# Summary of a Workshop on Integrating Energy Equity into Power System Planning and Operation

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## Disclaimer

The meeting organizers made every effort to accurately convey the points made by the participants. Any incorrect or misheard statements are the responsibility of the organizing team.

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# Contents

## Overarching Considerations

The U.S. bulk electricity system is changing to meet carbon emission reduction goals and address climate change. Careful resource planning would help achieve these goals, potentially including renewable generation, storage, and traditional generation with lower emissions, as well as considering resource retirement, changes to transmission line use, and transmission upgrades. However, historically there have been fundamental inequities in how different populations experience the costs, benefits, and risks of power systems and services. Revising planning and operational practices could help ensure a fairer and more equitable clean energy transition.

Historically, datasets, modeling tools, and analysis to support grid planning and operation have focused on economic efficiency and reliability over a large footprint but have not assessed how these costs and corresponding system benefits are allocated across populations and communities. The historical focus makes it difficult for decision-makers to understand the energy equity trade-offs of their decisions or include these trade-offs in power system planning models. Rethinking and redefining the "optimal" decision could improve the distribution of benefits and costs across populations and communities.

On November 29 and 30, 2023, the Energy Systems Integration Group convened a one-and-a-half-day workshop in Arlington, Virginia, to improve knowledge and practices for integrating energy equity considerations into power system planning and operation. Workshop participants discussed approaches for integrating energy equity aspects into models and tools and explored possible pathways for enhanced technical practices. Unlike other important forums that address critical energy equity challenges related to community involvement, stakeholder access, impacts from energy system externalities, workforce diversity, and inclusive offerings in energy programs, this workshop prioritized the technical aspects of incorporating the challenges and solutions identified by electricity-futures stakeholders and communities into power system planning. These technical activities include the fundamental grid structure and hardware, detailed modeling approaches that benchmark energy system performance and justify future investments, and engineering designs and limitations for potential solutions to meet energy equity goals in communities. Participants included utility planning and modeling practitioners, social science and energy justice academics, representatives from energy and environmental justice nongovernmental organizations, non-profits, consumer advocates, and representatives from the U.S. Department of Energy, national labs, and other government agencies.

The summary points that follow include comments shared at the workshop related to energy equity in power system planning and operation, together with questions and framing included in pre-workshop materials that were prepared to guide discussions in the break-out sessions. *Statements made in this summary do not necessarily represent the views of all or specific workshop participants.*

The workshop participants discussed the definition, dimension, methods, and tools of energy equity in the context of the power system. Many agreed that equity is a moral and strategic necessity for the energy transition, and that it is a multidimensional concept that encompasses various considerations, such as access, affordability, quality, reliability, participation, representation, and empowerment.

Participants discussed the need for a paradigm shift in planning that puts equity at the center, rather than as an afterthought or an add-on. It was suggested that traditional planning methods often fail to account for the multiple and intersecting burdens faced by disadvantaged communities both within the energy sector and across a broad set of other social dimensions such as poverty, exposure to pollution, health disparities, and lack of access to resources and opportunities.

Participants acknowledged that an energy transition is a complex and multifaceted issue that requires systemic and holistic thinking and that there is no silver bullet or simple answer. At the same time, they recognized that there is a sense of urgency and pressure to act quickly and decisively to respond to climate change and address significant disparities. Still, many participants felt that equity should not be sacrificed or compromised in the name of efficiency or expediency, and supported careful planning in consultation with affected communities, giving attention to the long term and the big picture. Given this dilemma of acting both quickly and with the deliberate process that these complex generational-scale challenges require, participants generally agreed that it is vital to find innovative solutions in planning and operation paradigms that can integrate and advance energy equity across processes and analyses.

This summary is divided into three parts. The first looks at aspects of the power system in which equity is not typically considered but could be. The second covers elements of what that consideration might entail and summarizes aspects of power system planning and operation that are involved—definitions, data, metrics, and modeling; possible roles for markets; and considerations regarding getting community input. The third lists possible actions mentioned by workshop participants that could be taken by various entities.

# Key Areas Where Equity Can Be Considered

Workshop participants discussed two main types of challenges faced by utilities and system planners when attempting to incorporate equity objectives into planning and operation: (1) reliability and resilience, and (2) access to clean energy, electrification, and distributed energy resources.

## Ensuring Reliability and Resilience

Participants discussed equity challenges they see embedded in current processes and practices for reliability planning and power restoration, and explored how equity objectives interplay with planning for and definitions of resilience. As noted above, statements made in this summary do not necessarily represent the views of all or specific workshop participants.

### Local Reliability

**Electricity system planning models do not sufficiently consider granular local reliability.** Planning models assess the reliability of larger sections of the power grid but fail to consider the localized impacts on individual communities. New metrics and methods may be needed to incorporate these considerations into these models. (See “Models” section below.)

**Customers have varying levels of vulnerability to outages, motivating a different approach to system restoration.** The social cost of an involuntary outage depends on location, the services disrupted, and the length of the disruption. Not every kilowatt-hour is the same. In the event of an outage, certain customers may experience significant setbacks—loss of income, loss of functioning medical equipment, or an absence of back-up power or community support options. The frequency, magnitude, timing, and duration of interruptions need to be considered. Some customers may have a very high dependence on electric power for essential services in the home and business or for income (communications, internet, sufficient home heating or cooling). This creates uneven vulnerability to power outages and compounding effects.

System restoration strategies can be revised to ensure that service restoration is prioritized for vulnerable populations and those more severely impacted by service disruptions.

**Some communities have greater vulnerability to climate-driven extreme events. Distributed energy resources, storage, and grid planning with greater emphasis on energy equity can help address the negative impacts of climate-driven extreme events (particularly in isolated communities, including rural areas and tribal nations).** The impacts of climate change will vary considerably by region; however, rural and tribal communities may be particularly prone to the effects of climate change due to being more isolated, with fewer robust connections to the energy system. Solar, wind, storage, robust transmission, microgrids, and other technologies can help overcome these challenges technically, but local communities may not be able to afford them. Moreover, local traditions may require careful engagement, such as for culturally significant lands.

## Considering "Economic Efficiency," and Quantifying Resilience and Planning

Some participants recommended re-examining the idea of economic efficiency and examining what it means for something to "make economic sense." They noted how definitions of economic efficiency are not an impartial market-based objective and outcome, but rather stem from subjective assessments of value and are influenced by priorities, values, and beliefs.

- **How might consideration of vulnerability affect current priorities for power restoration?** Typical approaches to power restoration practices follow grid and economic structures: areas with high economic productivity or a large number of customers are given higher priority, as are newer equipment and easier paths. Heuristic and optimal restoration strategies treat each outage independently and will always choose the same restoration path for the same outage. However, there may be a "new optimal" that takes customer vulnerability into account, as well as a re-balance for traditional restoration tools that currently prioritize economic activity.
- **How could consideration of customer vulnerability affect approaches to quantifying resilience?** Common resilience metrics, based on probabilistic-risk methods or structural methods, focus on infrastructure and generally do not consider customer vulnerability. Valuable tools—such as the Interruption Cost Estimate (ICE) calculator, which estimates economic costs of outages by duration and customer class—reinforce that the optimal power restoration strategy is one that does the least harm to economic productivity. However, this strategy potentially runs counter to one that avoids the most direct harm to vulnerable populations.
- **How can grid planning, which is primarily based on economics and reliability today, integrate energy justice metrics into modeling processes?** System-wide planning decisions typically start with a combination of capacity expansion and production cost models, models that solely minimize system costs under predefined reliability constraints. Detailed reliability, stability, and contingency analyses typically consider only engineering implications, and not demographics. Distribution planning is also typically limited to least-cost ways of providing reliability and power quality, potentially using load projections that may perpetuate historical biases. Energy justice metrics, if included, are mostly post-processed (i.e., assessed after the power system design is determined).
    - **Given the uneven vulnerability to power outages, how can we explore a "new optimal" that takes vulnerability into account**, as well as a re-balance for traditional restoration tools that currently prioritize economic activity (outage restoration for areas that aren't prioritized if using economic criteria)?

- **What is the value of resilience?** Participants discussed the importance of going beyond costs to better capture nonmonetary impacts, such as impacts on health care and other social consequences of outages more broadly.

## Obtaining Information and Data, and Defining Metrics

- **Capturing energy justice in modeling requires energy equity–related data and energy justice–related values that can be integrated into the modeling process.** This could take multiple forms: they could be directly integrated into objectives or constraints, assessed as part of near-least-cost feasible alternatives, iteratively included (especially for non-optimization-based analysis), considered with multi-objective approaches such as Pareto analysis, or included using other approaches. Equity can also be incorporated as a metric in prioritizing grid infrastructure investments through proxies such as grid stress, level of anticipated adoption of distributed energy resources, and demographic data. Participants pointed out that while data, metrics, and methods may need to be standardized across regions for a consistent framework, energy justice is community-specific, and care should be taken to include region-specific goals and issues.
- **How can reliability be measured to take equity into account**, for example, with programs such as Justice40, a major federal initiative focused on advancing equity. How should we think about reliability for a network that could be a mix of different communities?
- Given that network reliability indices reflect a wide area, **how can we get more granular and look at impact on household or customer-centric perspective?**
- **How can both anecdotal information and event-driven analysis of outage and restoration disparities be used to make the case for analyzing outages and restoration practices at the utility level?** Customer-aware (or customer-level socio-demographic-resolved) outage analysis would need to be performed to understand what types of outages affect which kind of customer. Anecdotal information exists as evidence of the inequities in the grid. Whether it is the winter storm outage in Texas in 2021, where minority populations were more impacted by power outages,[1] or reports that have documented (albeit spottily) the outage disparities across customer groups,[2] participants felt that it is important to take these cases seriously and ask the hard questions of why grid operational decisions led to these inequities.
    - Participants suggested a need to improve the way outages are tracked to ensure that investments are allocated appropriately.
    - In addition to the important anecdotal information, an event-driven analyses could be developed to measure and assess different outage experiences consistently and transparently. This would help to prioritize investments more effectively.
    - System operators, utilities, regulators, and communities can develop agreed-upon standards for equity that can be used in models to ensure a common understanding of what an equitable system is.

[1] https://www.cell.com/joule/fulltext/S2542-4351(21)00584-5

[2] https://www.sciencedirect.com/science/article/pii/S2214629621001997

### Specific Planning Decisions for Reliability

**Equipment upgrade decisions**

- Problems that increase the frequency or duration of outages generally become higher priorities when they become observable at the macro-system level, although some companies maintain and prioritize investments based on feeder-level performance data. Unless community-scale visibility into the distribution system is available, local reliability problems may be left unaddressed. Participants discussed how planning investment in the distribution system—for maintenance or to enable the expansion of distributed energy resources and other services—needs to consider the cumulative effects of past investment (or lack of investment) to achieve equitable outcomes. **How can local problems be addressed sooner than typical grid infrastructure replacement would otherwise indicate, especially to address equity issues?**
- Reliability can be enhanced by building not just additional bulk power system infrastructure, but also **distributed and non-wire alternatives** such as storage and local improvements.

**Assessing the role for demand response/flexibility in low-income communities**

- Demand response (or flexible load) is often seen as a relatively low-cost option to secure system reliability in the future. However, some households may not be able to meet the demand response requirements because it could affect their occupants' wellbeing. Therefore, **how can demand response programs be structured to close gaps in justice and service inequity and ease the pressures and burden on these households?** Can these market pressures be negotiated, for example, through a rate/contract option? Also necessary is an understanding of the financial, technological, and social barriers that low-income households face in accessing and using demand response, which requires smart technologies.

## Ensuring Community Access to Distributed Energy Resources, Electrification, and Distribution Infrastructure

Another key topic that workshop participants talked about is how to make sure low-income communities can access distributed energy resources. To improve reliability and resilience, adequate distribution infrastructure is needed to handle both distributed energy resources and new electric load from heating and transportation.

### Distributed Energy Resource Adoption, and Electrification of Heating and Transportation

- **With the rapid adoption of (but also uncertainty around) electrified end uses, what are the considerations for proactively planning distribution system upgrades that target specific communities while not inadvertently limiting adoption due to biased assumptions?** Transportation electrification is one area where the combination of uncertainty and assumptions around the rate and location of adoption of the technology is driving distribution infrastructure upgrades in ways that may need to be re-examined. Community trends regarding public versus private transportation could influence charging infrastructure deployment decisions; however, these decisions risk biasing certain types of upgrades to different communities. For example, a community that depends relatively heavily on public transportation might not be prioritized for distribution upgrades designed to handle high levels of home EV charging, which could limit residents' EV adoption. Given limited utility resources and supply chain backlogs for this

infrastructure (e.g., long service transformer lead times), careful consideration is warranted to avoid limiting a community's ability to adopt new electrified technologies based on potentially faulty assumptions of a community's needs or trends. A solution could be coordinating with other programs, such as those aimed at increasing equity in home cooling, electric vehicles, home electrification, and electric panel upgrades, so that grid limitations do not create a barrier for deployment.

- **How can it be determined whether grid and other limitations may prevent customers from electrifying demand (electric vehicles, heat pumps, etc.) or connecting distributed energy resources?** What approaches can help overcome such limitations?
- Distributed energy resource compensation and other investments can be seen as **not only grid support but also as wealth-building opportunities**.

### Distribution System Upgrades

- Increasing customer adoption of distributed energy resources (such as rooftop solar and storage) and demand electrification (including electric vehicles) can **expose further inequities where undersized grid connections and distribution infrastructure can limit access for customers**.
- Participants noted that while the Justice40 program outlines community eligibility to participate, there is **no attention on the state of the distribution system/circuit in that eligible community**. Justice40 is a federal initiative aimed at ensuring that disadvantaged communities receive at least 40 percent of the total benefits from federal investments in climate action, clean energy, affordable and sustainable housing, and other areas. Without proper consideration of the distribution system, the existing infrastructure may not be prepared to deliver the investment from programs.
- In a discussion about Justice40 and how benefits might be defined or quantified, a participant asked, what might be a benefit that can be influenced by investment in the grid?

## Considering Other Local Impacts of Power System Investments

### Community Impact of Generator/Storage/Transmission Siting and Generator Retirement

**The siting of electricity generation resources, energy storage resources, and transmission infrastructure has localized land-use and environmental impacts that need to be captured in planning models to ensure that these resources' deployment supports equitable outcomes.** All facilities and development have trade-offs; impacts include air pollution, water runoff, negative aesthetics, and land-use conflicts. Currently, planning models do not incorporate significant aspects of siting, with the siting of new capacity in planning focused on system resource adequacy and economic considerations and generally ignoring social or equity-related factors. To ensure that historical inequities are not perpetuated, it is important to develop new planning methodologies that consider a wide range of localized siting impacts and capture the distribution of such impacts across populations.

As utilities face decisions about how to replace fossil-fuel power plants that provide specific grid needs in certain communities with affordable, equitable, and clean resources, participants recommended that they consider how minority, low-income, and indigenous communities often bear a disproportionate

share of damages from these resources. Communities' outcomes can be improved by including energy justice screening methods—along with community engagement—in grid planning decisions.

Planning models and procedures have evolved to capture one socialized externality that impacts populations globally, namely, greenhouse gas emissions, although these emissions differ from other types of air pollution in that they are not location-specific. Greenhouse gas emissions are easier to incorporate in planning models because they are quantifiable by incremental use of generators, they can be evaluated and measured across various operating scenarios, and their social costs can be estimated or controlled at the system level through global emission constraints or direct monetization, such as through a social cost of carbon. However, other pollutants introduce health hazards specifically for populations that fall in the path of their emission, and mitigation measures need to capture the extent of these localized impacts. This could be addressed by coupling electricity system models with air pollution models capable of capturing emission dispersion pathways.

## Local Workforce

- **The community economic implications** of investment or generator retirement decisions are increasingly influencing planning decisions; however, these considerations are **not always captured in planning procedures consistently, transparently, and in a rigorously quantitative way**. Planning procedures can, therefore, benefit from integration with quantitative models able to assess how the benefits and costs of local job creation and dissolution and other economic impacts are allocated across populations to ensure equitable outcomes.
- The **workforce** aspect is more difficult to scale, but is very important. Input at all levels—utilities, government, universities—could inform how workforce and economic implications are addressed in power system planning and operation.

## Renter's Dilemmas / Split Incentives

Participants raised a number of considerations specific to challenges faced by renters.

- If investments are made to distribution systems, participants discussed how rental property **owners and developers receive the enhanced value but may pass the cost along in the form of rent increases**, to which disadvantaged communities are particularly sensitive.
- When certain utility bills are paid by the renter, the property owner has little financial incentive to make the home or unit more energy efficient unless the cost of the improvements can be recouped through rent increases. Conversely, when utility bills are paid by the property owner, who therefore has an incentive to increase the home's efficiency, the property upgrades may be focused on lowering utility bill costs that incur to the owner and might not take occupants' needs into account. Regarding utility programs that fund efficiency improvements for rental properties, participants discussed (and disagreed about) **whether it is necessary for the landlord to "have some skin in the game"** (pay part of the cost).
- **Many utility programs are designed for homeowners, but disadvantaged communities have much lower levels of home ownership**. Therefore, although disadvantaged communities are in more need of these programs, they see disproportionately less of the benefits. For example, renters may pay for energy efficiency and other programs or tariffs on utility bills, while the rebates (for residential solar or other programmatic offerings) are provided to the building

owners. In addition, certain rate structures may result in similar cost and benefits shifts between renters and owners due to net metering or other similar structures.

## Definitions, Data, Metrics, and Modeling

The participants discussed the technical approaches and data sources that are used or needed for incorporating equity into power system planning and operational processes and practices. Some of the methods and tools mentioned that can help to identify and address the equity dimensions and objectives in power system planning and operation were **geospatial analysis, scenario analysis, multi-criteria analysis, stakeholder analysis, co-optimization, forecasting, and visualization**. Participants also expressed a need for **more granular, disaggregated, and diverse data and information** that can capture the equity implications and impacts of different planning and operational decisions and actions. They noted the challenges of data availability, quality, accessibility, and transparency; the challenges of data security, privacy, and ethics; and the need for better data collection, management, and sharing, as well as better data governance and regulation, among different actors and stakeholders.

Participants also asked **what approaches, tools, and datasets are needed** to help ensure that power system planning supports the economic, social, and health needs of all communities and all community members? How well are concepts of equity accommodated in the traditional engineering and economic models and tools used to analyze and plan the power system for reliability? What kinds of factors (for example, spatial data) are "easy" to layer into these models? Which require work outside of the model but still allow for use of the model, such as scenarios with artificial constraints or post-processing, and how might that work in practice?

### Definitions

The participants gave regional examples of equity initiatives, which included the California Environmental Justice Alliance, the New York State Climate Leadership and Community Protection Act, the Minnesota Solar Equity Project, the Illinois Clean Energy Jobs Act, and the federal Justice40 initiative. These examples illustrate the momentum on equity, how different regions and populations have different equity challenges and opportunities, and how different equity solutions and actions can be tailored and implemented to address the varied challenges. These different approaches are in keeping with the fact that equity is context-specific and solutions should be place-based and account for the historical, cultural, and geographical diversity of the regions and populations. However, the examples also pointed to a lack of uniformity on key elements of energy justice, including how disadvantaged communities are defined, what metrics are used, and how success is evaluated. This lack of uniformity could hamper the coordination and scalability/transferability of efforts.

- Definitions of equity have **both technical and social aspects**. Participants pointed to the need to engage communities to see what we need to model in power system studies.
- Participants discussed **differences in how communities and power system planners define the relevant unit of analysis**, whether meters, circuits, neighborhoods, communities, or others. One compromise would be to use an aggregation of meters in an area or circuit, though this may not be sufficiently granular for a given purpose. Communities can be defined geographically or demographically (programmatically). A system approach works best for aggregation of meters on a circuit, but this aggregation is a business and technical fact, invisible and separate from the construction of communities, and would have to be explained and meaningful to the affected community.

- Many participants stated a need for clear definitions of **equity objectives**.
- What is a benefit that can be influenced by investment in the grid? **How should benefits be defined and quantified?**

## Metrics

Equity metrics are quantitative or qualitative measures that can help evaluate and improve the equity outcomes of the energy sector policies, programs, and investments. Participants believed that equity metrics and indicators should be **co-developed with the affected communities and reflect their values and aspirations**. Different states and utilities have adopted or proposed various equity metrics and indicators to monitor and track the progress and performance of their energy equity initiatives and goals. Some of the common themes and dimensions of the equity metrics mentioned at the workshop include **access to clean energy, clean transportation, and clean energy benefits; energy affordability and cost burden; energy efficiency and renewable energy potential and adoption; environmental justice and health impacts; and stakeholder and community engagement and participation**. However, it was noted that these metrics have mostly been included exogenously, and there is a need to better translate these outcomes into rigorously quantitative metrics and mathematical formulations that can more directly be modeled within planning and operations tools and processes.

Although the concept of energy justice has received increasing attention only in recent years, utilities, commissions, and the industry at large have decades of experience in quantifying benefits and costs, particularly while making financial decisions. Applying those skills and principles to energy equity is appropriate if imperfect for the moment, especially due to shifting scales of application from the engineering and business scales of a utility footprint to a community and customer-centric footprint. Regardless of how the benefit determination and assessment process occurs, it should be transparent. Equity justice is also dynamic, requiring continual engagement, monitoring, and evaluation.

- **Datasets, tools, and metrics could be augmented** to give grid planners and operators a more complete understanding of the impacts on the communities they serve.
- Participants expressed uncertainty about how to apply energy equity metrics to power system operations and how metrics might be more or less useful when the system is particularly stressed, for example, during **extreme weather events**. The same uncertainty was expressed for how to model and analyze the impacts of such events with the current tools.
- Participants discussed the challenge of resolution over spatial and temporal scales. When attempting to capture inequities across the power distribution sector, **more granular data** are needed at the customer/feeder/substation level.

In particular, many participants discussed the benefits of **more granular reliability metrics.** Typical reliability metrics for regulatory purposes are too spatially and temporally broad to capture relationships to populations. System-scale metrics or averages by customer class do not connect to feeder or neighborhood-level performance, or include population dimensions that have greater vulnerability to power outages and disruptive events, such as the age of a home's occupants. For example, SAIDI and SAIFI (System Average Interruption Duration Index and System Average Interruption Frequency Index), which do not consider vulnerability or capture neighborhood or community specifics, can lead to the same customers always experiencing the longest outages and are not traditionally aggregated at the neighborhood or community level.

- Participants asked how reliability metrics can be supplemented to describe the granularity of **population dynamics and the uneven distribution of the effects of outages**.
- Another area participants discussed was for greater granularity in recognizing **lost load**. Locationally, where is the unserved energy? What are the impacts? Value of lost load (VoLL) needs more demographic granularity. How could the different communities' or households' tolerance to outages (e.g., customers who rely on life-sustaining medical equipment) be modeled? Participants noted a range of potential responsive measures such as notification, grid hardening, storage, or back-up power.
- Participants identified a separate need for **equity metrics** in planning processes. What types of new metrics are needed? They also noted that having a map or the data does not mean having a metric that you can do something about and plan for.
- How can **perverse incentives** be avoided? If the wrong metrics are chosen, is the wrong thing been incentivized? There's "a lot of room for mischief."

## Data Sources and Needs

More data sources are needed to incorporate equity considerations into power system planning and operation. A few existing data sources were mentioned by participants,[3] and more data sources need to be identified and aggregated for the use of states and planners.

## Modeling

Workshop participants discussed how power system planning models could take equity into account and value or quantify utility investments intended to address equity issues. Participants called both for the **evolution of existing tools to incorporate equity considerations** and for **new tools built from the ground up specifically to capture equity**. Participants noted that:

- Planners need to simulate **integrated markets** that represent equity as part of the process.
- Equity can be addressed either through being **directly integrated** into planning models or, where appropriate, through a **post-processing** approach with a feedback mechanism to inform planning decisions.
- Modeling may need to be adapted to establish **a range of near-optimal solutions**, and/or we may need to use **new definitions of "optimal."**
- Models, as used today, may need to be **supplemented** in order for planning decisions to take equity into account. Modelers may have to get more comfortable caveating results, accepting a range of results, or doing more post-processing ex-post assessment of modeling results. One participant said, "Think about things other than what the numbers tell you. What we do impacts lives."

[3] Lists of geographic information system (GIS) and mapping tools that focus on environment justice and equity can be found at https://www.ejtoolkit.com/resources/tools, https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5, https://energyjustice.egs.anl.gov/, and https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html. Xcel Energy also has an interactive map organized by census block group that tracks several indicators including energy burden, median income, disconnections, launched in 2020.

- In addition to modifying existing tools, **new tools** may be needed to interface with current models and, more specifically, perform equity analyses.
- **Qualitative approaches** could be used to compare near-optimal portfolios. A summary is needed of techniques that practitioners can use in utility planning.[4]
- Planners should take care not to follow model results blindly and instead **preserve the connection between modeling, decision-making, and real-world impacts**. The models need to answer the relevant questions if they are to support informed decision-making.

### Frameworks and Approaches

Participants discussed the need for overarching frameworks and approaches to incorporating equity considerations in power system planning and offered the following questions and comments:

- **What decision frameworks or tools are utilities using** to implement these changes and make investment decisions? Cost-benefit? Other types to identify where the grid needs to be evolved/planned? Are they using equity rules?
- **Frameworks** need to be identified to value or quantify utility investments and how utilities should take equity into account. **Qualitative notions of equity** also need to be integrated.
- How are **clean energy goals translated into investment plans** that can satisfy Justice40 and other equity requirements? How to manage goals with linkages between affordability/equity?

## Possible Roles for Markets

### Role of Wholesale Markets

Participants discussed whether there is a role for wholesale markets in achieving equity objectives, and if so, what that role is. They also considered the impacts of **decisions by independent system operators and regional transmission organizations**, which, with their key role in grid operations, market administration, and system planning, have significant effects on communities. These important organizations make decisions on various aspects of the power system, such as generation dispatch, emergency operations, energy and capacity prices, generation interconnection queues, and new transmission lines. The decisions' impacts are relevant to the equity discussion in many ways as they influence emissions, the energy resource mix, distributed energy resource participation, the speed of decarbonization, the location of generation and transmission, and electricity bills, either directly or indirectly.

### Market Externalities

Across much of the United States, electricity systems are planned and operated through organized wholesale markets that provide market signals to promote economically efficient behavior. While these markets have been evolving since their introduction in the early 2000s to accommodate the clean energy transition, **the role that they can or should play in supporting social equity objectives is still unclear.** Market mechanisms typically presume to deliver socially optimal outcomes by promoting economic

[4] A preprint of one summary can be found at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4591242.

efficiency; however, such outcomes are dependent on the ability of market signals to capture all of the social costs and benefits associated with the development and operation of an electricity system. To capture equity objectives with a market framework, it is therefore **important to identify clear market externalities that can be quantified and internalized into market operations and price formation procedures**.

If the proper policies and regulation are implemented, **will markets automatically adapt or are more proactive changes in market design and market structure needed?**

## A Need for Community Input

There was considerable discussion at the workshop about the need for community input and how best to obtain it.

What do communities need?

- Power system planners, advocates, and others should not assume they understand what a given community needs. One point repeated many times by participants was to **ask communities what they need and what their priorities ar**e. When asked, community members may list considerations that are not on the utility's or other planners' radar.
- **Once communities' specific needs are known, how can technology decisions be aligned** with them? Do we need to invest in new technologies or enhance current technologies to align with energy justice goals?
- **Critical infrastructure** should be defined with input from community.

Who specifically should provide input?

- **Who within the community should have input** into the power system planning process?

What are the best ways to engage community members, gather community input, and incorporate it in power system planning and modeling?

- How can feedback from impacted communities and vulnerable customers **be given due weight, translated to technical outcomes, and captured equitably throughout a footprint**? What data and data capture tools would be needed to do this?
- Many people rarely think about energy and energy systems, or the decision-making processes involved. Grid proceedings require educated input. **Communities need a basic understanding of how the power system works, what its components are, and what specific entities are responsible for—and able to do**: one participant noted that "this stuff is not intuitive." How do systems work, what's connected to what, how do distributed energy resources integrate with the larger system, what is reflected in energy bills?
- Communities need to be helped to understand **what is realistic and within the competence of the power/utility sector to deliver from a very broad menu of social justice needs**. This will help them to focus their demands in areas of the competence of the utilities and assist communities in getting the most out of their participation in planning discussions.

- "It's a lot more complicated than you'd expect." A **third-party facilitator** can be a great resource if there is tension between community members and utility. But it may not be appropriate to use a facilitator paid by the utility.
- Is the utility just making presentations and **asking for validation,** or is it **truly soliciting the community's ideas**? Who is delivering information, how is it packaged, and is it inclusive or just a presentation to a captive audience? Is it translated for the audience, and is it framed in terms of its meaning to the audience: "how does this decision affect me as an end user?"
- It can be **difficult to get community members to attend**. The meetings are boring. Technical people aren't good communicators.

How to make sure there is transparency around utilities' decision-making, and accountability?

- **Are utilities' processes transparent from the public's perspective?** Are utilities accountable to communities and individuals?

# Possible Actions

Workshop participants were asked to name actions they were going to take following the workshop as well as actions they hoped others would take. Items in the latter category are summarized here.

## Possible Actions for Utilities

- Provide an automatic discount based on median income, based on maps showing average customer income
- Advocate for equity in cost allocation and rate design discussions with regulators
- Organize and analyze data they already have (advanced metering infrastructure (AMI), geographic information system (GIS), etc.)
- Through cooperation with health authorities and voluntary sign-ups, offer special reliability-related accommodations for low-income customers, such as rates, outage notices, and priority power restoration
- Consider what accountability to equity goals looks like (e.g., metrics), not only benefits but consequences

## Possible Actions for Regulators

- Ask utilities to be more transparent about their assumptions, to reimagine decision-making such that "least-cost" decisions appropriately include the benefits, harms, and burdens to different communities
- Work with communities and social scientists to develop clear definitions of equity and equity-related goals
- Work with communities early in the planning process to provide inputs to planners and modelers

- In addition to continuing to establish requirements when possible and quantifiable, also use illustrative frameworks and goals
- Consider rate structures that adjust for customer income/vulnerability
- Establish better measures for accountability, take a harder stance
- Consider what accountability to equity goals looks like (e.g., metrics), and consider not only benefits but consequences
- Review the regulatory paradigm to align utility incentives with public interest outcomes
- Require data on customer experience

## Possible Actions for Policymakers

- Work with communities early in the planning process to provide inputs to planners and modelers
- Consider what accountability to equity goals looks like (e.g., metrics), and consider not only benefits but consequences

## Possible Actions for State or Federal Governments

- States should consider requiring data on customer experience
- Equity metrics could be standardized at the state or federal level
- The Department of Energy or state offices could assess additional partnerships and resources to address equity

## Possible Actions for Researchers and Modelers

- Develop models, tools, and formulations that can capture equity considerations and assess equity outcomes
- Conduct analyses to assess how considering different dimensions of equity can have an impact on planning outcomes
- Identify datasets that are needed to conduct equity-informed capacity planning, and work with other stakeholders to help make them more accessible

# Summary of a Workshop on Integrating Energy Equity into Power System Planning and Operation

This workshop summary is available at

https://www.esig.energy/integrating-energy-equity-into-power-system-planning-and-operation/.

To learn more about work being done in this area, please send an email to info@esig.energy.