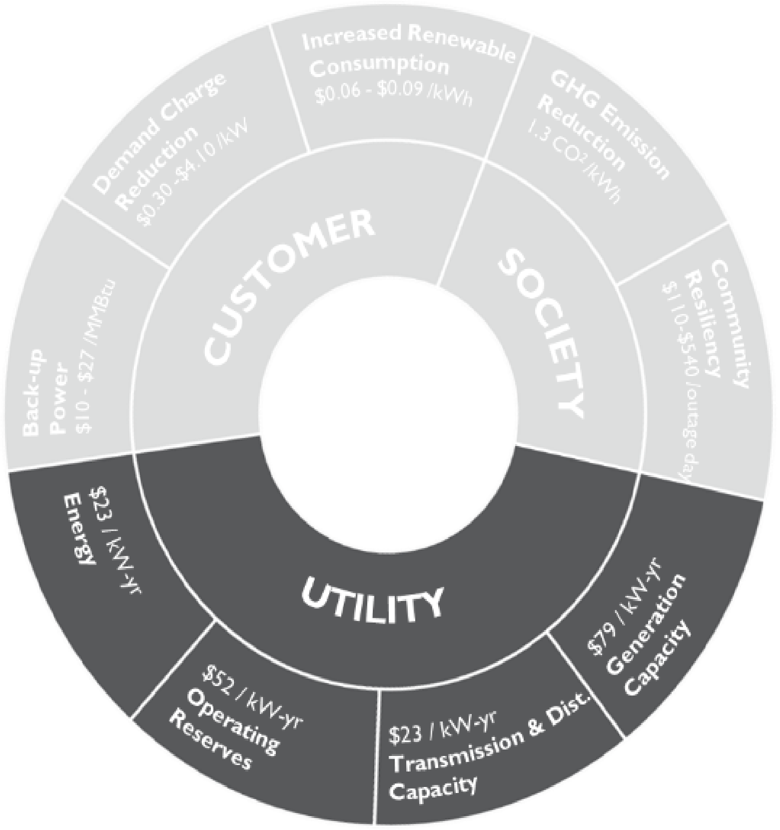
Police stations; fire stations; emergency response providers: emergency operations centers; 911 call centers, also referred to as Public Safety Answering Points; medical facilities including hospitals, skilled nursing facilities, nursing homes, blood banks, health care facilities, dialysis centers and hospice facilities; public and private gas, electric, water, wastewater or flood control facilities; jails and prisons; locations designated by the IOUs to provide assistance during PSPS events; cooling centers designated by state or local governments; and, homeless shelters supported by federal, state, or local governments; grocery stores, corner stores, markets and supermarkets that have average annual gross receipts of $15 million or less as calculated at a single location, over the last three tax years; independent living centers; and, food banks.

Value to the Customer

Customer Benefit	Description
Back Up Power	Provide additional Reliability and Resiliency in the case of an outage
Demand Charge Reduction	Sometimes called peak shaving or load shifting, involves dispatching a battery's stored energy to level demand (kW) use to reduce the associated charges on utility bills
Increased Renewable Self-Consumption	Capture solar energy to use onsite to increase value



Value to the Utility



Grid Service	Description
Energy Arbitrage	The practice of purchasing and storing electricity during off-peak times, and then utilizing that stored power during periods when electricity prices are the highest.
Resource Adequacy	A condition in which the region is assured that, in aggregate, utilities or other load serving entities (LSE) have acquired sufficient resources to satisfy forecasted future loads reliably.
Operating Reserves	Demand that the end-use customer makes available to its load-serving entity via contract or agreement for curtailment.
Transmission & Distribution Deferral	Defer or avoid the need for a T&D equipment upgrade that is needed due to demand growth.

Value to Society

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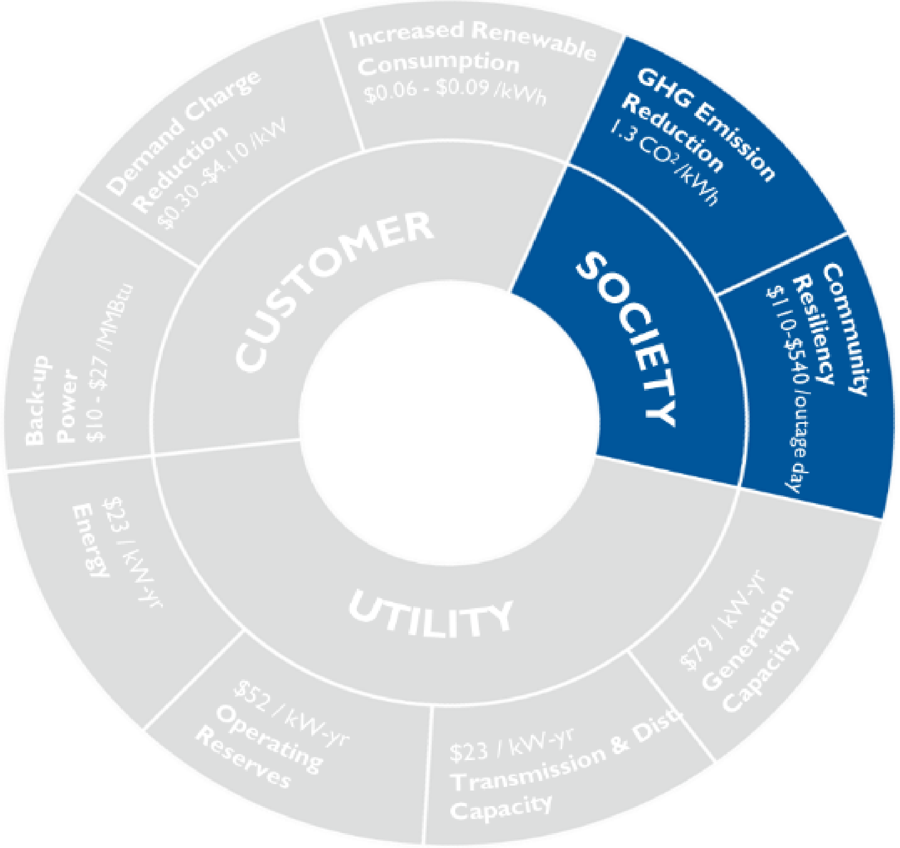
Societal Benefit	Description
Community Resiliency	During a grid outage, the value of having backup power to ensure the availability of emergency services can be valued in terms of avoided property damage, injuries, lives lost, and, to a lesser extent, lost revenue.
GHG Emissions Reductions	GHG emissions reductions from a solar plus battery energy storage resiliency system come from offsetting utility energy consumption during normal operations from the solar system and reducing or eliminating fossil fueled backup generator operation during an outage.



Value to the Utility

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Program Year	Cumulative Participating Capacity (MW)	Energy Arbitrage	Operating Reserves	Transmission & Distribution Deferral	Resource Adequacy	Total
2020	0.1	$3,076	$5,234	$2,290		$10,600
2021	0.4	$12,700	$21,413	$9,368		$43,482
2022	1	$32,803	$54,753	$23,955		$111,511
2023	2.6	$88,244	$145,603	$63,703		$297,550
2024	5.8	$439,875		$145,346		$585,221
2025	10.8	$898,706		$276,815		$1,175,520
2026	15.8	$1,399,507		$414,203		$1,813,710
2027	19	$1,700,560		$509,449		$2,210,009
2028	20.6	$1,873,690		$564,944	$2,207,884	$4,646,518
2029	21.2	$2,064,445		$594,654	$2,238,736	$4,897,835
2030	21.5	$2,284,696		$616,819	$2,190,598	$5,092,113
Total		$10,798,302	$227,003	$3,221,546	$6,637,217	$20,884,068

Increasing Value over Time

Value to Society

$600,000 and $3 million in resiliency benefits for a single two-week outage

Program Value Tomorrow

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Commercial-scale battery storage as starting point for Pacific Power to explore management of customer distributed energy resources