Pacific Northwest
NATIONAL LABORATORY

PNNL-32179

Review of Energy Equity Metrics

October 2021

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U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Summary

A literature review of energy equity and energy justice metrics was performed to support efforts to develop an energy equity metrics framework. Pacific Northwest National Laboratory (PNNL) reviewed the available literature, surveyed work in progress on the topic, and solicited expert feedback to lay the groundwork for metrics development and provide reference material for energy equity research and development applications.

This literature review identified three distinct equity metric types: target population identification, investment decision making, and program impact assessment.

- *Target population identification* metrics capture descriptive analytics on the population that may be eligible for support programs.
- *Investment decision making* metrics describe how one population compares to another. These metrics are often developed by contrasting target population metrics between groups.
- *Program impact assessment* metrics show how well a support program has helped a target community.

Advancing an equitable energy future requires understanding and expanding beyond the currently available measurement mechanisms. Demographic and energy related indicators such as income, age, race, ethnicity, geographic location, energy access, energy use intensity, energy affordability, access to renewable energy, incentive accessibility, access to public services, community engagement, etc. can be used to represent the relevant equity outcomes for collecting baseline equity measurements.

The following two research areas are identified as near-term needs for equity metrics:

- enhancing capabilities for mapping and tracking energy inequities, and
- designing methods to appropriately identify target populations by operationalizing community descriptive terminologies (for example, disadvantaged communities).

A key analysis area is the need for assigning scales for equity measurement—that is, answering the question: at what level should equity effects be assessed? Whether the appropriate scale is at the societal, community, neighborhood, household, or individual level needs to be thought through while addressing the issue of data availability at the desired measurement level. The data that allows for population identification at the community-scale can be episodic and difficult to correlate to other activities or systems. The most comprehensive, national data sets can be geographically diffuse, and must be either downscaled or developed through analytical means. Identifying the appropriate levels for equity measurement would allow for a more equitable quantification and comparison of inequities across populations.

Acknowledgments

The authors thank those who reviewed the findings of the study for their thoughtful comments and suggestions.

Acronyms and Abbreviations

EIA	Energy Information Administration
EJ	environmental justice
DOE	Department of Energy
EPA	Environmental Protection Agency
HDI	Human Development Index
LIHEAP	Low-Income Home Energy Assistance Program
PNNL	Pacific Northwest National Laboratory

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1.0 Introduction

Extreme weather events, brought on by the accelerating effects of climate change, have shed light on deficiencies in the ability of marginalized populations in the United States to access energy and the heightened ramifications of energy use among them. Recent advances, including grid modernization, clean energy deployment, and improved weatherization of buildings, should ostensibly alleviate these deficiencies. However, these new technologies are not accessible to all. To ensure that the benefits of grid modernization and clean energy deployment reach all individuals and that possible negative impacts do not disproportionately burden marginalized populations, the development of energy equity metrics and corresponding data analysis techniques is imperative.

The goal of achieving an equitable energy future that leaves no one behind is rooted in the principles of energy justice. Energy justice is conceptualized as integrating justice principles, fairness, and social equity into energy systems and energy system transitions (Sovacool and Dworkin 2014; Sovacool et al. 2017; Bouzarovski and Simcock 2017; Heffron and McCauley 2017). As such, a just energy transition would be one that

> equitably shares both the benefits and burdens involved in the production and consumption of energy services, as well as one that is fair in how it treats people and communities in energy decision-making
>
> (Sovacool & Dworkin 2014).

Applying energy justice advances the prioritization of human-centered concerns in energy system design and decision-making. It requires that everyone has reliable, safe, and affordable sources of energy and that the costs and benefits of energy services are disseminated fairly. This means energy justice is concerned with addressing energy inequities during energy production, distribution, and consumption, including pollution exposure, employment opportunities, land access, sufficiency of information about energy-related issues and new energy developments, and distribution of profits from energy investments.

Communities of color, those living on low to moderate incomes, and those on the frontlines of climate change (Table 1) are only some of the groups who have disproportionately felt the burden of an inequitable energy system. Recent policy[1] initiatives have begun to highlight the clear need to generate energy equity and justice, but ways for measuring progress toward these

[1] Executive Order 13985, Advancing Racial Equity and Support Underserved Communities Through the Federal Government, states the following: “The Federal Government should pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our Government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies (agencies) must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity. By advancing equity across the Federal Government, we can create opportunities for the improvement of communities that have been historically underserved, which benefits everyone.” https://www.govinfo.gov/content/pkg/FR-2021-01-25/pdf/2021-01753.pdf

Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, Sec. 223, Justice40 Initiative, indicates that “40% of the overall benefits of certain federal investments—including investments in clean energy and energy efficiency; clean transit; affordable and sustainable housing; training and workforce development; the remediation and reduction of legacy pollution; and the development of clean water infrastructure—must flow to disadvantaged communities.” (https://www.govinfo.gov/content/pkg/FR-2021-02-01/pdf/2021-02177.pdf)

goals are not yet clearly defined. This report aims to provide an overview of the current metrics and identifies areas that require new metrics to support ongoing efforts in energy equity metrics development. Pacific Northwest National Laboratory (PNNL) conducted this review study as an initial assessment toward measuring, analyzing, and tracking equity.

Table 1. Terms for describing social and economic status.

Community Designation	Definition
Underserved communities	People who have a decreased level of service or access to energy system services.
Marginalized people	People excluded from participating in decision-making and those who lack access to basic economic, political, cultural, and social activities.
Vulnerable populations	Those who are economically disadvantaged, racial and ethnic minorities, the elderly, rural residents, those with inadequate education, and those with other socio-economic challenges.
Highly impacted communities	Communities living in geographic locations characterized by energy inequity and facing economic or historical barriers to participation in energy decisions and solutions.
Disadvantaged communities	Those who most suffer from economic, health, and environmental burdens.
Over-burdened populations	Minority, low-income, tribal or indigenous populations, or geographic locations that potentially experience disproportionate environmental harms and risks.
Frontline communities	Communities that experience the first and worst of air pollution resulting from energy systems.
Fenceline communities	Communities living in closest proximity to dangerous facilities (within one-tenth of a facility's vulnerability zone).
Environmental communities	Those who are most affected by environmental harms and risks.
Low- to moderate-income persons	People who make less than 80% of the area median income.

The report is structured as follows: Section 2.0 presents brief background information about energy justice and energy equity; Section 3.0 provides the methodology employed when conducting the metrics literature review; Section 4.0 describes the results of the review; Section 5.0 identifies gaps and recommendations for future work; and Appendix A contains a complete list of the distinct equity metrics.

2.0 Background

Energy justice or energy equity emerged as a principle targeted to eliminate inequities caused or exacerbated by energy systems (Sovacool et al. 2014). These energy system inequities include energy poverty, energy burden, energy insecurity, and energy vulnerability among others (Table 2). These energy inequities highlight the embedded human and social dimensions of the energy system. Advancing energy equity requires understanding how the energy system intersects with and affects issues related to the environment, economy, public health, security, and resilience. It is critical to link these intersections with demographic factors such as income,

race, gender, ethnicity, employment, location, ability status, homeownership, and level of education (Lewis et al. 2020). The process of dissecting and differentiating the impacts across these demographic indicators allows for the identification of those in society who are vulnerable, highly affected, underserved, or marginalized due to the energy system (Hernandez 2015). In this way, energy equity works to rectify the disparities in the share of benefits and burdens in society by revealing how current and historical energy system conditions have allocated benefits and harm to different segments of society.

Table 2. Definitions of energy inequities.

Energy Inequity	Definition
Energy poverty	The lack of access to basic, life-sustaining energy.
Energy burden	The percent of a household's income spent to cover energy cost.
Energy insecurity	The inability of a household to meet their basic energy needs.
Energy vulnerability	The propensity of a household to suffer from a lack of adequate energy services in the home.

Advancing energy equity integrates social justice and energy systems in order to humanize or create a human-centered understanding of energy issues. It incorporates notions of justice—fairness, impartiality, equity—into energy system design and implementation. This forms the foundation for the energy justice goal of ensuring the fair distribution of benefits and burdens associated with the energy system during energy production, distribution, and consumption (Jenkins et al. 2016). The social justice foundation also forms the three core tenets of the energy justice concept—distributive justice,[1] procedural justice,[2] and recognition justice[3] (McCauley et al. 2013).

Environmental justice (EJ) is another building block of the energy justice concept (Jenkins 2018). The EJ concept originated in the late 1970s and early 1980s as activist and network movements in the United States confronted the disproportional impacts of toxic hazards located in communities of color (Sciotte and Brulle 2017; Skelton and Miller 2016). The main concerns of the movement were issues of public health, civil and human rights, social justice, anti-racism, and ecological sustainability. Most members of the EJ movement were people from communities of color, indigenous communities, and working-class communities. EJ through its principles represents the vision of a possible equitable future. Environmental injustice (or environmental inequality), on the other hand, is the situation where a particular social group is disproportionately affected by environmental hazards (Brulle & Pellow 2006). A key manifestation of environmental injustice is environmental racism, which refers to any policy, practice, or directive that disproportionately affects or disadvantages (whether intended or unintended) individuals, groups, or communities based on race or color (Sovacool et al. 2014; Mohai et al. 2009).

[1] Distributive justice involves identifying where energy injustices emerge in society. See https://www.sciencedirect.com/science/article/pii/S2214629615300669.
[2] Procedural justice evaluates decision-making processes to assess whether all stakeholders have been included in a nondiscriminatory way. See https://www.sciencedirect.com/science/article/pii/S2214629615300669#sec0045.
[3] Recognition justice emphasizes the need to understand different types of vulnerability and specific needs associated with energy services among social groups. See https://www.frontiersin.org/articles/10.3389/fenrg.2019.00099/full.

The U.S. Environmental Protection Agency (EPA) defines EJ as

> the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no population, due to policy or economic disempowerment, is forced to bear a disproportionate share of the negative human health or environmental impacts of pollution or environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies.
>
> (U.S. EPA 2021)

3.0 Methodology

The literature review searched for articles, reports, presentations, and websites about energy metrics, which were organized into four categories: buildings, grid modernization, clean energy deployment, and general. The sources identified were reviewed, keeping track of the following datapoints for all metrics discussed in each source—metric name, metric description, and possible data source(s). A compilation of the sources referenced in this review report is presented in Table 3.

Table 3. Search results and data sources.

Source	Document Reviewed	Link
Urban Institute	The state of equity measurement: A review for energy efficiency programs	https://www.urban.org/sites/default/files/publication/101052/the_state_of_equity_measurement_0_0.pdf
U.S. Department of Energy, Better Buildings	Clean energy for low-income communities: Metrics and indicators	https://betterbuildingssolutioncenter.energy.gov/CELICA-Toolkit/metrics-and-indicators
University of North Carolina, Journal of Law & Technology	Grid modernization and energy poverty	https://scholarship.law.unc.edu/cgi/viewcontent.cgi?article=1333&context=ncjolt
Empower Dataworks LLC	Quantitative energy equity	https://pubs.naruc.org/pub/F7E7EDC7-155D-0A36-31CA-49A77302407D
Los Angeles Department of Water and Power (LADWP)	Equity metrics data initiative	LADWP: Equity metrics data initiative
California Energy Commission	Energy equity indicators map	https://www.arcgis.com/apps/MapJournal/index.html?appid=d081a369a0044d77ba8e80d2ff671c93
Southeast Sustainability Directors Network	How do we measure equity in energy efficiency? Household/Building?	SSDN: How do we measure equity in energy efficiency? Household/Building?
World Energy Council	World energy trilemma index, 2019	https://www.worldenergy.org/assets/downloads/WETrilemma_2019_Full_Report_v4_pages.pdf

Source	Document Reviewed	Link
City of Dallas	Dallas equity indicators	https://dallascityhall.com/departments/pnv/dallas-equity-indicators/DCH%20Documents/equity-indicators-booklet-2019.pdf
Greenlining	Equitable building electrification: A framework for powering resilient communities	https://greenlining.org/wp-content/uploads/2019/10/Greenlining_EquitableElectrification_Report_2019_WEB.pdf

From this document review process, the review curated a list of 57 distinct equity metrics (see Table of Metrics in Appendix A). The Table of Metrics shows each metric's name, the metric type (discussed below), possible data sources, the literature source proposing the metric, and the categorization of the literature source. After examining the comprehensive list of equity metrics, three distinct metric types were identified: target population identification, investment decision-making, and program impact assessment. Each metric identified in the literature review was assigned a metric type; the distribution of metrics between these three categories is given in Table 4.

Table 4. Metric type counts.

Metric Type	Count
Target population identification	24
Investment decision-making	25
Program impact assessment	8
Total	57

3.1 Analysis Steps

The initial phase of the review consisted of a thorough reading of the documents listed in Table 3 and identifying keywords related to measurement mechanisms, including metrics, indicators, and indices. Because these terms were used interchangeably when measuring equity across the reviewed documents, the study used the following definitions to differentiate between the terms:

- A **metric** is a quantitative measurement for a qualitative phenomenon that can help measure a specific equity outcome.
- An **indicator** is a representation of a relevant equity outcome that can be used to establish the state of equity at a given point in time and is useful in collecting baseline equity measurements.
- **Indices** are multiple indicators that are aggregated into a single measure.

The second phase involved construction of a database for compiling the analysis results for energy equity metrics. The analysis binned the results into the three metric types (Table 4) of target population identification, investment decision-making, and program impact assessment. The target population identification category of metrics provides measures of the distributive effects by offering the means to examine the distribution of benefits and burdens in society. The investment decision-making category of metrics enables the evaluation and assessment of the

fairness of funding and grant processes, policy levers, and equity-advancing program initiatives. The program impact assessment category of metrics enables the evaluation of program or project success in terms of equity-specific outcomes. In the third phase, external expert reviewers were consulted to confirm the scope and completeness of the review findings.

4.0 Discussion of Review Findings

This section presents the results of the energy equity metric review study. The results are organized according to the respective category of metrics under which they fall—community descriptive metrics, investment decision-making metrics, and program assessment metrics. The metrics in each category are described, data points needed to calculate each metric are listed, and potential resources through which to acquire the necessary data are identified. Generally, the study found that community descriptive metrics and program assessment metrics go hand-in-hand. That is, the program assessment metrics enable the assessment of the change observed in the target population on a certain specific inequity for which the target population was selected. For example, the energy burden index helps in identifying the target populations that face energy burden issues, while the energy burden change metrics measure the change in energy burden in that target population to assess whether the program was successful.

4.1 Community Descriptive Metrics

Energy equity measurement starts with identifying relevant populations. The community descriptive metrics help in providing measurement to locate or describe the relevant target population. These community descriptive metrics could be demographic, behavioral, geographic, institutional, historical, cultural, and so on. Critical to finding specific groups or communities is asking and answering questions, such as the following:

- Who is eligible for support programs?
- Where are energy prices higher or more burdensome?
- Who is able to make their monthly bill payments?
- Where have energy efficiency measures been put into place?
- Who has a better quality of life?

Table 5 offers a summary of the metrics identified in the review. Target populations can be identified by using community descriptive metrics such as the program equity index, program accessibility, energy cost index, energy burden index, late payment index, appliance performance, and household-human development index (HDI).

Table 5. Community descriptive metrics.

Metric and Reference	Needed Data Points	Data Sources and Description
Program equity index (Shaban & Stockton 2020)	Energy assistance offered	Program data; distribution of program benefits across populations
Program accessibility (U.S. DOE Better Buildings 2021)	Eligible population data, income data	Program data; distribution of program eligibility across population groups

Metric and Reference	Needed Data Points	Data Sources and Description
Energy cost index (Shaban & Stockton 2020)	Median annual energy bill	EIA, utility records; distribution of energy cost across populations
Energy burden index (Shaban & Stockton 2020)	Median annual energy bill and annual median income	EIA, utility records, census; distribution of energy burden across populations (i.e., 6% is considered high, 10% is considered severe)
Late payment index (Shaban & Stockton 2020)	Late energy bill payment rate	Utility records, LIHEAP; distribution of late bill payment habits across populations
Appliance performance (SSDN; Partnership for Southern Equity; SEEA)	Appliance maintenance cost (lifespan, energy profiles)	Appliance purchase records, audit template; distribution of access to energy efficiency measures
Household-human development index (Harttgen and Klasen 2010)	Health status, education level, income	NIH, EPA, EJScreen; distribution of HDI scores across population subgroups

EIA = U.S. Energy Information Administration; LIHEAP = Low Income Home Energy Assistance Program; NIH = National Institutes of Health; EPA = U.S. Environmental Protection Agency.

4.2 Investment Distribution Metrics

The investment distribution metrics measure the potential impact investments would have in advancing equitable outcomes. The metrics in this category would also help assess the distributional effects of the investment across different groups—which communities support specific investment decisions, to what extent do different communities experience health and environmental impacts, where is the quality of energy service lacking, and which communities see an increase in jobs. These metrics help in understanding the effects of investments and subsequently help measure whether the investments contribute to or detract from an equitable energy system. Table 6 provides a summary of the investment distribution metrics identified in the review, including the community acceptance rating, program funding impact, energy use impacts, energy quality, and workforce impact.

Table 6. Investment distribution metrics.

Metric and Reference	Needed Data Points	Data Sources and Description
Community acceptance rating (U.S. DOE Better Buildings 2021; LADWP 2013)	Numeric representation of community satisfaction	Surveys of community acceptance and support for investment
Program funding impact (U.S. DOE Better Buildings 2021)	Percent budget for advancing equity	Program data; percent of investment funding supporting disadvantaged communities
Energy use impacts (LADWP 2013)	Health and environmental impacts due to investment	Distribution of health and environmental impacts of energy investments across populations

Metric and Reference	Needed Data Points	Data Sources and Description
Energy quality (LADWP 2013)	Investment impact on frequency of electric outages, energy capacity	EIA; utility data
Workforce impact (U.S. DOE Better Buildings 2021; SSDN; Partnership for Southern Equity; SEEA)	Investment generated jobs	Department of Labor; community benefits from investment (participation from low-income groups, local business contracts)

EIA = U.S. Energy Information Administration.

4.3 Program Results Metrics

The program results metrics enable the assessment of what the program was able to achieve. These assessments are done after project implementation, and they allow for the tracking of program performance and success. The metrics in this category focus on measuring benefits that directly reach people. For example, the energy cost savings metric measures the actual energy bill savings customers experience as a result of the program. As such, a program's effect on advancing energy equity will be assessed by asking questions, such as the following:

- Are communities satisfied and enrolling in the program?
- Has the program generated wealth for targeted communities?
- Has the program generated savings in energy or costs?
- Has the program improved the communities' quality of life?

Table 7 provides a summary of the program results metrics identified in the review, including program acceptance rate, energy savings, energy costs savings, energy burden change, and change in HDI.

Table 7. Program results metrics.

Metric and Reference	Needed Data Points	Data Sources and Description
Program acceptance rate (U.S. DOE Better Buildings 2021)	Percent of population enrolled in program	Program data; program enrollment after receiving information (i.e., information dissemination, transparency, community trust, etc.)
Energy savings (MWh) (U.S. DOE Better Buildings 2021)	Energy use over time	EIA, utility records; energy use savings in disadvantaged communities after program implementation
Energy cost savings ($) (U.S. DOE	Energy cost over time	Energy cost savings in disadvantaged communities after program implementation

Metric and Reference	Needed Data Points	Data Sources and Description
Better Buildings 2021)		
Energy burden change (Harttgen and Klasen 2010)	Household income, energy bill	EIA, utility records, census; percent reduction in energy burden after program implementation (energy efficiency, weatherization, rate design, wage changes, etc.)
Change in HDI score (Harttgen and Klasen 2010)	Household income, quality of life	EIA, NIH; wellbeing and quality of life improvement after program implementation

EIA = U.S. Energy Information Administration; NIH = National Institutes of Health.

5.0 Identified Gaps and Recommendations

This review study found that the status of metrics availability for energy equity is still in the development phase. Although the three categories of metrics discussed in the Section 4.0 offer a starting point for measuring equity, expanding and building both quantitative and qualitative assessment capabilities are needed. The identified gaps in the equity metrics literature are listed below:

- Metrics are needed to understand the disparate effects of past policies.
- Metrics are needed to capture community needs. Community inclusion is often done through community engagement approaches, which tend to be implemented as a commitment to the principle of engagement without tracking how successful the process has been. Identifying metrics that measure successful inclusion are needed to ensure community inclusion is done in a meaningful way.
- Metrics are needed to track and measure project impact, including the following:
  - Metrics to assess the quality of jobs.
  - Metrics to capture the non-cost benefits of reducing energy burden. For example, increased wellbeing, avoided stress.
  - Metrics to capture the abatement of health and safety issues.

To enhance the process of advancing an equitable energy future requires understanding and expanding the available measurement mechanisms. Indicators such as income, age, race, ethnicity, geographic location, energy access, energy use intensity, energy affordability, access to renewable energy, incentive accessibility, access to public services, community engagement, etc. can be used to represent the relevant equity outcomes for collecting baseline equity measurements. A process flow, shown in Figure 1, offers an example of an equity measurement process using the currently available metrics and indicators.

The near-term needs for equity metrics fall under two areas. The first area is related to enhancing the capabilities of mapping and tracking energy inequities. Designing methods to appropriately identify target populations by operationalizing community descriptive terminologies (for example, disadvantaged communities) is essential. This will allow for a more equitable quantification and comparison of inequities across populations. The second area is related to the need for assigning scales for equity measurement—that is, answering the question: at what

level should equity effects be assessed? Whether the appropriate scale is at the societal, community, neighborhood, household, or individual level needs to be thought through while addressing the issue of data availability at the desired measurement level. When the correct data granularity cannot be obtained, state or national data may be used as a proxy, but this decreases the accuracy of the analysis and can result in continued marginalization of groups not well represented in high-level data collection.

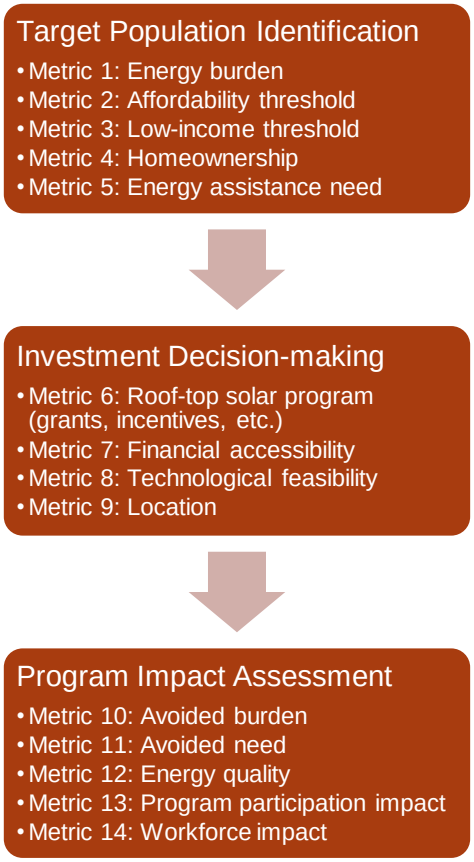

Figure 1. Equity measurement process.

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Appendix A

Table of Metrics

Metric	Metric Type	Possible Data Source (if listed)	Source	Source Category
Oral accounts of disparities experienced	Target population identification	Group studies from historians or lawsuits	The State of Equity Measurements	Buildings
Income of population	Target population identification	US Census	The State of Equity Measurements	Buildings
Health of population	Target population identification	US Census	The State of Equity Measurements	Buildings
Education attainment of population	Target population identification	US Census	The State of Equity Measurements	Buildings
Weatherization efforts by group	Investment decision-making	LIHEAP	The State of Equity Measurements	Buildings
Demographics of program staff	Program impact assessment	Program staff records	The State of Equity Measurements	Buildings
Customer call backs	Program impact assessment	Program marketing data	The State of Equity Measurements	Buildings
Program spending by customer group	Investment decision-making	Program marketing data	The State of Equity Measurements	Buildings
Energy use	Target population identification	Utility data	The State of Equity Measurements	Buildings
Fuel type diversity	Target population identification	Utility data	The State of Equity Measurements	Buildings
Energy cost savings	Program impact assessment	Utility data	Better Buildings	Buildings
Number of households served	Program impact assessment	Utility data	Better Buildings	Buildings
Percent of participants at different income levels	Investment decision-making	Utility data, US Census	Better Buildings	Buildings
Percent of participants by housing type	Investment decision-making	Utility data, US Census	Better Buildings	Buildings

Metric	Metric Type	Possible Data Source (if listed)	Source	Source Category
Change in energy burden	Program impact assessment	Utility data	Better Buildings	Buildings
Number of health incidences abated	Program impact assessment	None	Better Buildings	Buildings
Number of jobs created from program	Program impact assessment	Program staff records	Better Buildings	Buildings
LIHEAP eligibility rates within a customer group	Target population identification	LIHEAP	Grid Modernization and Energy Poverty	Grid Modernization
Number of power outages	Target population identification	EIA	LADWP	Clean Energy Deployment
Duration of power outages	Target population identification	EIA	LADWP	Clean Energy Deployment
Affordability threshold	Investment decision-making	None	EmpowerDataworks	Clean Energy Deployment
Low-income threshold	Investment decision-making	None	EmpowerDataworks	Clean Energy Deployment
Burden index	Investment decision-making	None	EmpowerDataworks	Clean Energy Deployment
Program equity index	Investment decision-making	None	EmpowerDataworks	Clean Energy Deployment
Energy cost index	Investment decision-making	None	EmpowerDataworks	Clean Energy Deployment
Late payment index-ratio	Investment decision-making	None	EmpowerDataworks	Clean Energy Deployment
Average appliance performance and lifespan	Target population identification	None	SSDN	General
Energy accessibility	Target population identification	None	SSDN	General
Economic vitality	Target population identification	GDP	SSDN	General
Poverty rate	Target population identification	None	SSDN	General

Metric	Metric Type	Possible Data Source (if listed)	Source	Source Category
% of fossil fuel and nuclear dependent jobs	Target population identification	None	SSDN	General
% of homes built before 1960	Target population identification	None	SSDN	General
% of homes with lead, leaky roofs, and oil furnaces	Target population identification	None	SSDN	General
% of energy shutoffs without reconnection for more than 30 days	Target population identification	None	SSDN	General
EE and RE program participation	Target population identification	None	SSDN	General
Air particulate matter	Target population identification	None	SSDN	General
Child asthma rate	Target population identification	None	SSDN	General
Cancer rates	Target population identification	None	SSDN	General
Broadband adoption rates	Target population identification	None	SSDN	General
Blood level of lead	Target population identification	None	SSDN	General
EUI	Target population identification	None	SSDN	General
Energy program maintenance costs	Investment decision-making	None	SSDN	General
Business development ratios (# of establishments, demographics of ownership, and business vacancies)	Investment decision-making	US Census, Reference USA, US Department of Housing, USPS vacancy data	Dallas Equity Indicators	General
Access to housing ratios (homeownership, evictions, and	Investment decision-making	US Census American Community Survey, Desmond, M., et. al.	Dallas Equity Indicators	General

Metric	Metric Type	Possible Data Source (if listed)	Source	Source Category
home loan denials)		Eviction Lab National Database		
Housing affordability and services ratios (ratio between populations with housing costs above 30% of income and internet access)	Investment decision-making	US Census American Community Survey	Dallas Equity Indicators	General
Neighborhoods ratios (long-term residential vacancies, street quality, and access to parks)	Investment decision-making	City public works department, city parks & rec department, U.S. Department of Housing, USPS vacancy data	Dallas Equity Indicators	General
Transportation ratios (vehicles per person 16+, commute time, and transit frequency)	Investment decision-making	US Census American Community Survey	Dallas Equity Indicators	General
Civic life ratios (representation in government, government service satisfaction)	Investment decision-making	Community surveys, government office	Dallas Equity Indicators	General
Incarceration ratios (case fines and fees, jail admissions, and juvenile detentions)	Investment decision-making	Police department data	Dallas Equity Indicators	General
Law enforcement ratios (arrests, police force diversity, and # of traffic stops and searches)	Investment decision-making	Police department data	Dallas Equity Indicators	General
Victimization ratios (property crime, violent crime, and domestic violence)	Investment decision-making	Police department data	Dallas Equity Indicators	General

Metric	Metric Type	Possible Data Source (if listed)	Source	Source Category
Access to health care ratios (health care provider, health insurance, and prenatal care)	Investment decision-making	State department of health services, US Census American Community Survey	Dallas Equity Indicators	General
Population health ratios (chronic disease, mortality, opioid-related deaths)	Investment decision-making	State Department of Health Services	Dallas Equity Indicators	General
Maternal and child health ratios (infant mortality, teen pregnancy, and low birth weight)	Investment decision-making	State Department of Health Services	Dallas Equity Indicators	General
Health risk factors ratios (child food insecurity, physical activity, and smoking)	Investment decision-making	US Census American Community Survey, State Department of Health Services	Dallas Equity Indicators	General
GHG emission changes	Program impact assessment	None	Greenlining Equitable Electrification	General
Specific community geographic vulnerabilities	Investment decision-making	None	Assessing the Potential Equity Outcomes of Maine's Climate Action Plan	General

EIA = U.S. Energy Information Administration; LIHEAP = Low Income Home Energy Assistance Program; LADWP = Los Angeles Department of Water and Power; SSDN = Southeast Sustainability Directors Network; GDP = Gross Domestic Product; USPS = United States Postal Service.

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