

ILLUME The Great Decarbonization

From Resilience to Capacity

Ingenuity when Disruption is Endemic

As each new headline begins with words like "unprecedented," is has been hard to nail down a single point of view for the introduction of "The Great Decarbonization," our fourth volume of the ILLUME magazine.

At the close of 2019, our magazine introduction was entitled "It's Time to Take Off Our Rose-Colored Glasses." Then, we argued that our industry must take a clear-eyed view of the vulnerabilities in our social, economic, and energy systems. It is safe to say

that the years that followed forced us all to engage in that call to action.

Given all we have learned in the past two years, what does this moment demand of us? What will it take to achieve "The Great Decarbonization?" We propose a shift in mindset – one that abandons the pessimism implicit in the "new normal" and instead adopts a mindset that builds our capacity to adapt while embracing the possibility of a better life for us all. But how? We propose a shift in mindset – one that abandons the pessimism implicit in the "new normal" and instead adopts a mindset that builds our capacity to adapt while embracing the possibility of a better life for us all.

- Embrace intersections. The challenges and opportunities ahead of us are not simple. We are seeing the climate, economic, and social pressures exacted on our communities, and we can expect them to increase. To meet the moment, we need to be capable of understanding highly contextualized and entrenched problems *while also* remaining adept at identifying simple and expedient policy, programmatic, and community-centric solutions. And we need leaders capable of pragmatic optimism.
- Identify and center ingenuity. Fostering ingenuity requires that we take a broad view of our challenges and develop incisive and simple solutions. This moment demands that we understand culture and energy systems, communities and policymaking, innovation, and regulation. We have to build teams and processes that can transform novel ideals into real-world opportunities. We need leaders willing to bet on ingenuity.

In this magazine, we hope to reawaken your sense of optimism through bold colors and design, and forward looking ideas. We invite you into conversations with the relentless change-makers among us. And we share our perspective on how to enable ingenuity in six areas of work that will drive the future of our industry.

Equity: Understand the difference between procedural and distributive equity and provide guidance on how to define equity for policy and programs.

Business and Economic Transformation: Find inspiration in our article "Further/Faster" where we interview Google's Director of Energy, Michael Terrell on the possibilities of 24/7 clean energy.

Opportunity Identification and Development: Explore how to expand your current programs and services to enable beneficial electrification and great demand management in "Heat Pumps Take Center Stage," and "Keeping the Lights On."

Market and Behavior Change: Learn from policy and industry leaders changing consumer behavior from the top-down and the bottom-up in "Is this Our Climate's Moonshot Moment?" with Kris Mayes and "Georgians Transforming the Lives of Neighbors" with Eric Arnold.

Customer Engagement: Learn how Tucson Electric Power leaders are infusing CX throughout their business practices and explore how community solar initiatives and green rates democratize clean energy.

Success Planning and Measurement: Evaluation is the untapped engine of successful innovation. Don't believe us? Check out "The Need for Speed" and "Basics for Innovation" to learn how to get more "success" out of your "measurement."

We hope that as you read through this magazine you will find bright ideas that inspire, design that energizes your senses, and leave with a sense of optimism that we will effectively move from resilience to capacity-building.





Equity



The great decarbonization requires all of us. And we all should share its benefits.

We take an empathic and community-centric approach to identifying disparities in your investments. We help you co-create solutions with your constituents to address those disparities.

We support you in translating our learnings into policies and strategies that are restorative, transformative, and engage your stakeholders along the way.

To reach your goals, we provide procedural and distributive equity analyses, policy advising, strategic planning, and integrated stakeholder engagement.

Balancing Your Equity Framework

Processes, Inclusive, fair, and respectful processes, systems, and decision-making

How •• • • • • • • • • • • •

- Include priority populations in planning and decision-making processes
- Treat people with respect, including in planning and decision-making processes
- Integrate Environmental Justice (EJ) principles into planning and decisions
- Consider cumulative burdens and legalities of discrimination when siting facilities
- Employ and train a diverse workforce

- Build capacity for disadvantaged or vulnerable communities to take advantage of programs
- Require hiring or training among target populations in RFP processes
- Engage in due process and transparency explain the process and decisions
- Communicate progress against equity goals

Jemez Principles for Democratic Organizing

- Be Inclusive
- Emphasize Bottom-Up Organizing
- Let People Speak for Themselves
- Work Together in Solidarity and Mutuality
- Build Just Relationships Among Ourselves
- Commitment to Self-Transformation

What We're Hearing on the Ground:

At a minimum do no harm but aim for restorative justice. Just getting to fair processes or proportional spending is not enough. People expect restorative justice. Further injustice and inequity will not be tolerated. You may have seen equity/justice frameworks with additional dimensions. The lines can get blurry so we're keeping it simple with two. These dimensions could encompass other considerations like Interactional, Interpersonal, Informational, Restorative, Recognitionbased, or Structural Equity and Justice.

Some policies legislate one equity dimension, and another may follow naturally from the first. Many states or organizations who start with one dimension end up building out the second for a stronger process and results.

Many policies center Environmental Justice (EJ) communities or populations, Disadvantaged Communities (DACs), vulnerable communities, frontline communities, overburdened communities, low-tomoderate income (LMI) communities or households, and priority populations. We refer to these communities more generally as Disadvantaged Communities (DACs), and to individuals, households, and workers included in processes or policies as priority populations. A groundswell of energy equity and justice legislation contain guidelines for more equitable processes and outcomes. What are states considering in their equity frameworks?

Distributive Equity Assess and ensure a fair distribution of costs and benefits across populations

How ·····

- Deliver an equitable distribution of costs, risks, resources, and benefits
- Provide equitable access to information and services
- Serve more than a proportional share of disadvantaged, vulnerable, or underserved people or communities
- Measure benefits for these groups—for example, the extent to which groups receive a fair share of benefits
- Minimize adverse impacts on disadvantaged, vulnerable, or underserved people or communities
- Measure adverse impacts or unintended consequences—for example, higher energy costs
- Track who participates in planning and decision-making processes
- Track workforce from priority populations

Policy Examples

CA SB 350: Creates Disadvantaged Communities Advisory Group for program guidance. Directs CPUC to improve air quality and economic conditions, and barriers to clean energy.

Colorado HB 21-1266: Spreads EJ best practices throughout state government. Creates EJ Task Force to embed equity and cumulative impacts in environmental decision-making.

CA SB 535: Directs percentage of greenhouse gas funds to DACs and priority populations.

CA AB 523: Considers localized health impacts in siting EV projects.

Maine LD 1682: Incorporates equity into DEP and PUC decision-making; defines environmental justice and frontline communities.

MA SB9: Creates cumulative impact rule to protect EJ communities in environmental and clean energy project decisions.

NY CLCPA: Directs 40% of benefits of state agency energy investments to Disadvanted Communities (Similar to **Justice 40**).

** To cultivate leadership by those in whose interests equitable changes are being implemented, transformation of [state] structures for engagement must shift for meaningful power sharing.

In this context, our next set of discussions must include priority community members - who have a right to know, understand, and weigh in on old, new, and emerging energy options and possibilities. This is a threshold issue.

Traditional decision-makers must not continue to make decisions on life essential services for priority communities without us. ¹⁹

-Naomi Davis - Blacks in Green

Supporting New York's Disadvantaged Communities' Goals

In 2019, New York State passed its groundbreaking Climate Leadership and Community Protection Act (CLCPA).¹ The Act uses established ambitious clean energy goals to empower every New Yorker to fight climate change at home, at work, and in their communities. New York's goals represent a once-in-a-generation reimagining of the State's infrastructure and program investments across the energy, buildings, and transportation sectors. At the urging of environmental justice leaders, the CLCPA established a goal for state agencies, authorities, and entities to ensure disadvantaged communities receive **40% of the overall benefits** achieved through the state's clean energy investments. This mandate will affect how billions of dollars in annual investments are allocated throughout the state.

The state's 40% target is monumental. However, defining what constitutes a disadvantaged community—and how those benefits will be measured—is no small undertaking. In response to this challenge, ILLUME is helping the Climate Justice Working Group (CJWG), the New York State Department of Environmental Conservation (NYDEC), and New York State Energy Research and Development Authority (NYSERDA) to determine what counts as a benefit, what we mean by "disadvantaged communities," and how we might quantify the benefits earmarked for them. ^{2, 3, 4}

To support the 40% mandate of the CLCPA, the Climate Justice Working Group is tasked with defining the criteria that will be used to identify disadvantaged communities across three geographic areas. These are:

1. Areas burdened by cumulative environmental pollution and other hazards that can lead to negative public health effects.

2. Areas with high concentrations of residents who are adversely impacted by several social factors, such as limited income, high unemployment, high rent burden, low levels of home ownership, low levels of educational attainment, or members of groups that have historically experienced discrimination based on race or ethnicity.

3. Areas vulnerable to the impacts of climate change such as flooding, storm surges, and urban heat island effects.

The Climate Justice Working Group thus expands traditional definitions of Environmental Justice areas to include climate vulnerability, consider the effect of multiple environmental burdens, and encourage the inclusion of negative health effects.

Identifying Disadvantaged and Vulnerable Communities

After nearly a year of working hand-in-hand with the Climate Justice Working Group and spending hundreds of hours knee-deep in data, we have developed recommendations for legislators, program administrators, public utility commissions, and utilities who are looking to define disadvantaged and vulnerable communities.

Considering Disadvantaged and Vulnerable Communities Will Become the Norm

New York is not alone is this challenge. Many states are enacting similar legislation and are navigating a web of considerations as they try to define disadvantaged or vulnerable communities. California set an early example by considering and directing spending to disadvantaged communities and priority populations with SB 350, SB 535, and AB 1550.⁵

Following the CLCPA, the federal government established their own version of the Justice40 Initiative⁶ which is modeled on the CLCPA goal that 40% of the benefits from select federal investments flow to disadvantaged communities. To support this, the federal government convened the White House Environmental Justice Advisory Council (WHEJAC) to establish definitions and metrics.

In addition, numerous states have passed or are deliberating legislation to define environmental justice, disadvantaged, vulnerable, or frontline communities to help them better (a) direct programs and/or spending to these communities, and (b) consider the impacts and benefits in agency decision making. As of the Fall 2021, we see actions to define or consider environmental justice, disadvantaged or vulnerable communities, or populations for clean energy decisions in states including Washington, Oregon, Colorado, Michigan, Illinois, Virginia, Massachusetts, Maine, and Vermont.

Uncover what people care about.

Carefully listen to community needs: Engage directly with stakeholders and/or community members to learn who environmental justice (EJ), local advocates, and community stakeholders define as disadvantaged or vulnerable communities and why. Listen to the on-the-ground experiences of communities that may warrant more investment.

Identify tangible threats and burdens: What types of threats are people worried about? We can focus narrowly on known toxins or pollutants, with a "scientifically proven" connection to negative public health effects. However, communities may think about a broader range of facilities or conditions associated with historical disinvestment or discrimination, regardless of their current threat (e.g., industrial zones, remediated sites, historical redlining).

Bring history into the future: We need to develop a definition that is both restorative (addressing the legacy of past discriminations such as redlining) and forward-looking (preparing for climate change impacts). However, this requires trade-offs. You will find yourself faced with difficult choices about how much importance to give historical factors (e.g., locations of regulated facilities or remediation sites) versus future proofing (e.g., coastal flooding or storm surge risk areas). Lean into the hard discussions!

Build with the purpose in mind: Understand how the definitions you establish will be used or applied. Will this be used for program outreach or eligibility? For regulated facilities? Awarding contracts? Measuring impacts? As you determine what metrics and data to track and collect, be clear about how these will be used. This has real implications for how to adequately develop community definitions, indicators, and analytical approaches.

Consider what a community-level definition means for programs: Do stakeholders want to define the populations based on geography, on individual household characteristics, or both? How would a community-level definition affect how programs allocate resources? With a geographic lens, what happens to underserved or vulnerable individuals living outside of defined areas? With an individual lens, what geographic effects remain overlooked? What cannot be measured at the individual level?

Make sure the data allows you to measure what people care about.

Start assessing data availability, granularity, and quality early: What statewide data is available? How was it collected (or modeled)? How stable and reliable is the data at different geographic scales? Are there gaps that will need to be filled in? If so, how? In many cases measurement error increases at smaller scales. Many important data points—like regulated facility locations, exposures, or health impacts—require interagency collaboration and/or GIS analysis.

Weigh the benefits of complexity vs. simplicity: The current trend is toward multi-factor indices or scoring systems. Having a streamlined list of indicators may exclude elements some deem important. However, an inclusive list of indicators may result in many interrelated and statistically correlated indicators that may not have much influence. In a complex scoring system, each additional correlated indicator will add less and less informative value while at the same time costing more and more to collect and analyze. Is it possible to start simple with a few distinct factors or characteristics that adequately identify the communities you aim to serve?

Understand how you value the data matters as much as the data itself: Once you have determined how to identify the communities you want to serve, how are you going to determine how to apportion those funds? Will you be able to serve all communities, or do you need to prioritize? If so, how will you do this? The data will not magically unveil a list based on importance; there are many ways to put the data together. The final decisions will vary significantly depending on how you combine or weight indicators and what value you ascribe to the data.

Ask again, what do people really care about? Find ways to map the data early to get people talking about regional patterns, specific areas, or communities to classify as disadvantaged communities (DACs) and why. We learned that even with lots of indicators, when people talked about "missing" DACs, it was often based on income, race, and ethnicity (among other sociodemographic factors), and shifted our thinking about how to weight the varying criteria.

There is no perfect answer.

Accept that it is difficult to compare different regional burdens: How do you compare environmental justice burdens with climate risks? Or drought risk with flooding risk? What about rural housing conditions against urban indoor air quality? How can you get people talking about the different burdens people face in different regions?

Define what "success" looks like before you begin: How do you know when you have a good definition? There is no right answer. There is no secret list of disadvantaged or vulnerable communities. Ultimately, we have the lived experience of community members we aim to serve, and we have their sense of equity and justice. In New York, we're approaching this ground truthing in several ways (see inset).

With these investments comes a tremendous opportunity to direct funding to people and communities that are historically underserved, historically burdened by regulated facilities, or most vulnerable to the impacts of climate change. This effort requires commitment and accountability to the communities we aim to support. As organizations tasked with developing those definitions, it is necessary to deeply understand the impacts of our analytical decisions and the ways our decisions effect communities.

And finally, we need to commit the time to discussions and storytelling around these definitions. Communities deserve to understand why one community is designated as "vulnerable" while another is not. The way we engage communities in the process and beyond can empower them to engage with the data, understand the results, and most importantly, remain the central voice as our work plays out in real life.

There Is No Secret List of Disadvantaged Communities

To unearth equity and justice we must ultimately listen to the lived experience of communities. In New York State, ILLUME is approaching this ground truthing by:

1. Looking at the distribution of DACs geographically and against other maps. How many of these are urban vs. rural? How many are upstate vs. downstate? How many are in HUD qualified census tracts or historically redlined areas?

2. Asking community leaders and members to ground truth maps of potential disadvantaged communities based on their own experience. Zoom in on an area you know well and think about the threats and burdens to the people and businesses there. We asked the CJWG to identify communities they believe should be DACs and a few that should not be. We can modify the scoring approach accordingly.

Using blank maps with no data (and then on draft scenario maps) our team integrated Tableau and survey functionality for stakeholders to flag misclassified communities (e.g., is there petroleum storage for the airport nearby?). Stakeholder comments then shaped the criteria and scoring to ensure we had the right indicators and had weighted them appropriately.



A Systems Approach: Defining Energy Burden and Determining How to Treat It





Ask a botanist to describe a plant leaf and you are likely to hear about a leaf's upper dermis, or its spongy mesophyll cells, or the role of the Xylem and Phloem in transporting water, food, and minerals. Inside each small leaf lies a complex biological system. The same could be said about understanding the complexities of energy burden.

Energy burden estimates are complex and require a lot of data and careful consideration. They include an ecosystem of considerations of customer behavior, building system performance, and building conditions that may be obscured by energy consumption data alone. Analysis becomes even more complex when tracking changes in energy burden over time.

If we can better identify and track metrics that capture the benefits residents experience from energy efficiency (EE) interventions (such as reduced energy consumption, increased health and comfort, decreased shut offs, etc.), we are better positioned to lessen or alleviate energy burden.

The Limitations of Cost & Consumption

When looking to understand energy burden, it is tempting for program administrators and researchers alike to use the readily available energy use data gathered by utilities. But there are several limitations that make it difficult to draw direct conclusions from energy use data alone. These include:

A single-fuel view is an incomplete picture: Understanding how a program, product, or service can impact energy burden is misleading in dual fuel homes if assessed via only one fuel type. Consider, for example, a resident using electric space heaters to supplement a failing gas furnace. The beneficial impact of HVAC or weatherization upgrades viewed in electric bills alone will not reflect changes in consumption on the gas side, essentially mischaracterizing the efficacy of the intervention and failing to reflect how the customer experiences energy burden after the intervention.

Income-eligible customers' circumstances and home conditions vary: It is a mistake to read the income eligible population as a monolith, including in terms of their energy burden. In one analysis, we saw the baseline energy burden vary dramatically based on poverty level. In a single-family electrically heated home, energy burden was twice as large for customers below 150% of the Federal Poverty Line (FPL) compared to those between 150% and 250% FPL. Tracking only shifts in energy burden may misconstrue the absolute financial impact achieved for some customers.

There is a complex interplay of behavior and baseline system operation, conditions, and performance: Where there are competing financial needs in homes, some customers may choose to sacrifice comfort to keep energy bills low. Assessing energy burden without assessing shifts in thermal comfort may distort the customer experience. In effect, "burden" may be underreported for those who have already taken measures to address the financial hardship caused by their energy bills, even if it degrades their quality of life.

Energy burden does not reflect the entirety of financial distress: As a metric, energy burden does not account for customers who cannot make payments, who are in arrears, who have shut offs, or who have requested assistance. These additional metrics are critical to understanding financial health and distress and should also be considered when creating a holistic view of interventions' challenges and impacts.

Non-energy impacts (NEIs) are largely ignored: NEIs are created by many common EE offerings, such as weatherization and heating system upgrades. These can improve indoor air quality and reduce drafts resulting in reduced doctor visits, hospital admissions, and sick days. Counting only the impact to energy burden can exclude these important NEI's and their impact on customers' overall financial health.

Our Expanded Approach

As regulators demand that more benefits from clean energy investments go to disadvantaged and low-to-moderate income communities, program administrators will need to increasingly rely on different analyses and metrics to determine how to create and show real benefits. Here's how our team used data to model energy burden changes in different scenarios to support our clients in strategy and planning:

We utilized customer data and demographic research to identify and characterize the income-eligible population. Our team combined utility customer data with data from the American Census Survey to characterize the size and demographics of the income eligible population, including the split of owners and renters and single versus multifamily customers. We also identified and characterized the utility's verylow-income population.

We harnessed the power of data to estimate impacts of select upgrades. We used evaluation results from HVAC and weatherization program offerings to estimate the typical savings achieved in various home types. We utilized data to identify the portion of the population that had not yet participated in a utility funded EE program or a federally funded EE program (e.g., weatherization assistance program). We then utilized secondary data to estimate the proportion of customers with housing stock issues (e.g., roof replacements, porch repairs, or anything that could create a deferral in EE work). Finally, we determined the financial cost to address health and safety issues in housing stock to estimate how energy burden would shift at the population level if all customer homes could be upgraded.

We put everything together to assess impacts to household energy burden. We combined granular data, like the number of single-family, multifamily, owners, renters, electric heat, and gas heat customers, to model shifts in the energy burden at both the household (micro) level and the population (macro) level.



The Takeaway:

Our analysis identified several important considerations for those looking to reduce the energy burden of income-qualified residents:

Consider sub-segments. Variability across income eligible sub-segments means that the baseline energy burden within this population can straddle a large range. As an extension of this, the achievable impact to energy burden can also vary across the many sub-segments within this group. Utilities should consider differentiating within income eligible segments to identify where they may be able to create the most meaningful reductions in energy burden.

Embrace the complexity of behavior. Energy consumption is driven, in part, by customer behaviors. Program administrators will need to think through how to disentangle both the potential for, and impacts created because of, their offerings. As we discussed above, baseline energy burden can appear low for customers who are sacrificing thermal comfort to reduce energy bills due to competing financial needs. Pairing consumption data with other information (such as heating and cooling system status, operation and schedules, household size, etc.) will be critical to determining how to identify those whose need is obscured by the data.

Explore intersections. Upgrades to weatherization and heating systems can provide additional benefits to customers beyond energy savings. For example, the growing interest in public health may provide utility and program administrators an increased opportunity to identify and track health-related non-energy impacts (NEIs), perhaps even integrating them directly into energy burden calculations. Such partnerships may also create opportunities to braid funds and outreach. (See Sidebar).

Why go it alone? Creating cost-effective and meaningful shifts in energy burden for income eligible customers can be challenging for single-fuel providers. For an electricity provider, current weatherization and HVAC offerings may not create significant shifts in energy burden if most IE customers have gas heated homes, for example. Such providers could consider strategic partnerships with gas utilities to increase the impacts created in customer homes.

MONETIZED METRICS:

How Energy Burden can be Combined with Other Metrics to Provide a More Holistic View of Benefits

In addition to the availability of energy data, it can be enticing to use energy burden as a metric to assess benefits because accounting for metrics (monetarily) is easy to understand and provides the opportunity to consolidate benefits. For example, program administrators can monetize the health and safety impacts created via EE offerings to aggregate benefits into dollars—a single and easy-to-understand metric. But monetizing benefits can be complicated and must be done carefully. Here are some tips to get started exploring this particular benefit framework:

- Create common definitions of metrics to standardize understanding across offerings and departments
- Determine how to support the assessment of possible benefits, including performing research on metrics, and identifying methodologies for monetizing
- Establish a process and systems for tracking and reporting benefits
- Identify how to avoid overlap in benefit
 accounting

Remember, there are many benefit frameworks to explore, and any one framework may not be capable of encompassing the breadth of possible benefits.



The Theory of Everything:



Is Equity's 'Broader' and 'Deeper' Approach the Key to Decarbonizing at Scale?

Equity is finally receiving the attention it deserves. An all-ofgovernment approach is redirecting visibility, influence, and resources to ensure energy benefits are more equitably distributed. Engaging with larger sets of stakeholders has led to broader definitions of equity, an expansion of state and utility program offerings, and undiscovered opportunities to address climate and social justice imperatives.

ILLUME Director, **Amanda Dwelley**, sits down with **Mike Li** (former Energy Bureau Chief for the Connecticut Department of Energy and Environmental Protection), as he discusses how to expand our transition to a clean energy economy without leaving people behind.

Amanda: *Mike, how would you describe this equity moment that our industry finds itself in?*

Mike: I think this is an exciting moment. More and more states are paying attention and policymakers, regulators, utilities, and stakeholders are really paying a lot more attention to equity issues. They are trying to figure out how we address equity in our transition to a clean energy economy so that we don't leave people behind as we transition the technologies we're using to meet our energy needs. It's a very exciting time as everybody is really paying attention to these equity issues.

Amanda: What is happening in the industry from an equity/environmental lens that you are excited about?

Mike: I'm excited because we have a long history of energy and climate programs in this country, in some way, shape, or form. What's exciting now is that we're looking back at a lot of the programs that we have in place through an equity and environmental justice lens. We are taking a second look at program design to make sure that the programs address issues of climate and energy are not exacerbating inequity or environmental injustice. A recent example comes from my time working for the Connecticut Department of Energy and Environmental Protection. Working with the Governor's Council on Climate Change we looked at our climate programs from an equity and environmental justice lens to re-examine whether these were the right programs to be implementing. On the energy efficiency side, we also initiated the Equitable Energy Efficiency (E3) proceeding which looked at all our energy efficiency programs and worked with stakeholders to identify areas where we needed to make some changes to address equity or environmental justice. These types of examinations are happening across the country. This is great because a lot of the changes that we are making today will stand the test of time so that 10 to 20 years from now, people will still be focused on addressing equity and environmental justice issues.

Amanda: How is stakeholder participation today different than that of energy efficiency programs of the past?

Mike: In a nutshell, we have a much broader set of stakeholders. In the past, it probably felt like there was only a handful of people that cared about these issues and felt like they were rowing upstream. Now there are just a lot more people going in the same direction trying to address these questions. The breadth of the people that care and are invested in addressing these issues has really grown over the years.

See sidebar for some of Mike's ideas on making it easier for people to participate in decisions.



Creating Equitable Process

Justice40 is creating a framework for the energy industry to place a greater emphasis more inclusive decision making.¹ Here are four of Mike's suggestions for policymakers, utilities, and consultants looking for ways to make the public input process more user friendly.

1) Simplify the rules so people can participate.

Those familiar with the work of public utility commissions or the Federal Energy Regulatory Commission (FERC) will agree that the rules for public participation in proceedings are cumbersome. Most people who participate are professionals who do so as part of their jobs. Your average person is going to find it difficult, starting with figuring how, when, and where to participate. FERC recently created the Office of Public Participation to address these barriers. In Connecticut we had a few approaches to simplify participation. One thing we did was create a short and simple set of instructions on how to participate that would fit on index cards. It was as simple as, "email this email address with your comments, or your answers to these questions." Done. They provided their written comments. We tried to take away all the formality to make it easy for people who wanted to participate, to just participate.

2) Simplify the language so people understand what we're saying.

The subject matter in our proceedings and reports is dense and hard to understand, even for insiders. So why are we asking energy customers to comb through hundred-page documents? People interact with energy every day so let's do a better job at translating those lived experiences into comments that can inform public policy making. Start with simple questions: 'If you haven't participated in energy efficiency programs—why?' 'What do you know about this program?' 'Are our programs too hard to participate in?' That puts the onus on policymakers or regulators to be able to translate: This person said X, Y, and Z and what does that mean for how we design the program? It puts the work on regulators and program administrators to dissect the comments and what they mean for program design, marketing, or things along those lines.

3) Assist people who want to participate in the public process.

We need to support people if we want them to participate in public processes. In short: provide childcare, serve dinner, provide travel reimbursement, or bus passes if folks want to attend an in-person meeting. Individually these seem like nominal issues but collectively these are barriers to participation for certain segments of the population. A big topic is compensating people for participating in these public processes, particularly ones that are ongoing that have multiple meetings over the course of a year. If we really want people from all walks of life to participate in these processes, we probably need to start thinking about ways to compensate people for their time and energy.

Build the capacity of environmental justice and community-based organizations already participating.

These organizations speak up for those not traditionally represented in the energy policy making process. So, let's build up their capacity to serve. What does this look like? Trainings to introduce the participatory process, and one-on-one sessions to educate those new to the work are some examples.

Amanda: We often talk about terms like 'equity' and looking at our industry through an 'environmental justice lens.' What does that mean to you?

Mike: It means being intentional when thinking about program design: How are programs operating? Who's participating or not participating in programs? It's about putting a focus where some of these issues might not have been addressed in the past. In the early days, energy efficiency tended to focus on resource acquisition. In a lot of places, it was about 'how do we acquire the largest amount of kWh savings for the least cost?' That really skewed programs towards large users of energy who could deliver the most energy saving for the least cost. But at the same time, that creates equity issues because all customers are paying into these programs. When you're focusing programs on the largest users, we know a lot of people are not benefiting from the programs that they are paying for.

Amanda: How is this tension between resource acquisition and kWh savings playing out as programs attempt to balance energy savings goals and equity?

Mike: I think that is something that a lot of states and utilities are trying to sort through because, for them, those energy efficiency programs must be cost-effective behind whatever definition is used in their jurisdiction. That means that we must acquire a certain amount of kilowatt hour savings for lower costs, particularly if you want to be able to balance a portfolio and acquire other savings at a little bit of a higher cost. So, there are inherent challenges in addressing that tension. The energy efficiency industry has been creative and has been able to come up with ways to address costeffectiveness—and equity challenges. More and more portfolios and more regulators are creating some type of exemption for equity purposes so that, for example, programs that are designed for households with lowincomes don't have to meet the same cost tests that other programs must meet. Connecticut uses a different cost test for income eligible programs than for market rate programs. The California Public Utilities Commission recently decided to segment its programs into three channels, with equity focused programs in its own channel.

Amanda: Are there areas of energy and climate policy that are hard to reconcile with equity and environmental justice?

Mike: The reality is that equity and environmental justice in our energy programs are hard issues to solve for. One example is transportation emissions. Several northeast and mid-Atlantic states have joined the transportation climate initiative and they're working towards implementing what's referred to as the TCI-P program. The TCI-P program essentially increases the cost of gasoline and creates a regressive policy for people with the lowest incomes who live in areas with limited public transportation and who must drive to get to their jobs. This is one of those areas where there is an inherent tension. On the one hand we're increasing the cost of gasoline as a way of trying to address climate issues that we need to solve for. But on the other hand, we also need to ensure that the policies that we're putting in place are not negatively impacting certain people.



Amanda: Your work in Connecticut included guidance on equity for energy efficiency programs. Who was that guidance for?

Mike: The guidance was for utilities who implement the energy efficiency programs in Connecticut. The goal was to look at all the programs and the portfolio utilities are implementing and look at who's participating and who's not participating. We also looked at historical data to identify if there are sectors of the population or sectors within the state that haven't been participating in efficiency programs. We wanted to understand nonparticipation and ways to better target or design our programs to get people who are under-participating to participate more. All customers are paying into the program, so we were trying to imbue fairness into program design.

Amanda: What did you learn as you dug into participation data and barriers?

Mike: First, income-eligible households, more so than the market rate homes, face real barriers to weatherization. Things like asbestos or knob-and-tube wiring prevented those homes from receiving the full suite of services included in the Home Energy Solutions program. And because those homes have a higher incidence of weatherization barriers, they were not able to participate in what we thought was an equitable way. So, we decided to design a program that goes in and removes the asbestos or replaces knoband-tube wiring with code compliant electrical. Once this is done, the program will refer those homes back to the Home Energy Solutions program to proceed with weatherization and energy efficiency improvements. This is funded through a combination of federal funds (\$7 million from the American Rescue Plan) and another \$1 million through the Low-Income Home Energy Assistance program, otherwise

referred to as LIHEAP, that is provided to each state by the U.S. Department of Health and Human Services.

Amanda: Some communities are skeptical of energy services and providers. How have you seen energy programs establish trust among communities?

Mike: One of the ways that we do that is by using voices that those communities already trust. In Connecticut, one of the things we did was develop a community engagement program/strategy with utilities. Community groups could apply for money from the utility to help do marketing for energy efficiency programs, with the idea that these community groups are trusted voices within the community and would have better traction and reach to communicate with those who might otherwise be skeptical of the utilities.

Amanda: How can equity metrics fit into the picture?

Mike: When it came to equity in Connecticut, our initial directives were to the utilities. We had eight goals, one of which was to embed greater equity in decision making. We also have the Energy Efficiency Board, so one of our goals was to improve the diversity of the board. The second was to track equity indicators.

We have an equitable distribution report that we are required to submit every year to the legislature. Historically that report has been focused on program benefit by income, essentially looking at whether households with low-incomes participate in programs commensurate with the amount that they contribute to those programs. Over time, we've realized that equity metrics need to go beyond household income, so we are changing that report to address race, ethnicity, and other metrics that fall into the equity bucket.

Amanda: What was the role of stakeholders when it came to equity metrics?

Mike: In Connecticut, we really wanted to hear from stakeholders: what they cared about, what metrics the program should care about. It was really driven by stakeholders, as opposed to driven by the state agency or the utility. At the end of the day, we had some idea what metrics we cared about, but the metrics and the way that the program is designed really must meet the needs of the people. There's no point in us coming up with metrics that are not meaningful to the residents of the state and customers of the utilities.

Amanda: What are some examples of these metrics?

Mike: One of the big ones is program participation by renters. Stakeholders wanted to know if renters were participating equitably in residential efficiency programs. Because renters don't own the property, their participation in programs might be lower. We set up a metric to get a better understanding of the number of households that didn't participate in the programs because they couldn't get landlord approval. We also outlined a series of steps to better understand barriers that landlords have to participation and accommodate these issues in the program design.

To give you an example: if the utility customer qualifies, the Home Energy Solutions (Income-Eligible) program provides multiple services at no cost to the customer or landlord. Even with no costs, there were still concerns that landlords were reluctant to participate. We set up a bunch of steps to understand the extent to which this was true, what the barriers were, and then solutions to overcome these barriers.

Amanda: What barriers did you face trying to collect and measure race and ethnicity data?

Mike: The biggest challenges were getting race and ethnicity data for every customer that participates in our programs and ascertaining the accuracy of proxy data where we couldn't get actual customer data.

We collect customers' names and addresses, but historically we have not asked for race or ethnicity data. We need to ask 'Do we want to put a field there where a person can volunteer to disclose that data?' Knowing that not everybody is going to fill out that field, what does that mean for incomplete data? Customers want to know why we were asking invasive questions, even if they were optional. Then there's the whole question of how many questions can you ask somebody on a survey, how many fields of information can you ask people to fill out an application? There's a lot of survey fatigue and we're trying to lower the barriers to participation, not increase them. Maybe an extra question or two doesn't create a meaningful barrier, but that's a concern. As more and more programs go towards upstream or midstream programs, where we don't know who program participants are, that data becomes harder to track by individual customer. The workaround has been to use U.S. Census data or other data we can procure from various companies. The accuracy of that data is relatively high. Even if it's not perfect, it is representative of those populations participating in the program.

Amanda: How has Connecticut thought about the 'underserved', 'disadvantaged', and 'vulnerable' customers or communities beyond households? For businesses or C&I?

Mike: In Connecticut this was a work in progress. We conducted a deep segmentation study into who was participating in programs on the commercial and industrial (C&I) side to look at which industries or sectors were not participating. We created targets for utilities to reach those sectors.

It's probably no surprise that participation was relatively good across the board among the highest energy users (large organizations). For smaller energy users, the data showed that certain business types were systematically under participating in the efficiency programs. This led to targets for the utilities to improve participation for specific types of customers/businesses.

Are Utility Hardship Programs Generating Additional Hardship?

Recent research on vulnerable households illustrates something we've long suspected: utility hardship programs can create additional hardships if the enrollment or participation process isn't designed well. Here are a few tips on how to redesign your hardship programs to better serve all customers.

Don't put the onus on the customer to know your programs by name.

Customers who don't know hardship programs by name might not know the best fit for them and it's up to customer service teams to usher them through the most optimal journey.

Find ways to route customers in need to greater support.

One of the themes that emerged in our research is that customers who take part in hardship programs may be receiving a different experience than customers who enroll in a program like smart home offerings. If customers use phrases like, "I'm having trouble with my bills," that should cue customer teams to explain the full suite of enrollment programs.

Don't send customers back to square one.

Matching payment programs give customers an opportunity to lighten their financial burden with the help of utility matching dollars. But once a customer misses a payment they are automatically dropped from a program. Student loan programs are undergoing similar scrutiny. It's time we revisit our programs, so they do not further burden would-be participants.

It's time to put hardship under the microscope.

We're constantly doing impact evaluations or process evaluations, but for many utility-run hardship programs we don't do those kinds of evaluations. We need more scrutiny to understand what's working.

Business & Economic Transformation



Businesses, markets, and workforces, must define new paradigms for success to thrive in our changing energy industry and global climate.

We take a holistic view of your challenges to identify clear, actionable strategies so you can confidently take your first step toward transformation.

We navigate regional and federal policy to support you through identifying and defining new business strategies and models. We determine approaches to ready your communities and trade networks for economic transformations.

FURTHER/FASTER

Google Sets Its Sights on 24/7 Clean Energy to Power Its Global Supply

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In the Venn diagram of energy and technology, American utilities and one Mountain View, California company, are facing the same problem: how to power consumers' increasingly digital lives with the least impact on the grid and the environment. With more than fourteen data centers in North America, and nine locations in Europe, Asia, and South America, Google understands the sheer scale of decarbonizing the global electricity supply as it sets its sights on delivering carbon-free energy for every hour, of every day, at every location.

Enter Michael Terrell, Google's Director of Energy.



A descendant of Alabama coal miners and a graduate of Yale's School of Forestry and Environmental Studies and the University of Michigan's School of Law, Michael has been carefully studying the intersection of technology, energy, and conservation since his days with the Clinton administration.

A believer in the idea that you don't have to recreate the future from scratch, Michael sits down with ILLUME Founder, Anne Dougherty to talk about Google's vision to turn one plant into a data center, and how uncovering embedded value in the nation's existing utility infrastructure might just hold the key to our industry's just transition.

Anne Dougherty: We bring many aspects of our histories and our stories to the work we do. What brought you to your climate work and how does that history inform the work you are doing with Google today?

Michael Terrell: It's a long story, but my family was in the coal business. My grandfather, my dad, my uncle, and I ran a coal mining company in Alabama where I was born and raised. I spent a lot of time at the strip mines when I was a kid which led to an interest in rocks. I majored in Geology and Forestry in college and spent my summers working for the U.S. Park Service and Forest Service in the Western United States. I became interested in the intersection of national resource policy and public policy, which led me to Washington, D.C. where I worked in the White House for several years. This was an incredible experience that exposed me to Al Gore and his climate advocacy, which was incredibly compelling even back then. I also got a lot of exposure to the scientists and folks who were working on these issues. Not only did I come from a family that was in the coal business, but I came from a family with a lot of entrepreneurs. I wanted to recapture that business spirit, which led me to Google. I have a strong interest in solving big problems, like climate change, and am enthusiastic about the private sector's ability to build and scale new solutions to help us do that. The opportunity I have at Google allows me to mix those things.

Along those lines, you have worked to procure six gigawatts (GW) of power for Google. You are also moving to 100% renewable or clean energy for 24/7 for global energy supply for Google. What are the fundamental principles that are guiding your strategy and moving you in the direction you are moving in?

MT: We are a very large electricity consumer and we have looked at how to tackle emissions associated with our electricity consumption. We initially started doing this by purchasing carbon offsets and then we set a goal to match 100% of our annual electricity consumption with renewable energy purchases. That's what's helped us to procure over six GW of renewables. Now we're moving to the next step, which is to buy carbon free *energy for every hour, of every day at every location*—what we call 24/7 carbon-free energy—the last step in this journey. We set a goal to achieve this by 2030.

In terms of the how, I've been involved with just about every Google energy initiative since the beginning. And we have found that when you approach it from the perspective of trying to solve fundamental challenges in the business, this can give you a path for new approaches that you can then scale. This is how we approached our electricity purchasing and move to renewable energy. We saw the challenge as one that we needed to solve as part of our electricity supply for our data centers around the world. We started talking to our utility suppliers, renewable energy developers, and others in the energy industry looking for solutions we could put in place that were directly related to how we supply our data centers with electricity. That helped guide us to look for solutions that are grown out of the business, and solutions that can help solve these problems that make business sense and can be scaled. We worked with our CFO to structure these deals in a way that made sense for the business and in a way that we could scale across the business. Because of this we have been able to go further and faster than we even thought we could.











Google has a truly global geographic reach and the energy demanded by this reach is incomparable. How do you think about the scale of your work?

MT: Ultimately, we want to transition the entire global energy system, which is a huge challenge. For a company of our scale, we're looking at gigawatt scale solutions as we have operations all over the world. That piece is particularly challenging because as people in the electricity industry know, there is an incredible amount of variation in the market structures and the market dynamics from a place like Singapore to a place like lowa to a place like Belgium. We are working all around the world trying to work at large scale to drive solutions in the space.

Are there any policies that Google would like to see move forward to further your efforts?

MT: As many of your readers know, policy plays a huge role in the direction of the energy future, and it's certainly an area where we have been very heavily engaged for a long time. In terms of policies, we started with breaking down barriers to allow corporations to procure renewable energy on their own. We found that in many markets where we operated, the utility provider didn't offer a carbon-free solution and we were not allowed to procure one. We worked to change the laws in places like North Carolina and Georgia where we have set up purchase programs with the utilities and the regulatory commissions. In Taiwan we worked to change the law to allow corporations to purchase clean energy, and now you see Google and other companies doing that in those markets. That was how we got our start.

But obviously if you want to tackle this program and move the grid towards greater decarbonization, you need to look at a whole suite of policies. There is no one silver bullet. That includes internalizing the externalities associated with greenhouse gas emissions through, for example, the price of carbon. Also, this includes looking at how we can deploy clean energy technologies faster, and what incentive programs or other mechanisms can be put in place to do that. We need to reform the energy markets themselves. One of the things we found is that there is lots of value in managing grids on a regional scale through competitive markets. That really helps to bring more players into the market and manage the variability of renewables over large areas—the regionalization of energy markets, per se. Finally, you have empowering energy consumers, giving buyers a path to clean energy who want to be there now. The more we can empower energy buyers, the better.





Your work to convert coal plants to data centers, specifically your work with TVA, changed the way I thought about the challenge. We often think about transitioning economies as a one-for-one endeavor, from say coal to renewable energy generation. In this model, we fail to think in terms of replaceable economies or opportunities. As we transition to carbon neutral energy sources, channeling the creativity Google brought to bear on the TVA project, are there certain ways we need to shift our thinking or change the way that we are conceiving of the problem in order to better address the challenge in front of us?

MT: We don't have to build the future completely from scratch. We have a strong foundation from which to build. We certainly saw that in the case of the data center in Alabama. When I was standing on the ground at that site with a large coal plant, a very large switchyard, a large transmission infrastructure, it reminded me of standing onsite at a Google data center which also has large infrastructure, substation, transmission...that sort of thing.

I'm wondering if you can indulge me in taking part in a 'blue sky' exercise. What's next for Google after you accomplish 24/7 renewable generation?

MT: I've been in this space for 25 years. And what's most exciting is that the future seemed very, very far off. And the future is now. We're starting to see changes in the energy space that have only been talked about in theory for a long time. We're seeing transformation from all angles: whether it's clean power generation, whether it's energy storage, whether it's the way we deliver and manage power, whether it's smart electricity use, and flexible demand, whether it's electric vehicles. It's just an exciting time. This is an area where you have those opportunities and where I think it could lead to a lot of improvements. On the one hand, change can cause apprehension, but because of the challenges we're facing with climate change and needing to continue to grow the economy and have growth and opportunity for everyone, I'm super optimistic about the opportunities that are in front of us. We're starting to see the fruits of a lot of investment and a lot of hard work starting to translate into real tangible changes.

We found that in many markets where we operated, the utility provider didn't offer a carbon-free solution and we were not allowed to procure one.



Embedded Value:

How the energy sector can leverage existing infrastructure and mental models to transition economies

In 2018, Google invested \$600 million to convert a coal plant into a data center in Jackson County, Alabama. This resulted in over 100 jobs in a variety of full-time and contractor roles, including computer technicians and engineers, as well as various food service, maintenance, and security roles. Michael Terrell explains how the company breathed new life into a community sitting atop aging utility infrastructure.

"We found that there are decades of embedded value in the system that don't have to be completely lost and can be transformed into something new. The [Alabama] site was in a very robust section of the power grid with infrastructure that we could utilize and take advantage of. It was a win-win-win for us, the utility, and the community."

This is a game changer because the energy industry often thinks about transitioning economies as a one-for-one exercise (i.e., from coal to renewable energy generation) rather than thinking in terms of replaceable economies or opportunities for those jobs or positions. So, we asked Michael to share a few lessons from the Google experience that can be replicated by energy suppliers, like utilities, and non-traditional entities.

Have an openness to change.

"We operate in a very dynamic environment that is changing all the time (and faster than ever) because of the pace of technology. Lean towards change and keep an open mind."

Work with new partners to drive the future you want to see.

"Welcome the notion that there are so many new players in the energy space now that bring ideas, and technologies, and opportunities that didn't exist even ten, twenty years ago. From long time players in the industry to new entrants, I think it's the alchemy of all of that working together that is so exciting."

Think of leveraging value as a 'long play'.

"We redeveloped industrial sites in Oregon, Ohio, and Finland. It takes a little bit more time and effort, but the return is also greater. Getting back to policy, we should be looking for ways to harness the value of these sites and repurpose them for the future because there is an enormous amount of opportunity there. Not just for data centers, but for other uses."

Are there any specific emerging technologies, innovations, or ideas that really excite you at this moment? Are there things that you find particularly inspirational?

MT: If you had told me ten years ago that we would have opportunities to purchase carbon-free energy in places likes the Southeast United States, and for prices that are competitive with grid power, I would have not believed it. We've seen historic cost declines in existing technologies like wind and solar. Now you are starting to see cost curves apply to battery storage and it's creating a lot of opportunities. Also, we're seeing emerging technologies in the power generation space. Whether it's large utility-scale storage, or long multi-day, long duration storage, or green hydrogen or carbon capture, or advanced nuclear-these are interesting opportunities. On the demand side we started shifting our data center loads around, not only in time but in space. We have also rolled out a new product for Nest thermostat customers that helps them manage their energy more intelligently, so lots of technology opportunities on the demand side. We're using machine learning to optimize the cooling in our data centers and to help us manage our wind portfolio in the United States. I think there are lots of exciting developments that are hopefully going to scale and are going to help us realize this future that we have all been driving toward.

Google has tremendous brand influence. How do you rally the private sector to join you in this decarbonization effort?

MT: What is so interesting about the business community and the opportunity to help solve problems like climate change, is that we all intersect the economy in different ways. It's fascinating how if you look and really dig deep and examine where your business or where your technology intersects the economy, that you can really go big in that way. Google was a large power consumer, so we really leaned in on that area to try to see how we could transform that element of our business and, in doing so, bring a lot of others along with us.

We've now seen the corporate renewable energy purchasing space go from just us and a couple of other players, to now hundreds of companies and tens of gigawatts of annual corporate purchase agreements. Now we're looking at our platforms, whether it's Nest thermostats, or it's our information technology platforms. This notion of getting the electricity system to 24/7 carbon free, it's not a pipe dream anymore. It's something that's possible. And there are already several electricity grids around the world where we operate data centers where already over 90% of the hours of the year are carbon free.

So how can we take that further, faster? Through the 24/7 carbon free energy compact, a partnership amongst Google and other companies and organizations and the United Nations to rally people to this goal of 24/7 carbon-free energy. Because the technology and technology pathways, and the market pathways are there in a way they have never been there before. And we think it's achievable. We think it's achievable sooner rather than later.

My advice for companies is to focus on your intersection with the economy and how you can drive change for your own business and your own space, but also for everyone. Because if we all do really well at the things that we are good at, then we can lead to a lot of positive change.







Michael Terrell is the Director of Energy at Google where he leads global strategy and 24/7 carbon-free energy initiatives for Google's data centers and global energy portfolio. In this role, he has advanced new approaches to Google's procurement of over 6GW of renewable power, pioneered groundbreaking renewable energy purchase programs, and delivered landmark projects such as converting coal plants to data centers. Michael is a regular lecturer on climate and energy at Stanford University and serves as Board Chair of the Renewable Energy Buyers Alliance. Prior to joining Google, Michael worked in energy and climate law and policy. He held several roles in the federal government, including the White House Council on Environmental Quality, where he helped guide U.S. policy on energy and environmental issues. He holds a JD from the University of Michigan, a master's degree from Yale University's School of the Environment, and a BS from the University of the South.



AFTER THE PANDEMIC

Building an Equitable Clean Energy Workforce

We have long known that the demographics of our energy efficiency workforce is not representative of the public it serves. 'The Great Pause' has created a much-needed opportunity for industry and workforce introspection.¹ As our clean energy industry recovers from the pandemic, we have an opportunity to re-envision our workforce to better address structural and historic inequities in access, wealth, and opportunity. *But how do we ensure that the green recovery is accessible to a broader swath of the U.S. population*?

State of the Trades: Demographic Disparities in Energy Careers

Installing Energy Efficiency (EE) upgrades is a critical piece of the clean energy puzzle. Given the sizeable workforce that is needed to carry out this transition, it stands to reason that an abundance of higher paying clean energy jobs will attract an abundance of diverse workers.

But according to a 2019 Brookings Institute analysis of Bureau of Labor Statistics (BLS) occupational employment numbers, the demographics of the clean energy and energy efficiency workforce do not bear this out. Only 3.7% of insulation workers were women and only 5.9% were Black or African American. For context, women made up 47% of the national workforce while Black and African American workers made up 12.3% of the workforce.² Except for an overrepresentation of Latino workers in the insulation trade (43.3% compared to 17.6% of the national workforce), our industry is not inclusive in the trades. We are also missing opportunities in the ranks of environmental scientists and geoscientists where women (33%), Black and African American (4.8%), and Hispanic or Latino workers (12.4%) remain underrepresented.³

Brookings' research shows that many occupations within the clean energy economy are higher paying despite having lower educational requirements.⁴ But our industry should be careful relying on the low educational requirement of clean energy jobs as a substitute for doing the intentional work of reaching out to communities to ensure a diverse workforce.⁵


Redressing Historic Wrongs Through Workforce Development

As an industry, we are at an inflection point to redistribute the benefits of clean energy and energy efficiency jobs more equitably across the labor force. Clean energy jobs tend to pay better than average employment and many jobs have lower barriers to entry than jobs with comparable salaries.

ILLUME is supporting a resilient community pilot in a historically underserved community. When we asked community members to share their concerns, *workforce development and economic development* were at the top of their list—not smart grid infrastructure or energy efficiency.

In addition to creating jobs in underserved communities, workforce development efforts may help to increase program participation. In a 2019 study of nonparticipants across Massachusetts energy efficiency programs, ILLUME found that nonparticipants were more likely than participants to live in rental units, have a high school education or no secondary school degree, be low-to moderate income, and speak a language other than English at home. Investing in workforce development to train contractors can provide jobs for the community and make it easier for people in the community to access programs. Developing a more diverse energy efficiency workforce could also enable more people to participate in programs, as implementation team and contractors are able to (literally) speak their language and reflect their community. Our research also finds that there are often barriers to participate in programs related to language, culture, and access.

Focusing workforce development efforts to ensure that the new clean energy workforce reflects the demographics of the community and service territory provides an opportunity to rectify the historic imbalances of who is served by the clean energy industry.

As utilities consider investing in workforce development efforts, our team has the following recommendations:



Identify the gaps in your existing workforce:

What does the current EE workforce look like in your area and how does that differ from the broader workforce? Are there communities that are under-represented? Are there communities that don't participate in programs? How might you better serve those communities through expanding your trade ally networks?

Create a training structure and support:

For trade allies, especially for minority, women, and disabled veteran-owned business enterprises (MWDVBEs), providing specific training, mentorship, and other support can help people begin work in a new trade or position. As part of our contractor research for an evaluation of a workforce development program, our interviews highlighted the importance of informal mentorships (of being 'taken under the wing' of a more established contractor). While valuable, these informal mentorships may perpetuate a workforce with similar demographic makeup as the current workforce. Creating structured programs and explicit mentorships and opportunities for learning and training can expand these 'informal' knowledge sharing opportunities. We highlight ComEd's Diverse EE Supplier program as an example of a program focused on developing MWDVBE trade allies (see sidebar).

Build community relationships:

Building relationships in a community takes time and repeated engagements. Especially for communities that have been underserved, there may be skepticism that the utility outreach is real and/or that the investment is not a one-off. Gaining trust will take time and consistent effort. Similarly, building a workforce, especially expanding a workforce to include those historically marginalized, requires an investment of time and money. If utilities want to transform their workforce, they will need to commit the time and money to doing it well.

Focus on youth initiatives:

Several successful workforce development programs like SoCalREN's ACES Pathway program (see sidebar) target young people in high school to provide the training needed for a clean energy career and cultivate interest in clean energy jobs.

Work with commissions:

Utilities working to expand their workforce may want to consider working with commissions and partnering with other stakeholders to defray the cost of investments in training. This also ensures greater buy-in for workforce development efforts.



SAMPLE PROGRAMS

Incubating Entrepreneurs: ComEd's Diverse Energy Efficiency Service Provider (EESP) Incubator Program

ComEd's Diverse Energy Efficiency Service Provider (EESP) Incubator Program links community-based workforce development and trade organizations to increase access to energy efficiency jobs and projects for minority, women and disabled veteran-owned business enterprises (MWDVBE) in its service territory (ACEEE 2020). The program provides a range of support to contractors including training contractors on ComEd's Energy Efficiency Portfolio offerings, back-office training and support, and assistance on certifications and project financing applications. More broadly, program services help contractors identify, address, and resolve barriers to building a successful business in the energy efficiency industry. The program's goal is to enable diverse contractors to join the EESP Network and complete energy efficiency projects. Once ComEd accepts cohort members into its EESP Network, outreach specialists work with the utility's implementing contractors to help cohort members obtain marketing materials and correctly submit project application materials.

ComEd has accepted eight cohort members into its EESP Network and three have submitted energy efficiency projects or fulfilled product orders for the portfolio. ComEd is also fostering a mentorship relationship between current EESPs and cohort members. It will continue to support cohort members' business growth plans by offering additional training through its CONSTRUCT Program, which trains individual workers to apply for entry-level positions in the construction industry.

Investing in Youth: SoCalREN ACES Pathway

Architecture, Construction, and Engineering Students (ACES) Pathway Program

Sponsored by Southern California Regional Energy Network (SoCalREN), the ACES program encourages high school students to explore careers in science, technology, engineering, arts, and mathematics. Participants co-enroll in community college courses. The credits they earn are transferable to campuses within the California State University and University of California systems, helping to remove barriers to higher education. In addition, ACES offers students paid summer internships. The program further addresses financial barriers to higher education and job training by providing students with related necessities, from proper work gear to various training and enrollment fees.

Currently, six high schools participate in ACES, with nearly 400 students enrolled in the program.





Ground Truthing Strategy:

Developing a successful strategy requires a commitment to learning, visioning, and re-thinking our challenges and our solutions. At ILLUME, our focus is committed to informed and ground truthed strategy. We do not lean on expertise alone; we ground everything we do in knowledge generated within and outside of your organization, drawing on our team of social scientists, data scientists, engineers, and planners.

Throughout our process, we ensure that skepticism and optimism remain in conversation, not in opposition. Our approach to strategy invites other viewpoints and a "devil's advocate" mindset to refining—and, where necessary, rebuilding—ideas, processes, and approaches. In this way, we do the work to vet your approach upfront, so you don't pay later.

Set a Vision.

Working with leadership and strategically identified team members, we workshop the future-state vision. Pairing utility- and customer-specific expertise, we help you paint a picture of your ideal future state in human, financial, and business terms.

Define Your Reality (and its Challenges).

Once the vision is established, we will work with you and your team to define your current state and begin to articulate the barriers to achieving your vision. We will do this through one-on-one interviews with your team and a deep review of your business environment, including regulatory constraints, market dynamics, and human factors.

Discover Your Opportunities.

Market opportunities. Once we understand where you are—and where you want to go—we work with you to identify opportunities. Using customized empirical research, qualitative research, and data science, we will identify strategic opportunities that you can leverage to overcome barriers to achieving your future state.



Social assets. Drawing on interviews with your leadership team and our learnings from the discovery, we will identify those individuals in and outside of your organization that will be critical to the success of your strategy—as either champions or detractors—in order to integrate them into your process.

the ILLUME Way

Establish Goals.

Through a third workshop, we will guide your team through the process of establishing objectives and goals that will be critical to putting "legs" on your vision.

Rethink Your Approach.

Once we identify your opportunities, we will gather our learnings and sanity-check your vision and our conclusions through carefully orchestrated "rethink" sessions. Drawing on a diverse set of tools and approaches, we will work with you to identify the best paths forward. These could include internal and external workshops, focus groups, interviews, or a combination of these. In this stage, we will present the proposed objectives and goals to internal and external stakeholders to identify gaps, potential pitfalls, and to reenvision the path forward (and perhaps even, the vision itself).



Assess Your Performance.

If desired, the ILLUME team will work with you to establish specific strategies under each goal and objective, and the KPIs and tracking approaches, to make sure your efforts are clearly defined and measurable.

Opportunity Identification & Development



The great decarbonization presents many challenges. And in each challenge, an opportunity for transformation.

We help you understand regional trends, evolving opportunities, and their ever-shifting markets to determine the best course of action for your business and constituents.

Our team of technical, data, and social science experts support you in emerging technology pipeline development, technology-to-program transfer and road mapping, beneficial electrification opportunities and strategy formation, demand response design and assessments, and distributed energy resources integration.

Illuminating Opportunity in Uncertainty: Developing a Pipeline for Success

We need better models for identifying, vetting, and moving new opportunities to market to achieve the innovation necessary to transform our industry.

Yet with so many opportunities out there to choose from, it can be overwhelming to identify which options are truly worthy of our investments. Whether they are technological, programmatic, or behavioral, finding new and emerging opportunities can feel like sifting through chaos to arrive at uncertainty. *Will this investment even work? How will I know? Did I choose the wrong investment in the first place?* These are nagging and very real questions.

Developing a suite of new opportunities is both possible and manageable. But it requires patience, a clear process, and a little external perspective. In this piece, we step you through ILLUME's process of opportunity identification.

Our process involves five simple steps:

- Identify Areas of Strategic Priority
- Inventory Potential Solutions
- Transform Solutions into Offerings
- Test Offerings
- Scale Market-Viable Offerings

Identify Areas of Strategic Priority

As a first step, it is critical to identify the company's area(s) of strategic priority. Like any business, it is important that your investments align with your strategic objectives. For example, if fostering electric vehicle adoption is a strategic priority, then you can feel relatively confident beginning your work in this sphere of potential solutions. In this example, there are innumerable technologies that we might develop, from charging infrastructure to dynamic rates.

Inventory Potential Solutions

Once we have the areas of strategic priority, the next crucial step is to identify the specific technological, product, and/or service **solutions** in this area that may be of interest or value to your organization.

To determine what might constitute a viable solution, it is critical to conduct both a technical and market assessment of the opportunity. Brainstorming and documenting the factors that you hypothesize will be necessary to deliver this solution and what benefits you expect to gain from your investment. This includes technical resources, market partners, key delivery channels, internal and external resources, potential customer segments, and potential impact streams (savings, demand reduction, revenue, etc.).

Document these factors and impacts across all solutions of interest. This will help you prioritize which solutions can meet your goals. The more systematic and thoughtful you are in this stage, the more likely you are to identify solutions that will meet your needs. Secondary research support can come in handy at this stage.

3

Transform Solutions into Offerings

Next, a **solution** becomes an **offering** when a viable business or program model is established for the solution. Every potential solution, such as electric vehicle charging stations, require many activities and investments to turn them in to a market offering.

In this stage, you must transform your solution into a vision for your offering and enlist the actors who will support you in developing or delivering on it. ILLUME supports our clients in this stage by helping them with formative research, RFP development, and vendor reviews, as well as providing technical and behavioral subject matter expertise to create the ideal business or program plan. Things to consider include, but are not limited to: the value proposition, funding sources and budgets, target markets and segments, key partners and channels, regulatory limitations or requirements, technical competencies required, cost structures, and desired impact streams (revenue, savings, demand reduction, etc.).

Test Offerings

Minimum viable offerings then move to the "testing" stage in the form of a field trial or pilot.

These offerings are implemented under controlled and measurable conditions to identify strengths, weaknesses, opportunities, and threats to your hypothesized business or program model.

In this stage, it is important to be clear on whether you are running a field trial or a pilot. A field trial is an early-stage test that focuses on a minimum viable offering. A pilot, in the energy world, is a fully-formed offering. In both cases, it is critically important that your test conditions represent or resemble the market and conditions in which you want to scale this offering. Otherwise, you risk making important business decisions based on unreliable test information. It can be tempting to cherry-pick segments and conditions at this stage to create a case study, but you are setting yourself up for more work (and failure) in the future.

Scale Market-Viable Offerings

Once you identify and mitigate weakness and threats in the testing stage, you can then scale your offering in market. Scaling always requires a full go-to-market strategy and a viable business or program model that is clearly articulated, measurable, and has trackable outcomes.

In this stage, you also want to set yourself up for evaluation against your program and/or business goals. This assessment is essential. To demonstrate your success, you will need to ensure that you have the tools, data, and tracking mechanisms in place to demonstrate your impacts. Through careful and ongoing data gathering, you will be able to identify weaknesses, make critical adjustments to your strategy, and determine whether your investment is worth more of your money and time.

Our staged approach is much like design-thinking and entrepreneurial processes. Through these steps, we help you move from an environment of many—often overwhelming—choices to solutions and offerings that have a measurable impact.



As today's most economical way to electrify space heating in the U.S., heat pumps represent both the opportunities and challenges central to beneficial electrification efforts.

How can heat pumps push the energy industry toward a greater and more equitable decarbonization strategy?



Environmental advocates talk a lot about electrification because unlike natural gas, propane, and gasoline, electric power can largely be provided at scale through cost-competitive, zeroemission sources. In their push toward electrification, advocates frequently cite space heating and transportation as easy entry points because electric powered versions of these technologies are readily available in retail markets at cost-competitive prices.

However, transforming the space heating and transportation markets isn't easy or straightforward, and there is not a clear playbook for successful beneficial electrification (BE) strategies. Heat pumps, however, are providing organizations with an opportunity to make progress on electrification and learn critical lessons along the way. As we tackle this new frontier, the frameworks, and decisions we make today for electrifying space heating have the potential to influence future efforts in industries with more nascent electric powered technology, such as manufacturing. So what electrification playbooks are heat pumps writing? **Electrification** refers to converting end uses to electricity from an earlier power source such as natural gas, gasoline, propane, or oil. Beneficial electrification (BE) is electrification that meets one of the following conditions, without negatively affecting the other two.

- Saves consumers money or time
- Enables better grid management
- Reduces negative environmental and human health impacts

Why heat pumps?

In addition to providing an electrified alternative to space and water heating, heat pumps offer:

Two to three times the efficiency of traditional heating systems. Heat pumps leverage available heat in the outdoor air (even at low temperatures) to provide more space heating than the electricity they consume. As a result, they're typically rated at two to three times the efficiency of traditional heating systems.



Many applications for ubiquitous end use, providing a large market potential. Top contenders currently include air source heat pumps (ASHP) used for space heating and cooling and heat pump water heaters (HPWH) used for domestic hot water.

An established market, including several major manufacturers, vendors, and distributors that provide this technology.

Lower operating costs in some regions, particularly for high efficiency units going into applications with oil or propane baselines.

In addition to the things heat pumps already have going for them, there are emerging trends creating yet more opportunity for heat pumps. These include a growing demand for space cooling in what have traditionally been heating-dominated climates, like the Pacific Northwest, and the rapidly accelerating demand for affordable housing and accessory dwelling units (ADU) or granny flats sweeping the nation – for which ductless heat pumps (DHP), a type of ASHP, have become the go to heating and cooling system.

But there are challenges too.

A couple key issues have limited the momentum for heat pump adoption, including:

Limited customer demand. While installations have increased, many customers remain unaware of heat pump technology. Customers with existing electric resistance heat may pose a distinct challenge, as electric resistance heating systems tend to have a long operating life which makes the opportunity for replace-on-failure upgrades less common.

Confusion in the market. In some regions, contractors are actively promoting heat pumps (notably ASHPs) to customers while other contractors are actively discouraging their adoption. This appears to stem from contractors' lack of familiarity with heat pumps or misinformation being spread in the market by competitors to heat pump appliances.

Heat pump performance in extreme cold. While extended capacity (or cold climate) heat pumps are becoming increasingly available, heat pumps struggle to effectively meet heating loads in some climates as the sole heating system.

Thinking revolution rather than evolution: While EE programs tend to work on the customer side of the meter, decarbonization is much more sweeping. For example, some statewide programs like those that exist in Oregon, Maine, Vermont, and Wisconsin, could consider decarbonization initiatives, measures, or offerings far outside our current paradigm. These might include working with construction crews to reduce natural gas leaks or working with local agriculture or forestry groups to change practices to provide decarbonization and carbon sequestration. Lack of sufficient training for how to optimize ASHP performance in homes with supplemental heating systems. Contractors who are not familiar with sizing, controls, lockouts, and switch over temperature setpoints can create installations that negatively impact both energy savings and comfort.

The environmental impact of some commonly used refrigerants. Refrigerants are key to heat pump technology. We know refrigerants can impact the environment via decomposing in the atmosphere and some eventually contaminate the ground and water. While some low global warming potential (GWP) refrigerants exist and progress isbeing made on yet more emerging versions, refrigerants continue to have a detrimental environmental impact.

For more information on **Emerging Refrigerant Tech**, see page 60. •

Increased operating costs and economic conditions in some regions, particularly where natural gas prices are sufficiently low compared to electricity prices, make the payback from electrifying space heating unrealistically long, even with an incentive.

And there are additional longer-term challenges that still exist. First, large-scale electrification of heating may dramatically increase winter peak demands on the electric grid and introduce new grid demand management challenges. Second, we do not have a clear way to identify and prioritize potential decarbonization measures through our traditional program funding mechanisms. And finallybut importantly-within our traditional DSM framework, there might be places where other decarbonization strategies (i.e., strategies other than electrification) are more cost-effective in the near term. This is especially so when we consider the total potential infrastructure costs of making buildings ready for the electrification of new end uses. For example, potentially lower cost decarbonization strategies might include approaches like using hydrogen power for certain industrial needs, and although currently limited in potential, using renewable natural gas.

Integrating BE into EE

EE programs may be well suited to administer BE directives as EE programs and program staff have the infrastructure and market knowledge to prioritize technologies, affect adoption rates, and monitor their progress. Some states, such as Massachusetts, Vermont, and Maine, are opening their energy efficiency programs to support initiatives beyond EE, including beneficial electrification. For example, Wisconsin's Focus on Energy policy manual allows fuel switching in cases where it is cost-effective from a total resource and customer perspective. The Illinois Technical Reference Manual (IL TRM) currently lists measures that explicitly allow fuel switching (both from natural gas to electric and from electric to natural gas), including both electric and gas heat pump measures, as well as a gas combined heat pump measure.

However, in many regions policies regarding EE and BE, and how utilities are allowed or not allowed to promote or get credit for BE, are mostly lacking. There are so few statewide policies in place right now that most utilities lack a viable means to fund BE actions within EE programs. The few operational policies that do exist in the U.S. are relatively young yet to demonstrate long-term success. At this point, it remains to be seen whether these policies will continue as they currently exist or undergo meaningful and disruptive changes. **Fuel Switching**, also referred to as fuel substitution, refers to switching from one fuel source to another. While the definitions and terms of which fuels are included vary by state, fuel switching is generally a movement toward the lowest-carbon fuel choice. Emerging policies are attempting to create additional criteria including accounting for the full greenhouse gas (GHG) and fuel-savings benefits that fuel switching yields.



The horizon

The next generation of products, including ducted ASHPs that can integrate with existing furnaces, a residential-sized variable refrigerant flow (VRF) heat pump, and products that can use emerging types of more environmentally friendly refrigerants, show promise in overcoming some remaining barriers to adoption.

There are also emerging heat pump applications, including heat pump clothes dryers, and the potential to value stack by using heat pump appliances, such as HPWHs, to provide demand flexibility by shifting load to off-peak times. New rate designs may also increase the appeal of heat pumps in some applications.

And innovation in codes and standard work include ideas such as a requirement that residential central air conditioners be capable of refrigerant-based heating. Finally, as EE programs and market actors become more familiar with heat pumps, we can expect to see innovative marketing strategies, program designs, and trade ally support for this technology.

In short, all signs suggest that we'll be hearing about heat pumps for a long time.

Getting Started

Here are some initial steps to consider:

Foundational research. Foundational research might take different shapes depending on the context of your region. This research might include understanding common BE measures, common heating fuels in the region, regional context for counting savings from or evaluating BE or BE-adjacent measures, customer and contractor sentiment and awareness of high-profile BE measures, as well as potential barriers and drivers. This research can also help to find the appropriate balance between efforts to increase heat pump adoption compared to efforts to further improve the efficiency of heat pump technologies. At this stage, it can be helpful to share your findings within your organization to begin developing a common language across the relevant teams.

Strategic identification of measures. Identify entry points for heat pumps, or heat pump applications and products to strategically pursue. Ideally these measures can contribute to program savings immediately (e.g., with a current practice or time-of-sale baseline) while also providing learning opportunities and creating some degree of market momentum (e.g., by increasing customer and contractor awareness). **Identify areas of influence.** Whether intending to increase heat pump adoption or drive further heat pump efficiency improvements, it can be beneficial to identify the actions your organization can take to affect change. For example, you may be able to adjust incentive levels, marketing strategies, or host contractor trainings to affect market adoption.

Demonstration projects. Consider field tests or demonstration projects to test your most promising entry points and areas of influence. These tests can be designed to determine the viability of strategies and to learn lessons from new heat pump products and measures. For example, your organization might consider piloting a HPWH measure to understand comfort impacts, bill impacts, and user experience. Such a study could also identify lessons learned from the field, including insights regarding installation, contractor experience, and potential program implementation. Where the demonstration projects are successful, the team can move forward scaling the strategy, developing recommendations to modify technical references, or pursuing regulatory changes as appropriate.

A decarbonization success story

Buoyed by supporting policies, Efficiency Maine Trust's heat pump program appears to have proven that the scalable, market-based electrification of heating can work.

Since 2012, more than 75,000 high-performance ASHPs have been installed across the state's 800,000 homes and businesses. With over 1,000-plus currently registered Maine heat pump contractors, the state saw 20,000 heat pumps installed in the past year putting Maine on track to hit a goal of installing another 100,000 heat pumps in the next five years.¹

Maine's program includes online tools that allow customers to compare annual home heating costs across fuel types and heat systems. The tool also helps customers find registered heat pump vendors and customer education such as user tips, installation considerations, and FAQs.

Trade allies in the program have access to training scholarships, sales tools (brochures, case studies), and an e-newsletter with best practice tips and notices of upcoming exhibiting opportunities. Much of this momentum is driven by Maine's statutory carbon reduction targets and related policies, including policies directly addressing the advancement of beneficial electrification.

For example, state law requires Efficiency Maine to use revenue from the region's forward capacity market to fund the installation of high-efficiency heat pumps.

Public Law ch. 476 established in 2019 required that the state develop an action plan to achieve Greenhouse Gas (GHG) targets. In the Climate Action Plan delivered to the Governor in December 2020, the state set a target of installing whole house heat pumps in 115,000 homes and heat pumps providing supplemental heating in an additional 130,000 homes by 2030.



Keeping the Lights On Leveraging Energy Efficiency for Reliability



As the need for demand management and reliability increases, how can we extend energy efficiency (EE) portfolios to increase demand impacts and improve reliability?

ILLUME is helping our clients identify and reprioritize their energy efficiency measures to capture greater demand response (DR) benefits.

Whether your customers plan to operate a microgrid, use back-up generation, or continue to rely on the grid, EE can help them have security with less restricted energy resources. If electrification and renewables expand quickly, EE can help add life to existing infrastructure while utilities upgrade their systems.

How?

We address this challenge with a staged approach. We start by understanding the intersection of current and emerging grid constraints, the regulatory environment, and the energy efficiency portfolio mix. From there, we conduct deeper research to narrow dozens or even hundreds of measures down to three to ten viable case studies to test for DR inclusion.



Stage 1: Gather. ILLUME works with our clients to understand current and emerging grid constraints, the regulatory environment, the EE portfolio mix, and other regionally specific contexts. ILLUME uses this background to prioritize measures at the subsequent stages.

Stage 2: Identify. We then develop an extensive list of measures from the EE portfolio that fit well with the clients' grid constraints, regulatory environment, and other needs. These measures may include emerging technologies like distributed energy storage, behavioral interventions like rate changes, or classic EE measures with ideal savings profiles like heat pumps and energy recovery ventilators.

Then, we collect high level information on each measure to narrow this list of technology and behavioral measures.



We use criteria such as:

Stage 3: Investigate. After working with the client to identify the top measures from the previous stage, we dig deeper into each measure. Our research at this stage may include reviewing participation data, estimating savings, estimating potential or market size, estimating incremental costs, and researching high level successes and challenges for these measures from secondary sources of information.

Q	High	Moderate/High	Moderate
	Smart	Heat Pump Water	Energy
	Thermostats	Heater (HPWH) Strategic Energy Management (SEM) for Water and Wastewater Treatment Plants	Management Information Systems (EMIS)
	Energy Recovery		
	Variable Frequency Drive (VFD) High Speed Ventilation/ Circulation Fan		Efficient Compressed
			Air Nozzles
			Customer Sited
			Battery Storage
			Efficient Clothes Washers

Stage 4: Demonstrate. Finally, we work to identify the interventions worth further research. Depending on the client's needs, we may help develop a field demonstration project with a vendor or conduct secondary research on case studies that exemplify a potential path forward for each measure.



Integrated EE with DR.

ILLUME identified and summarized multiple integrated smart thermostat program designs (including pros and cons) for a client interested in developing joint offerings. Smart thermostats represented an easy entry point, where EE and DR programs in the region were each separately supporting smart thermostats, just not working in coordination with one another. One benefit for this client was that an integrated offering could enable smart thermostat DR for smaller utilities in the region who would not be able to support a DR offering without the benefit of additional infrastructure provided by the statewide EE program.

Customer Targeting.

ILLUME helped develop a project with a vendor to understand the grid benefits from using targeted marketing for customers with potentially high savings, based on usage analytics. Customer targeting could potentially help rebate funds go further in reducing usage (especially at key times) but has had some mixed results in practice. This work is ongoing, but our team is excited with some early results!

Why EE Programs?

What characteristics make energy efficiency measures well suited to prepare against storms, extreme temperatures, and supply and demand imbalances? We sought to answer that question.

Most states' energy efficiency programs were launched in a time when price volatility was creating uncertainty throughout the economy—from urban planning, and investment forecasts, to families' month-to-month finances. Now states are looking at how they can adjust those same programs to support a similar need for reliability in the face of new uncertainties wrought by extreme weather events in a warming climate. As disruptions to the U.S. energy system become more common, new forms of energy generation, transportation, and storage are needed to stave off the worst impacts of climate change. We need better ways to deliver reliable energy services, without disruptions, especially during those times of greatest grid and human vulnerability.

When facing new or evolving challenges, decision makers in large organizations often struggle between creating new task forces or adjusting the mission of existing ones; these challenges are no different. Our take is that the right answer is somewhere in the middle, and success depends on execution. Existing energy efficiency programs already improve reliability and can be adjusted to further manage supply and demand imbalances. Still, there is value in developing targeted demand management and reliability initiatives with their own goals. Ultimately, the test for utilities is whether they can identify the right places to use existing energy efficiency programs to support and scale their demand management and reliability plans.

We already incentivize technology and equipment that does this, so emphasizing reliability only involves small tweaks to priorities and eligibility.

Balancing Tech and Human Needs

Technology



Integrated EE With DR Measures with Savings at Peak Times are Ideal Candidates

- For many energy systems, times of imbalance between supply and demand are driven by heating/ cooling end uses and occur during times of high/low temperatures, and typically not during shoulder season.
- Thus, improving the efficiency for heating and cooling loads can directly mitigate supply and demand imbalances in many regions.
- Promising measures include weatherization, HVAC interventions, energy recovery ventilators, and even heat pump water heaters, where water heating loads can vary seasonally.



DR-Ready Appliances are an Easy Path to Success

- The success of smart thermostat DR clearly demonstrates the value in increasing adoption for DRready appliances – Bring Your Own Thermostat (BYOT) DR programs can easily ramp up into the thousands and tens of thousands of participants within a few months of launching.
- Other appliances are beginning to follow suit, as ENERGY STAR® now requires DR capabilities for their designation in residential water heaters.¹
- While we saw mass adoption of DR-ready smart thermostats across the U.S., other DR-ready appliances
 may need more support to achieve similar levels of market penetration, and we see EE programs as
 being able to play a major role. These programs already have the infrastructure in place to drive
 the market, with their connections to trade allies/vendors/manufacturers/distributors, their market
 knowledge, and the processes they have in place to track their success and continually improve.

People



DR Opportunities That Could Benefit from Shared Infrastructure, Market Knowledge, and Connections

- Energy experts are actively working on cost-effectiveness tests for DR, which might not yet appropriately value DR for all its benefits, including reliability.
- In the meantime, EE programs can identify DR offerings that may not be able to launch without the support of shared EE infrastructure.
- For example, statewide EE programs can support smaller utilities to launch smart thermostat DR by aligning themselves for easily integrating EE/DR offerings with the various DR providers in the region. They may be able to share the same implementers, websites, evaluators, and other infrastructure. Similarly, for Strategic Energy Management (SEM) programs, participants may be interested to leverage the SEM EE infrastructure and existing relationships for support with their demand charges, which could alleviate supply and demand imbalances.
- Some of the key infrastructure to consider for supporting these DR opportunities includes:

Relationships: vendor, implementer, evaluator, research team, manufacturer, retailer, distributor, and trade-ally networks

Approaches/process: reporting timelines, stakeholder groups and meeting schedules, Technical Reference Manuals (TRMs), approved methods for balancing rigor/cost

Market knowledge: what types of offerings have/haven't worked, who is buying what appliances

The Takeaway

When facing new or evolving challenges, decision makers in large organizations often struggle between creating new task forces or adjusting the mission of existing ones; these challenges are no different. Our take is that the right answer is somewhere in the middle, and success depends on execution. Existing energy efficiency programs already improve reliability and can be adjusted to further manage supply and demand imbalances. Still, there is value in developing new demand management and reliability initiatives with their own goals.

While traditional EE programs help manage peak demand and support reliability through efficiency measures, there is a larger role for EE programs to mitigate future demand to the benefit of customers and the utility. These programs possess the infrastructure and market knowledge to prioritize technologies, drive adoption, and monitor progress which makes them well suited to administer these directives. Through targeted research, utilities and program administrators can uncover a wealth of knowledge to further assess strategies for enhancing programs. Ultimately, the test for utilities is whether they can identify the right places to use existing energy efficiency programs to support and scale their demand management and reliability plans.



From the Lab into our Lives

Technologies that Promise to Transform how we Generate and Save Energy

Technology will be central to the Great Decarbonization.

But technologies as we know them now? Perhaps and perhaps not.

Here we explore the not-so-common but promising technologies that may help us reach our climate change mitigation goals. In just the last ten years, we have seen an abundance of innovation in our homes. These have included the emergence of connected and smart home appliances and the increased adoption of electric climate control and even clothes dryers. While much of our progress toward households' decarbonization leans on electric heat pumps, they require refrigerants to readily absorb heat from the environment. But conventional hydrochlorofluorocarbon (HCFCs) refrigerants, while an improvement from their chlorofluorocarbon (CFCs) precursors, are still toxic, flammable, ozone depleters, and have come under scrutiny for these attributes.¹

To find the perfect refrigerant, researchers must balance a product's low global warming potential (GWP) against how environmentally friendly the refrigerant and its decomposition products are. **Hydrofluoroolefin refrigerants** have been lauded for their comparatively low GWP relative to conventional CFCs or HCFCs, more readily decomposing in the atmosphere. However, they eventually form trifluoroacetate which ends up contaminating ground water, and is very difficult to remove once it's there. Figuring out how to effectively remove these byproduct contaminants could open the opportunity space for these low GWP refrigerants and make them a more widespread reality.

Solar paint is an exciting innovation in energy capture with the potential to turn an entire building into a solar panel. Early-stage research has added a moisture capture component to conventional titanium dioxide-containing paint. This combination of ingredients allows ambient water to be captured and split to produce hydrogen, a source of storable clean energy. While safely using and storing hydrogen is a barrier, this is a big step toward a paintable solar capture energy source.⁶ When used in combination with traditional solar panels which convert light directly to electricity, a home could conceivably have direct (electric) and backup (hydrogen) energy sources, just from basking in the sunlight.

An alternative to conventional refrigerants is the long-emerging world of magnetic refrigeration, which enables conventional refrigerants to be replaced by cyclic heat transfer between a special "magnetocaloric" material (e.g., gadolinium or more recently, holmium) and a benign, often water- or heliumbased "cooling fluid."^{2, 3, 4, 5} When these special materials encounter a magnet, their magnetic field is rearranged such that their heat capacity, and therefore temperature, increases. Various techniques and materials are being researched to make magnetic refrigeration more efficient and less expensive, moving the technology out of the lab and into the household.

Cutting edge energy capture and conversion technology is being continuously developed and improved. Distributed energy resources (DER) like solar house paint are a critical element in building a more resilient, decarbonized power landscape. The concepts of partial grid defection and utility-mediated microgrids are growing in popularity as a means of backup power generation for more reliable and space-saving alternatives to, for instance, diesel generators.⁷ As climate change forces us to expect the unexpected, options for back up generation or the ability to "island" from the larger grid grow ever more attractive.

The **smart microgrid** developed by Commonwealth Edison (ComEd) in Chicago will be the first of its kind to provide a largely underserved metropolitan area with increased resilience in the face of power outages. The microgrid has 750 kW of solar and a 500-kW battery system that can run for four hours. The project will be the first utility-operated microgrid cluster, designed in part to better understand how shared energy resources work.^{8,9}



A truly flexible and resilient system requires its ability to store renewable power and integrate it with existing systems. The **Multi-Timescale Integrated Dynamic and Scheduling (MIDAS)** framework developed at the National Renewable Energy Laboratory aims to understand the

grid by evaluating the differences in timescales between grid reliability, stability, and economics in the face of decarbonization from renewable energy sources.^{10, 11} The innovative concept of **vehicle-to-grid (V2G)** or (or vehicle-to-home) (V2H) technologies are particularly appealing around the home and in local travel. The battery in an electric vehicle (EV) can give energy back to the grid or home when plugged in and not in use. The new electric Ford F150 promises eventual V2H compatibility called Ford Intelligent Backup Power, which could be used to provide power to homes during peak energy use. When used in accordance with grid demand, V2G could decrease costs and optimize pull from renewable energy sources.¹² School bus fleets have been used with V2G technology due to their high intermittent downtime in the middle of the day and at night, with the night-time contribution able to offset the lack of solar power at those times.^{13, 14}

Electric vehicles (EVs) are a major player in the global push toward decarbonizing the transportation sector. ILLUME did a whole piece on their history in our 2019 magazine! ¹⁵

This is led in part by EV-related or—adjacent policies from Europe's strict CO2 emissions caps to China's "new energy vehicle" credit, to India's emissions mandates, and the Biden administration's acceleration proposal for 100% renewable energy by 2035.

However, experts say that the direct replacement of all personal gasoline/diesel vehicles with EVs would require such an enormous production volume that the carbon burden would not ultimately be mitigated.



Instead, the only way to truly decarbonize soon is to rely less on personal vehicles and more on public transportation.¹⁶ That aside, even EV experts say that EVs are not inherently fully green because manufacturers' power sources are fossil-based, there is a limited recycling infrastructure for lithium ion (Li+) batteries, and their production depends on mining practices that are sometimes neither sustainable nor ethical.

The cobalt used to stabilize Li+ batteries is likely the riskiest link in the supply chain for EV manufacturers and requires mining primarily from regions unregulated by U.S. health and

safety standards. Research has aimed to address these issues by developing **cobalt-free EV batteries** that are still reliable but made from more accessible materials.^{17, 18, 19} Additionally Tesla, whose vehicle batteries even now contain below 5% cobalt, has announced their ongoing work toward cobalt-free batteries.²⁰

And of course, global travel today requires flight. With jet fuel demand set to double pre-pandemic levels by 2050, decarbonization of the aviation industry is needed. The road (cloud?) to **electric airplanes** is exciting and potentially long, given challenges of battery weight, concerns over efficiency once airborne, and issues with being far from grounded charging stations once in flight. To solve these issues, hybrid fuel-electric aircraft may be a solution, where partially electrified flight could be a nearer-term possibility.²¹



Renewable jet fuel offers a way to decarbonize existing infrastructure and engine design. A collaborative effort between researchers at multiple national labs and universities has made **carbon-neutral jet fuel from waste** material.²² Diverting waste that would otherwise emit methane while sitting in a landfill theoretically enables net-zero carbon flights while also taking advantage of a largely underutilized feedstock. Test flights for this fuel are set to begin in the very near future.²³

Market & Behavior Change



People and markets behave in complicated ways. Our strategies to change them should be simple.

We help you unpack these often-perplexing behaviors to create evidence-based approaches, add focus to your efforts, and home in on your clean energy goals.

We enable your success through careful market and competitive assessments, customer segmentation and prioritization, and establishing behavior change strategies and market interventions.

Georgians Transforming the LIVES of Neighbors



an interview with ERIC ARNOLD



To reduce household energy burden, many utilities offer income-eligible weatherization and home improvement programs. This ensures customers don't have to make tradeoffs between paying their utility bill or paying for groceries, childcare, or transportation. But what happens when our resources run up against older housing stock or structural expenses that require more investment than what is available?

Enter Georgia Power with its Home Energy Efficiency Assistance Program (HEEAP).¹ HEEAP is an ambitious effort in the utility's toolkit that leverages the generosity of local donations to augment existing energy efficiency dollars and solve for some of the structural challenges that are beyond the scope of program dollars.

Sara Conzemius: Eric, what is the origin story behind this unique donation program?

Eric Arnold: In 2017, we launched the energy assessment and solutions program which had an income-qualified component. In addition to Georgia Power spending its dollars, we began to ask questions like: '*How do we get community involved? How do we get investment from folks that are invested in their communities? How do we build more equity among local communities?*' These questions, coupled with all the diversity, equity, and inclusion (DEI) initiatives and social unrest, and suddenly we knew the timing was there to introduce a program to involve the broader community and improve the homes of folks who live within those communities.

What models inspired your approach? How did you come up with the framing for the program?

EA: We started with the Purposity app model. Imagine there's a school that needs backpacks. You can go on the app, zero-in at the ZIP code level, and find out that a school needs 100 backpacks. You can then go to Amazon and send 20 backpacks to the school. It is a community effort for a cause. That's where the concept for this donation component started. We asked ourselves, 'How do we take this Purposity model to engage communities to get energy improvements to folks that they know in local communities?'

We also framed this campaign as, 'Help a neighbor in need,' which helped soften the message because we lead with what Georgia Power is willing to put on the table. If we were starting with zero dollars and asking the community to donate to the cause, that would be a different story. That would mean we have no skin in the game and we're asking you to support 100% of the cause. It helps that we're coming to the table with dollars and asking for anything additional so that together we can improve somebody's life.

How have donations allowed Georgia Power to maximize its impact at the household level?

EA: As you start to look at homes, one of the biggest barriers that we find are structural challenges. And that's where the donation component comes in. It's designed to assist us with doing more measures beyond the dollars that we supplied and take care of some of those structural things. Our power dollars are focused on kilowatt reductions, and it needs to stay focused on that.

What have been some of the program's challenges?

EA: First, nobody had done it. There's that. Secondly, you're pulling the siloes together. We need to have an application portal, we need contractors, we need a way to receive donations and a way to distribute these donations. Not only do we have to market this thing to serve participants, but also market this donation portal to make all this come together at the geographic level. You have the macro program, but you also have the micro view of what you're trying to solve for.

COVID also delayed the program. We were supposed to launch this program in February 2020. We had delays even getting contractors on board. We had a budget that was allocated to serve our income qualified customers, so we used energy kits to serve that population in the interim, but we really wanted to get back to the core of the program.

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Georgia Power Taps into the Kindness of Neighbors to Fund Home Energy Improvements

HEEAP provides income-qualified Georgia Power customers with free home energy improvements to help lower their energy bills. Eligible customers receive up to \$3,750 in improvements from Georgia Power and may receive up to an additional \$3,750 from outside donations that can be used toward home energy improvements.

Home energy improvements include:

- insulating attics
- sealing air gaps
- repairing cracks and leaks
- sealing ducts
- servicing heating and air systems
- installing LED light bulbs and smart thermostats
- conducting a home energy assessment
- · receiving education on how to reduce energy usage

Customers who wish to participate must be Georgia Power customers and must have a household income that is 200% or below the current U.S. federal poverty guidelines. Donors who want to support the program can make either a one-time or recurring donation and have the option of choosing a preferred geographic location to target their gift. The HEEAP program is powered by Gridmates, a donation cloud platform that helps utilities empower communities to create custom fundraising campaigns.²Georgia Power is not a nonprofit organization and contributions are not tax deductible.



We started this program in May-June of this year, so we were halfway through the cycle when we launched, and we had the challenge of trying to stand up a program that's never been done. The application portal is open, and while we wish it was as simple as, '*if you build it, they will come*,' it is not that simple.

How was the program received? How do you keep the momentum going?

EA: Within 20 minutes of our first campaign people just started popping in donations from the \$5 level, to \$200, to \$1,500 overnight. To get donations from individual contributors, residents, and small businesses we need to stay focused on the message of improving the community. They're on board with that. But just like any other marketing, you must keep the message out there. We found out people really care and want to see improvements in their neighborhood.

We have also been really focused on the grassroots effort of getting the word out. Do people really believe that 'Big Utility' is going to spend money on my home? It's not a scam; this is real. But we also have the challenge of market penetration. We've been tapping into food banks, Meals on Wheels programs; every touch point that we can come from on the grassroots level. We just had a conversation with the software company Propel©, whose app targets income qualified folks receiving assistance, and that could be another a great way of reaching customers.

What level of interest are you seeing from the private sector?

EA: We have a few large corporations that have shown an interest in participating and possibly exploring a model of engaging their customers through a dollar-for-dollar match. Which is also a scary because we must be able to match these dollars and applications in a manner that is effective. You want the perfect storm of a full application portal, spending all the dollars we have as a resource, and matching those dollars to the homes that need repairs (plus all the advanced measures). We're trying to figure out how to perfectly match these things. We don't want any donations left on the table, but also want to balance how far we push that lever. If one company sees another company's philanthropic efforts and thinks, 'we want a piece of that action!' we want to manage that demand so that we are not over-donated.

What type of stories and data are you sharing with your donors and program partners?

EA: We must share stories that show the difference the program is having. We've been working with the one of the local housing authorities—I think we are finishing up 118 or so units—and we must leverage that success not only with the city, but we have to go back to the residents and host an energy fair so we can tell them what we have done and show them how to change their behavior to maximize energy usage to the point that it's putting dollars in their pockets.

Cities are telling us, 'We'll create this campaign and you'll put the money in it. But how can you guarantee this money is going to come back to us?' These are the things that we have to work out because folks want to see their dollars going towards things they are most passionate about, like their local community. We want to get this model down to the ZIP code level so that this connection is made. We're going to keep looking at the model to see how we can better refine it. People will donate if they are seeing improvement in their communities. Defining 'communities' is a piece we're going to keep working on.

What type of contractor network do you need to support this program?

EA: Our entire industry was hit hard because of COVID. I want to be able to build a contractor network that is reflecting the communities that we are serving, and the support from

ILLUME to help us understand workforce development has been invaluable. As part of our DEI efforts, we learned that if we want to build sustainability, we need to start employing folks who are in these communities so that we are not only making these homes energy efficient, but also investing in job creation and economic development. We want to ensure customers don't have to make the choice of putting food on the table or paying their utility bills. We need to bring more income into these communities.

Another effort generated by this program has been deliberately searching and finding minority contractors and women-owned businesses in our community. And if they're not in our communities, finding out how we get them trained in this business so they can be part of the program. This has been a personal effort of mine. As a company, Georgia Power is committed to spend over \$75 million over the next five years on DEI initiatives. I hope those dollars will be available to support something like that.

How is Georgia Power communicating that the trades are part of a sustainable career path that can create a generational change for families?

EA: Most minority contractors fly under the radar. They know how to do the work, but they don't have the resources to get the formal certification or the formal education. If I were to pull someone who looks like me and ask, *'who does your heating and air work?*' They're going to say, *'it's my cousin, it's my uncle.*' They know what they're doing but they're under the radar.



If we want to generate diverse participation in this program, we need to also reach the Asian and Hispanic communities; we have no contractor infrastructure there. It's probably there, but when we talk about how we target participants and getting them to respond, we're probably not going to be very successful in getting those communities to respond because we can't send just anybody into those homes that they can trust (or relate to) and have confidence in this program. We must create the infrastructure to be able to tie the trust and communication with our customers.

For utilities in other parts of the country reading this article and thinking about replicating your efforts, what partnerships have been most helpful to get you in front of customers?

EA: We've been working with the city of Savannah. They have a department of sustainability that has been preidentifying energy-burdened ZIP codes. They found out about this program through word-of-mouth and were excited to find a utility partner. There are a lot of exciting conversations up front and then it comes down to executing: 'How soon can you start providing us with these homes?' 'How soon can we identify folks at the right income level?' 'Once we verify income, how long does that process take and then you move from there?' We're looking to cut some layers if partners can bring us identified areas where we don't have to worry so much about income screening because we know that if we hit a particular [Census] tract, we're going to hit 90 to 95% or better of the customers that we need to reach.

We initially thought that if we put this program out therewhoosh!—all these people are going to come. It didn't quite happen that way. We've had some successful leads from community action agencies because they are out there doing this type of work. We're also exploring partnerships with housing authorities and sponsoring meetings so we're engaging and identifying multifamily properties within their reach. A lot of these grassroots activities are happening. You got all these irons in the fire and you're waiting for this explosion to get things going.

What keeps you up at night as you think about this program's moving parts?

EA: Making all this work and getting this model to run like the machine that it can. I'm constantly looking at what barriers we can eliminate in terms of trying to target a customer, sign them up, get them qualified, build the infrastructure so that

we can serve someone within a week of them applying. We are targeting the scale, but we must make sure all these components work well. I need to be able to quickly send someone to change an HVAC unit and spend those donation dollars so we can go back to our donors and say, 'Here's how your dollars were spent—this program is experiencing the success that it was designed to.'

Also because of COVID you're trying to prove something. You think three years is a long time, but it's not a long time. When you don't get started until halfway through that, we have a short window to make this beautiful model work. It's hard to move fast enough to make sure that we can eliminate those barriers. Plus, we're still in this sort of COVID environment where you are limited in the things that you can do.

Do you have any success stories you want to share with us?

EA: We had a customer the other day who sent us a picture of her home, it had this big hole in the ceiling. The donation funding opened opportunities to partner with folks in the community with a hammer to help with structural issues so that we, as a utility, could focus on advanced energy saving measures. We had sufficient donations available that we were able to fix the hole, air seal it, and take that home a lot further than we would have based on the old program model. In the old days we would have simply said, '*Stop. That's as far as we can go.*'

Eric Arnold is the Residential Energy Efficiency Program Implementation Manager at Georgia Power. Eric has served Georgia Power and its utility customers for more than 34 years. He leads the utility's strategic objective of implementing energy efficiency programs in the residential class as certified by the Georgia Public Service Commission as demand-side management resources. Eric began his career at Georgia Power in 1987 as a Utilityman in Power Generation and then served as Residential Segment Manager, responsible for managing and developing the sales strategy of end-use products in the single-family and multifamily markets. Eric has also served in other marketing, field service, and energy audit roles at Georgia Power.

Eric Arnold served in the U.S. Navy and holds a Bachelor of Arts degree in Business from Mercer University. He is a member of ASHRAE, AEE and served as Atlanta Chapter President and Southeast Regional Director of the American Association of Blacks in Energy (AABE). Eric is a Certified Energy Manager (CEM) and Certified Energy Auditor (CEA). He currently serves as the Vice President of Habitat for Humanity of Georgia.

Unpacking the Utility's Value in a Time of Climate Shocks

Extreme weather events like sub-freezing temperatures, wildfires, extreme heat, hurricanes, and flooding nearly always result in the same outcome: power failures.

When this happens, utilities can activate incident command protocols and procedures to quickly restore power.

But what about those mechanisms to restore customer confidence? How do utilities stand up and restore value in a time of persistent climate shocks?
Customer Confidence Is Fragile

Customers are all too familiar with the stress of climate shocks. Extreme weather events have resulted in billions in economic and property losses, adding pressure on the 21st century utility already overwhelmed with keeping prices down and earning back customer goodwill. Customer satisfaction depends on consistent, reliable, quality service.

Because customers cannot unsubscribe from their utility, the easiest outlet to express frustration is via price dissatisfaction. Social media is amplifying this dissatisfaction as customers express cynicism through memes that call out utilities that demonstrate poor corporate citizenship.

The same social media environment that gives customers a means to communicate with their utility is also exacerbating distrust of 'big utility'. Absent proactive communication from utilities on how they will address reliability in a changing climate, customers will judge the value of their utility through the lens of power outages and the social media feeds of similarly disaffected customers.

As climate change leads to more frequent and more destructive events, utilities will need to develop strategies to *address reliability, communicate clearly and with transparency, and invest in climate resilient infrastructure.*

Address Reliability & Align Communications

Price satisfaction is directly related to reliability. Simply put, customers are not satisfied with the cost of their service when basic reliability concerns persist. For example, recent events like Hurricane Ida in New Orleans or the freeze and ensuing heatwave that engulfed Texas this summer drove customers to social media to express dissatisfaction, cynicism, and distrust of the utility. Match communications with action. According to our research, customers expressed a sense of betrayal when communications about reliability did not reflect their lived experiences, especially during/after a storm. Utility preparations, such as the appropriate number of trucks and line workers necessary to restore services, will need to reflect the increased incidence and impacts of extreme weather events.

To earn back trust, utilities must:

Invest in the core issues related to reliability, such as making important enhancements to the grid. This includes investments in grid monitoring, line upgrades, tree trimming, and strengthening and upgrading critical infrastructure, i.e., hospitals and backup power.

Invest in Climate Resilient Infrastructure

Our research found that most of the emotional events utility customers remember are tied to outages related to natural disasters and storms. These stressful events are often associated with their utility, even if the utility is not at fault.

Below we share two considerations for utilities looking to re-frame customer schemas:

Address climate change and its effects: The social and economic costs of climate change are rising in the U.S. and causing more frequent impacts. Between January and September of 2020, climate disasters accounted for approximately \$46.6 billion in damages. Against this backdrop, utilities should remember to focus on the immediate needs of people during outages: spoiled food in their refrigerators and freezers, the cost of home and auto insurance claims, and lost wages. **Focus on resilience investments:** Whenever there is a storm and a resulting outage, American utilities will battle the perception that outages are due to a company-wide characteristic versus a single incidence of failure. To combat this perception, utilities must invest (and communicate their investments) in microgrids, home battery storage systems, and other resilience infrastructure to signal to customers that the utility will protect its customers from the threats of climate change.

Communicate Clearly and with Transparency

In addition to addressing reliability, utilities need to explain to customers how they are proactively addressing the challenges that are intertwined with reliability, such as aging infrastructure, communications challenges, and climate change. In our review of utility customer satisfaction scores, ILLUME found that utilities that score higher make information (about pricing, for example) easily accessible on their websites, through simple visualizations that explain complicated concepts, and by employing easy-tounderstand language.

Below are suggestions for utilities to improve customer communications:

- Use bill inserts to communicate specific information about how your utility is strengthening and upgrading grid infrastructure around local hospitals and other critical locations.
- Make publicly available information easy to access and understand. One way to combat distrust of the utility is by summarizing or clarifying information that can often be buried within filings and legalese.
- Incorporate openness and transparency in customer communications. For example, communicate where the utility has fallen short, particularly when it comes to the communication issues evident from recent events, and how the utility is remedying these issues.
- Address changes to the communication system, and within customer-facing communications, to demonstrate that your utility is working to improve processes. Also, be sure to avoid miscommunication cues which can compound dissatisfaction.

Our Approach

In synthesizing this holistic view of utility communications and customer perceptions of price, value, and cost, ILLUME employes several methodologies. These range from in-person and virtual customer interviews, to fieldwork, to cognitive psychology.

Review of marketing communications.

We analyze customer communications, ranging from topics like tree cutting, bills, emergency preparedness, energy efficiency, transmission, distribution improvements, and more. We categorized these communications by type and by topic and examined these communications to understand the utility's external voice, tone, and style across different formats, channels, and departments.

Ethnographic fieldwork.

To compare a utility's voice with its customers, we spent time in our utility client's territory conducting ethnographic fieldwork, including in-home, in-depth interviews with customers and intercept interviews at three different shopping malls.

Comparative reviews of utility price communications.

To understand how various utilities communicate with customers about pricing, we conduct a comparative analysis across utilities using information available on their websites and, where available, bill inserts and other mailed collateral. The comparison focused on several topics related to pricing, including rates, utility bills, and bill payments.

Cognitive interviews with utility customers.

We conduct in-depth cognitive interviews with utility customers to understand how customers read, interpret, and respond to customer satisfaction survey questions specifically related to pricing. For example, total monthly cost of electric service, fairness of pricing, etc.

Linguistic reviews.

ILLUME conduct linguistic reviews of interviews and focus groups transcripts to assess whether utility customers use language in a unique way and, if so, how the utility could use this language style to better connect to the community.

The Pacific Northwest

Flooding, Heatwaves

Storm surges along the coast of the Pacific Northwest will increase with climate change. Extreme precipitation events can cause landslides, sinkholes, and flooding, creating slope instability along transportation routes. Rural communities in this region may grow increasingly isolated and vulnerable as roadways and railways are blocked.¹ Heatwaves are compounding transportation challenges. In 2021, public transportation systems like Portland's TriMet commuter rail experienced disruptions due to record-breaking heat waves.²



The Northern Rocky Mountains Wildfires

Spring wildfires in the Pacific Northern Rocky Mountain forests have been driven by earlier spring snowmelt and warm summer temperatures. Warmer spring temperatures brought about by climate change are causing snowpack to melt at faster rates. This fast snow melt, paired with a moisture deficit in the summer, will lead to dry forests that can be extremely sensitive to wildfires.³

The Southwest/ Colorado River Basin

Drought

By the end of the 21st century, the Colorado River Basin is predicted to flow one third below the previous century's average.⁴ Lake Powell, located on the Colorado River, which serves as a reservoir for seven states and 40 million people, is projected to cease hydropower production as early as 2023. The result? Water shutoffs and potential interstate water rights disputes.^{5,6}



An increase in dry brush, forests, and grasslands has been linked to warming temperatures in the region. Aridity fuels like these allow for fast spreading fires that are difficult to maintain, resulting in mass damage in short periods of time.

Shocks to the System

Climate change is placing a greater emphasis on reliability, infrastructure investments, and customer communications. Utilities must prepare for, manage, and address critical services as extreme weather events become more frequent and longer lasting.

The Northern and Southern Great Plains

Drought

Rising temperatures in this region have resulted in increased drought (and drought intensity). Water shortages in the Great Plains region will shock agricultural production, directly impacting food security in the United States. Wheat, corn, potatoes, canola, and soybeans are farmed in this area. This means rising temperatures and increased drought could result in continuous economic blows to American farmers as crop yields decline.⁷⁸

The State of Texas Extreme cold

Scientists are looking at how a warming climate affects the polar front and the stability of the polar vortex's winds as they expand into North America. Newly recorded cases of unstable winds from the polar vortex dipping further into North America have caused extreme weather events like the deadly Texas freeze of 2021. Regions with relatively warm winters are suddenly thrown off keel as unstable polar vortex patterns result in tragic loss of life and billions of dollars in damages.

The Northeast

Storm surge height is predicted to grow in the 21st

century, putting Northeast coastal communities at risk of extreme flooding events (up to two to four feet of sea level rise) through year-round precipitation from Atlantic hurricanes and Nor'easter storms.⁹ The proximity and population density of Northeast cities like Atlantic City, Boston, and New York City makes them vulnerable to infrastructure, environmental, and socioeconomic impacts.¹⁰

The Southeast Flooding

As the climate warms, the number of tropical storms to hit the Southeast is predicted to increase.¹¹ Coastal and low-lying regions are vulnerable to flooding impacts caused by sea level rise, resulting in damage to infrastructure, water systems, communities, and ecosystems. Billions of dollars of flood damage have accumulated in this region as flooding has intensified.¹²

Moving Markets with Top-Down Legislative Action

STASOUT cimate's Moonshot Moment?

With the passing of the Bipartisan Infrastructure Bill and Build Back Better Act, the federal government and states are playing an outsized role in helping shape energy policy and providing much needed resources to help communities undergoing a just transition.^{1, 2}



An ecosystem of private companies is also chomping at the bit to transform the clean energy space.³ This has us thinking, *has our industry entered its "moonshot moment," using legislative action like a planet's gravitational orbit to accelerate a second clean energy boom?*

That view is entirely possible. At least according to former Arizona Corporation Commissioner, **Kris Mayes**, who has been busy leading Arizona State University's (ASU) Utility of the Future Center and is running for Arizona attorney general in 2022.

Mike Li catches up with Kris Mayes to talk about the movement of markets through regulatory policy, the role of environmental and social governance (ESG) as a driver of clean energy practices, and why Kris believes this might be the right time to take a second look at existing formulas for cost recovery and ratemaking.



Kris Mayes, J.D. *is the Director of the Utility of the Future Center at Arizona State University (ASU) and a Professor of Practice at ASU's School for the Future of Innovation in Society, College of Global Futures. Kris Mayes served on the Arizona Corporation Commission from 2003 until her term expired on December 31, 2010. She helped co-author the Arizona Renewable Energy Standard, which requires that by 2025 utilities must generate 15% of their overall energy portfolio from renewable sources like wind, solar, biomass, biogas, geothermal, and other technologies. The Standard contains the most aggressive distributed generation requirement in the country, requiring utilities by 2011 to acquire 30% of their energy from residential or non-utility owned installations, like rooftop solar panels on someone's home or on a shopping mall. She also helped establish one of the most ambitious energy efficiency standards in the nation, requiring utilities to sell 22% less energy by 2020 than they would have under current forecasts. Kris earned her Juris Doctorate from Arizona State University. She holds a Master's in Public Administration from Columbia University and a Bachelor of Arts in Political Science and Government from Arizona State University.* MikeLi: We're in an unprecedented moment regarding federal investment in addressing climate change. Between the \$1.2 trillion Bipartisan Infrastructure Bill and the Build Back Better Act, what are your thoughts on how this legislation can help us achieve our climate change goals?

Kris Mayes: The infrastructure bill was a great first start in terms of helping states meet their renewable energy, energy efficiency, and clean energy objectives. But Build Back Better is really a generational opportunity to advance clean energy and to combat an existential threat to our country and to the world in the form of climate change.

For the state of Arizona, Build Back Better represents an enormous opportunity to grow clean energy jobs to combat the serious air quality issues in Maricopa and Pima Counties and, where there are coal plants that are about to shutter, to assist communities in making the transition to a more prosperous economy. Coal impacted communities, like the Navajo Nation and places like Joseph City and St. John's, are all going to have to make this transition. Build Back Better will provide the resources they need to transition away from coal. That transition is happening across the west and it's going to hit these communities hard. They deserve our support.

In the Obama Administration, when I was at the U.S. Department of Energy, we spent a lot of time trying to figure out how to help communities transition, with limited success. What are your thoughts on what works?

KM: I run the Just Energy Transition Center at Arizona State University, which works with communities that are making this coal transition. What we're finding is that it's kind of a two-pronged approach. Number one, it works best when communities are thinking about this from a grassroots level and are designing their own futures for themselves-thinking through what makes sense for them from an economic development standpoint, post coal closures. But then we also need help from the federal government and from utilities to provide the resources that support the vision that communities create.

What we're finding in Arizona is that coal communities want to commit. They are fiercely independent and have a vision that includes clean energy, but they need our help in funding those visions. That's what's so transformational about Build Back Better and the infrastructure package; it has the potential to provide the resources at just the right time when these communities need it. These communities made Phoenix and Tucson possible, and frankly every other metropolitan area in each state that uses coal for cheap electricity. So, shame on us if we walk away from them at the time when they need support most.

6 6 ...the way to look at investments is by asking, 'compared to what?' For instance, when we think about hardening our electric grid and bolstering electric infrastructure to avoid wildfires, that is going to cost money. But compared to the enormous societal, human, and economic impact of devastating wildfires, it's not so expensive.







In the absence of broader federal regulation, do you think we can hit our climate goals with just the help of the private sector who are pushing a lot of environmental and social governance (ESG) goals? Or do we really need the federal government to intervene?

KM: I struggle with that one because I come at this from the perspective of somebody who believes very much in state action. I helped design Arizona's original renewable energy standard. I believe in the ability of states to move forward on clean energy and, at some point, we will need to have a coordinated federal approach to clean energy, akin to what was in the Clean Electricity Performance Program. If we take what is in Build Back Better, the resources for things like energy efficiency, renewable energy projects, transmission, and layer that on top of what states are planning to do to go 100% clean energy, we are starting to get something that could work.

You sit on a variety of boards for different organizations. What have you learned from those experiences about how we should go about decarbonizing our industry?

KM: I still sit on the Vote Solar board and, until recently, was on the Energy Foundation Board which I stepped down from to run for office. I've learned that there's real power in policy to kick start things like clean energy, which is good for our country, for our states, and for our people. I think that's what you saw in the 2000's and what you're continuing to see in the form of Build Back Better and the infrastructure plan—when you develop policy that guides utilities and clean energy companies in a certain direction, you can then sort of let them take it from there.

We established renewable energy standards in the 2000's that led to an explosion of job growth across western states and success in the decarbonization of our economies. We saw huge growth in energy efficiency, which has saved ratepayers across the west and across the country tens of billions of dollars. And then there is the development of an ecosystem of private companies around that clean energy. I think what is important is that you have this incredible opportunity to advance policies that lead to cleaner air and a better climate, but also expansion of jobs. There are not too many things that get you two-or-three times the return, so that is what I've learned in both government and in the work that I do with nonprofits.

As you reflect on your time as a Commissioner for Arizona's Corporation Commission, what are other accomplishments that you are proud of?

KM: I'm proud of the energy efficiency standard that we established in Arizona, which at the time was one of the best in the country and led to a savings of \$9 billion on behalf of ratepayers across our state. Second, our solar net metering rules, which led to 10,000 jobs in Arizona and the expansion and development of hundreds of companies.

Finally, a general focus on consumers. Public utility commissions, for the most part, were established to protect consumers. Now, protecting consumers equals advancing clean energy because it is the cheapest form of electricity that we can produce in America. The fact that we are at a point where clean energy is cheaper than everything else, including coal, is quite remarkable and a great achievement for everybody involved in policy back in the aughts and even before.

As states think about how to align investments to achieve their climate goals, there is a recognition that a lot of the investments fall under the oversight of public utility commissions. How do you think about resilience relative to cost when there is a potential ratepayer impact?

KM: I think the way to look at investments is by asking, 'compared to what?' For instance, when we think about hardening our electric grid and bolstering electric infrastructure to avoid wildfires, that is going to cost money. But compared to the enormous societal, human, and economic impact of devastating wildfires, it's not so expensive.

Back when we were establishing the renewable energy standard in Arizona, renewables were more expensive than fossil fuels. But we knew we needed to require utilities to invest in renewables to drive down the cost and get to the point we are today—where clean energy is the most cost-effective resource available. So, when I think about investments in infrastructure, and especially in the electric grid, I think about this compared to the alternative, and what would happen if we don't make these investments. The same goes for investing in coal-impacted communities and making sure they are taken care of. We can't walk away from these communities and leave them high and dry. There's a societal cost of walking away from them. We can't have that in this country.

What should public utility commissions be doing to support electric vehicle growth and the decarbonization of the transportation sector?

KM: Obviously there's a huge debate about how much the utility should be allowed to participate in terms of charging stations and rate-based infrastructure. I think that utilities must be involved at some level. Promoting their involvement in electrification of transportation is a good way to 'bear hug' them into the clean energy revolution, because we want them involved in a costeffective way. And one way to get them involved is to promote the electrification of transportation, which increases overall load-they sell more electricity, we get cleaner air, and Americans get the opportunity to own electric vehicles.

The question really becomes, 'do you want the utilities to be able to rate-base the infrastructure related to transportation electrification?' And I think that must be decided on a state-by-state basis. I would say the answer probably is, some of it, yes. Especially in areas of the state where we know that the private sector isn't going to go. I would be very supportive of bringing the utilities in and allowing them to own some of that.

6 ...it works best when communities are thinking about this from a grassroots level and are designing their own futures for themselves-thinking through what makes sense for them from an economic development standpoint, post coal closures. But then we also need help from the federal government and from utilities to provide the resources that support the vision that communities create. 🤈 🤊



Some of your work at ASU focuses on performancebased regulation, which a lot of people are suggesting is the future of utility ratemaking. Is this a short-term trend or long-term opportunity?

KM: I think we're headed that way. Hawaii is in the throes of the first experiment, and I think they've done a fantastic job. We need performance-based regulation: we need to be incentivizing utilities to do more renewable energy, more energy efficiency, cleaner energy-based transmission, and distribution, and customer-sided solar. To do that we need to pay them to perform in those areas, rather than paying them to build big stuff, which is what they have historically done.

We don't need to pay them to build big coal plants and gas plants anymore. We need to pay them to do decentralized and customer-focused energy. We need to incentivize them to decarbonize. Hawaii is leading the way and there are a couple of states that have ongoing dockets including California and Minnesota. I think that's where we must head. Americans want solar and energy efficiency.

You're running for attorney general. What are some of your policy priorities and how do you envision using the attorney general role to support decarbonization and meet our climate goals?

KM: I want to be the first attorney general in Arizona history to make fighting climate change a top priority. We need to start a trend here, which is that every attorney general in America should be making fighting climate change a top priority. The attorney general's office in Arizona has an environmental division; many AG's offices do. When I'm elected attorney general of Arizona, on day one, I will appoint an attorney to be my climate director and focus our attention on advancing clean energy for the betterment of all Arizonans. We need to explore every possible way we can deal with our water shortages and droughts and our air quality issues—all of which are becoming acute in Maricopa County, where Phoenix is located.

I think you'll see me become very involved at the legislature. I intend to testify in front of the Corporation Commission on issues and I intend to be become involved in negotiations over the Colorado River water allocations. There are a few AG's, like Maura Healey in Massachusetts, who have done a lot and lead the way, but there is so much more that other states can do. Out here in Arizona, water and clean energy are two areas that are overwhelmingly supported by both Democrats and Republicans—both areas bring all Arizonans together and both things are important for a state that is so reliant on our ability to preserve our water supplies.

Of all the things that you're seeing, what brings you the most hope or gets you most excited about ways we can meet our climate challenges?

KM: What gives me the most hope is the overwhelming support for clean energy in action and on climate across the state of Arizona. Whether you're talking about Republicans or Independents or Democrats, most Arizonans want us to roll out more clean energy and combat climate change. They understand we're facing a water crisis in the West. So, it gives me hope to know that at the end of the day the voters of Arizona want to see us act.

Look at a place like PebbleCreek, a retirement community west of Phoenix. This is a community where the average age is probably north of 65. That is where you will find that one out of every three homes are solarized. It's a very conservative, very, very Republican community. What does that tell you? It tells you that Arizonans believe in the right to produce their own power, believe in clean energy, and they want to see us get something done. And that gives me hope. Solar energy in Arizona is not a partisan issue; it is something everybody wants to see more of, and I love that!

Thank you, Kris. I appreciate you sitting down for this interview with us.

KM: It's good to see you again. I'm glad you're doing well and looks like a great outfit that you're with. I hope we can get back together again soon.



Customer Engagement



Every day is a journey, a collection of brief moments and decisions that craft a life.

We connect you to the daily experiences of your customers to align your vision with their aspirations.

Our research balances exploration and pragmatism to provide you with elegant solutions capable of engaging all people in the great decarbonization.

We align you with your communities through product and service design optimization, marketing, communications, message testing, and customer journey development and refinement.

Customer-Centered Culture





A Conversation with Tucson Electric Power's Customer Experience Team



Anne Dougherty: Dallas, can you give us a sense of your role leading the Customer Experience team at TEP?

Dallas Dukes: I serve as Vice President of Customer Experience Programs and Pricing. I'm responsible for the customer experience with regards to customer satisfaction, billing, the call center interaction with our customers, commercial customers through our business development teams, our economic development teams' insights around the customer, and our research in those areas.

I oversee associated programs: energy efficiency, demand side management of the renewable programs, distributed generation, beneficial electrification, electric vehicles, and the emerging tech and innovations groups which are always looking at what's on the horizon that's going to bring value to our customers and our organization from a products and services standpoint, a process standpoint, or a new technology.

I also have the team that handles our rate cases and regulatory activities around rate design in our territories and the array of cases that we follow both with the Federal Energy Regulatory Commission (FERC) and the Arizona Corporation Commission (ACC). Our team does the load and sales forecasting, and we have a back-office group that takes care of compliance filings associated with regulatory proceedings, energy programs, and with collection and the spending of those dollars—in short, trying to make sure that we're spending the customers' monies appropriately.

Anne: Lynne, how do you interface with this work?

Lynne Petersen: I am the Senior Director of Customer Experience. I'm responsible for the contact center and all the different ways customers interface with us when they're turning on service, changing service, or terminating service, and if they have billing questions or any other type of customer service-related questions. Our teams help those customers solve their problems, whether they are residential, small-, medium-sized, or large business. We also have a team researching customers' needs: what do they look like today, what will they need, and what will the requirements look like tomorrow? Finally, there's a group that takes those needs and translates them into new service offerings. My second role is to advocate for the customer throughout the different parts of our corporation, as well as externally with regulatory, government bodies, or other agencies as needed.

Anne: The customer experience is a hard thing to define. How do each of you define the customer experience?

Dallas: I think it's about looking at your customers' interactions and making sure the overall experience is exceptional or satisfying. How we describe that in our organization is ensuring that the customer is the center of all our decision making. We ensure that every interaction they have with us is valuable, enjoyable, easy, and exceeds their expectations. That's our mantra and our direction.



Lynne: I strongly believe that if you treat the customer experience as a discipline, it leads to profits. Customer experience initiatives should have a return on investment or return on equity. Whether this means that they should lead to increases in efficiencies, or effectiveness, or increased revenue—they should help you retain customers, expand your business with customers, or even attract new customers.

Dallas: Lynne said it terrifically. Utilities must come at this differently because customers—especially in Arizona— don't see us as a brand choice. There is no, 'I like their product better than their product,' or 'I can condition my home without using electricity.' So, there are very limited choices for customers. At the same time, we're essential to individuals in the community, the economy, and to sustaining life.

We want to know whether our customers are walking away from their experiences with us feeling that TEP is valuable, that they really matter, and that they're doing something great. That's why we added the 'valuable, enjoyable, easy' part to our mantra.

Anne: The energy industry is experiencing so many changes right now, and with those changes there is a renewed emphasis on the customer experience. What's unique about the time that we're living through that makes it important for utilities to care about the customer?

Dallas: Customer experiences have always mattered to utilities. What has changed is how ingenious everyone's gotten in the pandemic at delivering products to customers through technology. Customers' expectations are growing and changing, and the utility industry is not immune to that.

The movement towards cleaner and greener electricity has had a profound impact on the industry. Twenty years ago, the smart kids coming out of MIT and other great schools were trying to start Yahoo or Facebook or improve Google. Now those kids are coming out of school, and they want to save the world. They want to create ways to use less energy and produce more green energy. There are companies and ideas coming out of the woodwork on how to do energy differently. Our greatest defense is making sure that we're meeting the needs of the customers and that we are creating new products and services. We must make sure that our customers are highly satisfied, and they value and see us as their choice. Our greatest tool to do that is through their experiences with us.

Everybody from Shell to Amazon to Google to Arcadia is trying to figure out ways to get between us and our customers to provide easy, affordable, and clean energy. If we don't raise the bar from good to great with our customers, we're going to fall behind.

Lynne: I agree with Dallas. We need to keep up as customer expectations increase, particularly when substitutions for the energy services that we provide are on the horizon. Disruptions—like ESG requirements will propel entrepreneurs into this space who will be thinking about solutions that may replace our products.

I spent close to 25 years in the communication sector. Local phone providers thought their competition was other local phone providers. In the end, it was a substitution product—cell phones—that caused their demise. In my experience, once an alternative is available, it's way too late to start listening to your customers.



Anne: Centering the customer experience and business practice requires a cultural shift. When you talk about this cultural shift what does that look like?

Dallas: Cultural change is a heavy lift in any industry. Getting ahead of customer expectations, requires organizational alignments that put the customer in the middle of every decision you make. Let's face it: our product is dangerous, it takes a lot to produce, it's very complicated and, at the end of the day, the customer doesn't care about any of that. They just care about their lights coming on and the things that are important to them: being comfortable, ease of payment, or programs that save them money. They also care about what you do in the community.

When I talk about cultural change, I mean making sure that from the field techs, to the IT programmers, to the CFO, the first question everyone should ask is, "If I do this, how does it bring value to the customer and how does it enhance customer experience?" We will never get there perfectly; there is no "stop." You're always going to be chasing customer experience because the goal line moves as customer expectations change.

I was in a recent financial committee meeting making decisions on a capital procurement and capital budgeting project and the first thing the CEO asked is, "What's this doing for the customer? Explain to me why we're doing this in relation to the customer?" I think when you get to that point, you know that you're really making inroads and establishing that as a core belief. We always make sure that our community, customers, and employees are safe. Just as important as safety is making sure that the customer experience is exceptional. Anne: Much of what you are describing requires developing institutional muscle memory and creating a culture where the customer experience becomes second nature. What guides you either personally or professionally through that process?

Lynne: We're lucky in that we have a strong company vision, defined strategic focus areas, and core values that we see lived out every single day. All I need to guide the team in the right direction is reference our vision to be an exceptional energy provider that positively impacts the lives of our employees, customers, and our communities. Our four strategic focus areas—thriving employees, valued customers, efficient growth, and social impact—makes it super easy.

Take for example, thriving employees. We invest in employee learning that helps us get smarter about the customer experience, so we're afforded the opportunity to help our employees move along that learning curve.

For our valued customers, we have a strategic focus laid out for the entire corporation. This includes improving the customer experience with technology services and choice, which makes it much easier, as the team comes up with those best solutions, to fall right in line with our strategic emphasis as a company.

Put simply, we believe that we achieve excellence together. So, it is natural to reach across organizational boundaries and hold hands, so to speak, to come up with the right solution for the customer that makes sense from a financial perspective and, of course, from the customer perspective.



Anne: Can you explain a bit about the CX Council and Guiding Team you've developed?

Dallas: Changing culture is a big driver around this governance structure. There's an expression 'culture eats strategy.' If your culture is not aligned, your strategy is not going to work.

When we look at aligning strategy across the different groups in the organization, we're also making sure that senior leadership and the influencers in the organization are aligned culturally. We set up a Customer Experience Guiding Team of senior leadership and key executives. We have folks from generation, distribution, and transmission, regulatory, government affairs, community affairs and the VP for that area (including myself). We also brought on our VP of human resources because employees are a key part of understanding of what the customer experience means to us. We wanted to make sure everyone was involved.

We also brought in a consultant to join this team by bringing their expertise, organizational knowledge, and broad knowledge across experiences at other utilities and other industries to ensure we had an external perspective, and the group didn't become a kind of an echo chamber.

We wanted to create a group of what I call 'customer experience leader experts.' We then put together a Customer Experience Council underneath that, which mirrors the groups throughout the organization that shape interactions with customers. We want the influencers to help us understand how we measure value, how we measure success, and determine what we should prioritize.

Lynne: What we're really trying to get from putting the structure in place is an agenda with buy-in across the company. Once established, it should be easy to move forward. Alignment and cultural agreement will help facilitate the rollout and establishment of our customer experience initiatives.

Anne: You both shared that the customer experience doesn't really have an end point and that this work is a continual investment. How do you know when you're "doing right" by your customers?

Dallas: As Lynne said, initially it's increasing our customer satisfaction scores with JD Power, in addition to making those cultural changes that I described earlier. But it's also in the way we run meetings and feature a 'customer experience moment' in addition to our 'safety minute.' It's about having discussions consistently across the organization about how our work impacts and brings value to the customer expectation.

When these things are consistently happening, we know we're making good progress. Our success happens when we see that, as an organization, we're making capital and resource decisions holistically, advancing customer expectations, and creating a return on investment. Success is when we have a cohesive and well thought out process beginning from the customer lens and not from our processes out.



Lynne: I agree. Another measure of success for me is when the customer is at the center of every decision. Some companies add an empty chair or an object in the center of the table to represent the customer so that they are always at the forefront. You wouldn't suggest something in that meeting that the customer wouldn't appreciate.

Another example is when we find ourselves more agile and adaptable than we are today. What will show that we've made a lot of progress is when we can have what I call a 'hair on fire' mentality, and still have a governance structure in place such that even when we make fast decisions, we still make great decisions.

Anne: Any parting thoughts?

Lynne: Our customers will continue to evolve, and so will we. We do not have a vision to be cutting edge. We have a vision to be fast followers and smart followers. As the customers evolve, we evolve with them so that we can continue to provide safe, reliable, affordable energy.

Dallas: We're trying to build a culture where there is a willingness to experiment. We have been able to get down into a tactical sandbox, and we want to add 'culture' to that sandbox.

Instead of going to the Commission and asking for a program in our regulated world, we want to partner with the Commission (where we are allowed), and perhaps with an external stakeholder. We'll experiment in small batches and then bring the Commission a program that has evidence of success. As an energy supplier, we cannot afford big failures. We can afford 'controlled, small failures,' and remain within our fundamental mission to deliver reliable, safe power to the public. Sometimes it feels odd taking risks, because safety and reliability is your ultimate promise not only to your customers but to society.

Anne: I appreciate all so much for taking the time for this. Our readers are going to benefit so much from your insights.

Dallas Dukes

Vice President, Customer Experience, Programs and Pricing

Dallas joined Tucson Electric Power (TEP) in 2004 as Director of Corporate Accounting after serving as Divisional Controller for Citizens Gas & Coke Utility (now Citizens Energy Group) in Indianapolis. He became Director of Rates and Revenue Requirements in 2005 and was later promoted to Senior Director in that role, eventually assuming oversight of new programs and services, customer services and analytics, renewable energy, and energy efficiency programs. He was promoted to Vice President in 2019.

Lynne Petersen

Sr. Director, Customer Experience

Lynne joined Tucson Electric Power (TEP) as Sr. Director, Customer Experience in February 2020. She oversees the teams dedicated to customer satisfaction, improving the customers' journey, and business development for the Unisource (UNS) companies. Joining Unisource Electric, another UNS company in Arizona in 2015, Lynne has served most recently as Director and previously as Senior Customer Relationship Manager, strengthening relationships with key business customers, collaborating with community leaders, and driving towards greater organizational excellence.



customer experience evangelist in her own right, **Lynne Petersen** is trying to get the Customer Experience down to a science. So how is TEP looking beyond satisfaction scores to elevate the customer experience? "One of the things that I'm really trying to do is to look at the customer experience as a

The Art and Science of the Customer Experience

discipline or a science," says Lynne Petersen, TEP Senior Director of Customer Experience. "Our utility is using the Forrester Research¹ definition of customer experience to put some discipline around the art of customer satisfaction." Below, Lynne uses this research model to walk us through how customers perceive their experience at three different levels.

1. Meeting the Customer's Needs: "For us that means that means asking questions like, 'Did I get to accomplish the goal that I set out to?' 'Was the customer able to receive what I wanted them to receive?'" Lynne emphasizes that this step at the base level of the customer experience pyramid is crucial to every business, including utilities. Like many in this industry, TEP believes in delivering reliable, affordable, safe energy—which Petersen considers table stakes.

2. Ease of Doing Business: This second level relates to the question, "Is our company easy to do business with?" "This is where we look at how customers perceive the ease of doing business with us—which is a critical factor if you're trying to establish a competitive advantage," says Petersen. She goes on to explain that even if the utility is not trying to establish a competitive advantage, or because of the utility's monopolistic position, being a company that is easy to do business nonetheless shows respect for the customer. "We take into consideration their digital ability, agility, or affinity or their language choices. While it's critical for a competitive environment, it's still important in a non-competitive environment."

3. Customer Perception: "The third level of how customers perceive their experience relates to the interaction with the company," says Petersen. Here you have questions like: "Was it enjoyable? Did the customer leave with a positive interaction?" "If a customer says, 'I feel really good that I called today' or 'I'm glad somebody came by to change my meter today!' this shows that you have the capacity for empathy for customers who are struggling with something." Petersen reiterates the importance of speaking plainly when explaining things to customers, ensuring that their questions were totally answered, and even making sure that your voice is relatable and fun.

IHERE ARE JUBS TO BE DUNE How Journey Mapping Can Move Us Past Experiences

to Opportunity

How might we use customer journey mapping to innovate in service of the great decarbonization? We provide a few pointers for exploring the customer's journey to identify opportunities for innovation.

Customer journey mapping has emerged as a hot topic in energy programs and services over the past five years. And while widely adopted and discussed across the industry, we have largely reduced this approach to a diagnostic tool for fixing process and transactional issues.

Unfortunately, this narrow view of journey mapping misses one of the most valuable applications of this tool: new service and solution identification.

Often used in the early "empathy" building stages of the design thinking process, journey mapping is a key component in the design thinking toolkit.

When placed in that context, journey mapping is best seen not as a way of diagnosing what's not working in a particular offering, but as a means of identifying new, untapped opportunities to improved service, products, access, or engagement.



Expand your view of the customer journey.

When we develop a product or service, we tend to take an egocentric approach. That is, we assume the customer's journey begins and ends when they are interacting with us. Yet consumers do not magically arrive at our proverbial doors.

By working with custumers, utilities have an opportunity to explore the experiences that predate their engagement with your services to gain a more complete picture of their needs (and your opportunity to serve them).

Let's play out an example. If you are an electric utility looking to support customers with residential photovoltaic (PV), you might choose to focus only on the current moments in a customer's journey when they transact with you – namely during interconnection and the time of pay/billing.

However, our work at ILLUME has shown that customers' pain points for solar begin as soon as their research into solar does. People struggle to understand what solar PV systems to install, how to size those systems, and how to identify and engage with reputable providers. Later in the journey, customers are concerned with continuity of service, maintenance, and the integrity of their warranties (what if the provider goes under?). If you examined only the points of transaction with your company, you would miss other important challenges and opportunities to serve.

Understand the social and cultural context of decision making.

Every decision we make is influenced by a complex social environment. Understanding your customers' most important values, beliefs, and cultural norms (and how they differ by segment) is critical to determining what "jobs" you need to help them manage (more on jobs on step 3).

Continuing with our example of PV solar adoption, our research suggests that familiarity with solar is often an important predictor of likelihood to install PV solar. Seeing solar around the neighborhood or knowing family, friends, or others in a community who have adopted solar may impact how people orient themselves to PV as imaginable for their home. Similarly, people's previous experience with their utility may impact if and how they look to the utility for support.

For instance, people who are looking into solar solutions to address persistent/repeated power outages and ensure a more reliable source of electricity to their home may be unlikely to opt for utility solar services. In those cases, individuals and families may have lost trust in the utility after persistent experiences with outages.

Identify the functional and emotional "jobs" that consumers are trying to solve.

As an industry, we often focus on the technological challenge that needs to be solved-be it carbon-free generation, smarter demand management, or simply reducing consumption through energy efficiency. However, most people do not make choices for a single, isolated reason. They are looking to solve a functional problem and often an emotional one (this is described well by Anthony W. Ulwicks's book Jobs to be Done). For example, if we are looking to develop a new energy management solution, we might explore the customer's journey to installing a new thermostat. However, if we focus only on the technical needs (say, being able to control the temperature) we may miss important emotional needs, such as ensuring a comfortable home or keeping the peace around thermostat wars. These emotional insights might lead us to smarter customization, such as helping customers identify a "comfortable" temperature for the family or creating a set number of "overrides" each family member is allowed from their app to help them solve household arguments.

Identify the gaps between consumers' ideal experience and their actual experience.

By exploring the breadth of a customer's experience, we are better able to identify important gaps in their current state that help us find solutions for their future state.

Let's revisit the solar PV example. By looking at the entire customer journey, we discover that there are huge gaps in the customer experience from upfront research, to warranties, and on-going service and maintenance. Taking a close look at these gaps—and understanding the needs of customers—we might explore how to serve as their third-party solar concierge. At first this role may seem counterintuitive. Why would we help customers procure generation from another supplier? Yet helping customers identify reputable providers, vetting sales offers, and providing extended maintenance and warranty plans would retain customer engagement.

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Know the strengths and limitations of your brand. Most people have a clear understanding of who they trust to support them for different needs in their life.

As you explore the customer journey, aim to understand who does—and does not—have the customer's trust (or permission) to fill gaps in their journey.

While it can be tempting to take this question head-on by asking people what companies and brands they trust, it is better to start with a broader view. Engage in a dialogue with the customer about what attributes a trusted actor would have. These attributes may include technical proficiency, reputable references, a long history of work in the community, etc. Exploring the attributes of trust will help you better assess whether your brand can meet—or can extend to meet—these needs.

MORE ACCESSIBLE SOLAR

Community Solar & Pricing Programs Democratize Solar Benefits **Voluntary clean power programs** (like *Community Solar* and *Green Pricing* programs) are critical among clean energy sources that are needed to aggressively decarbonize the grid. They also equalize access to clean energy for a wide variety of customers.



Consider **Aidan** who lives in an apartment, **Gloria** who lives next to an old oak tree, or **Jocelyn** who plans to move after she retires in a few years. All would like to support renewable energy but are unable to install systems on their own rooftops.

Voluntary clean power programs promise to expand clean energy generation and the population of people who can participate in and benefit from clean energy generation.

Historically, rooftop solar programs have only been accessible to a smaller, wealthier group of homeowners. Subscription-based or renewable energy credit (REC) -purchasing programs open solar up to individuals like Aidan, Gloria, and Jocelyn, who are renters, condominium owners, and homeowners surrounded by mature trees, and those for whom the upfront cost of rooftop solar is a barrier. The appeal of community solar and green pricing programs shows up in the stories we hear from customers and in the national trends: cumulative community solar capacity has grown by about 1305 year over year since 2010.¹ The National Renewable Energy Laboratory (NREL) has tracked the voluntary clean power market since the 1990s: In 2019 the number of customers participating in green pricing programs surpassed one million with high participation in the west and Midwest.^{2,3}

Voluntary Clean Power Market

Voluntary markets allow a consumer to support renewable energy at levels above what policy mandates that the utility provide. This includes green pricing programs, community choice aggregation, and competitive suppliers offering green power products.

Green Pricing Programs

Customers pay a premium on their electric bill to support the development of renewable energy sources, for example, solar or wind. The utility uses the premium to retire RECS on behalf of the customers.

Community Solar

Customers can buy or lease a portion of solar panels at an off-site array. Customers receive a credit on their electric bill for electricity generated by their share of solar panels. Despite this phenomenal growth, opportunity remains. We know that program availability does not guarantee participation. For programs to be successful, program administrators need to reach customers with the right messaging and motivators to ensure programs are fully subscribed and that they are reaching an equitable cross-section of the customer population.

In early 2021, we surveyed 540 voluntary clean power participants and nonparticipants from a southeastern utility territory. The offers available to those customers were premium programs that allowed customers to purchase blocks of renewable energy or to offset up to 100% of their usage through solar. Our findings at once reflected national trends and showed regional particularities. **Considering both, our takeaways on voluntary clean power programs are:**

Don't Shy Away from Promoting Clean Power Values in Your Marketing and Communications

The customers we spoke with were motivated to support renewable energy production, reduce their carbon footprint, and help fight climate change. More than 50% of current participants selected these as top reasons for participating in the programs. About half of current participants had investigated solar for their home before participating in one of the clean power offers. Participants noted that installing their own rooftop solar was "not an option" and that the program was an "easy way" to support solar "without the hassle" of installing their own panels. Nonparticipants who expressed interest in the offers also identified these as top reasons they were considering participation. These findings are consistent with research from other regions.^{4,5}



Aidan, who lives in an apartment, cares deeply about climate change. He has more limited options for actions he can take in his home but learning about how green pricing programs support clean energy will motivate him to sign up.

Use Local Renewable Energy but Expand to Sources in the Region if Demand is High

Customers expressed diverging opinions on the importance of "local" when choosing to participate in a clean power program. While many named generating renewable power locally as an important factor in their decision to participate, few current participants indicated they would drop out of the program if the solar energy came from sources outside their state.

Make Sure Customers Understand How the Program Works - Financially

While some customers have a sophisticated understanding of how the costs of premium programs affect their bill, most do not. In fact, less than half of participants were clear that participation resulted in an additional charge on their bill with some commenting that they were uncertain how their bills compare to what they would pay if they were not participating in the program.



Jocelyn is sticking to a budget to save for moving after she retires. She still wants to support clean energy. Fun online videos and bill comparison tools can ensure she has no surprises when her bill comes.

Current Participants Don't Reflect the Population

But research suggests it doesn't have to stay that way. Make efforts to include more people with climate-forward messaging.

In our study, current participants were more likely to be young, white, wealthy, homeowners with a college degree. Nonparticipants who found the offers appealing after reading about them tended to be more racially diverse, lower income, and were more likely to be renters. National research on program participation is divided – some studies find that higher-income customers are more likely to be interested in voluntary clean energy programs while others found that level of education is a stronger determinant.

However, national research on concern about climate and support for climate-related programming shows high interest across race, income, and age categories.⁶⁷ Voluntary clean power programs can leverage this interest by messaging to a wide array of customers, rather than just to customers typically perceived to be more interested in these offers.



Gloria is a first-generation homeowner. Her home is modest, but she loves the old oak tree in her yard as much as she is committed to taking care of the Earth for her children. With more inclusive messaging and images around clean power programs, Gloria would carefully

consider an invitation from her utility to participate.

Images are Powerful and Affect Attitudes, So Choose Them Carefully

Community solar and green power pricing offers can appeal to customers with vastly different homes and life situations. Communicating that these offers are for Aidan, Gloria, Jocelyn, and many others, means using a wide range of images and messaging. We found that images matter. An image of a child playing was more appealing to larger families while an image of a singlefamily home surrounded by trees was appealing to customers with shady roofs. Conversely, images can be limiting. For example, multifamily housing comes in many forms and someone living in a high rise may not see themselves in images showing garden apartments.

Lead by Example: Customers Want to Know That We're in This Together

Customers who are committed to clean energy want to know that their utility is doing its part. The customers we spoke to want their utility to be "pitching in" and "leading the way" and not making clean energy use solely the customers' responsibility. Demonstrating how the utility is supporting a clean energy future is critical to winning over customers, especially for green pricing programs that ask customers to pay a premium to support renewable energy.

Rooftop solar provides many benefits to homeowners who have the ability and resources to install their own rooftop system. Gloria, Aidan, and Jocelyn are three people who are unable to install systems but have a keen interest in renewable energy. Expanding the reach and appeal of clean power programs will support renewable energy and help more people benefit from clean energy resources as work toward a decarbonized future.

Success Planning & Measurement



Success is not a point of arrival; it is a process of continuous planning, learning, and adapting.

Our ability to solve global challenges relies on making informed decisions to optimize resources, benefits, and impacts with an eye to the future.

We partner with you to provide critical and contextualized insights toward planning and performance success, embedding research and analytics along the way.

We support you in designing, planning, tracking, and measuring the impacts of your investments so that every step forward leads us to our clean energy future.

We empower your decision making through careful pilot and market trial design, key performance indicators and metrics development, and on-going market and intervention tracking.

The Need for Speed Evaluation as an **Opportunity Accelerator**



Many regions have successfully retooled evaluation to move beyond retrospective assessment to an integral part of continuous improvement for existing programs and solutions. But have our evaluation practices evolved to provide critical and timely insight for emerging interventions and technologies? **Not yet.**

Integrating evaluation into emerging opportunity pipelines can not only assess the impacts created by an opportunity but can better equip markets and networks to accelerate opportunity adoption both of which are key to innovating at the speed that our climate clock demands.

In a moment when innovation is imperative, leveraging evaluation to innovate will require out-of-the-box thinking, proactive planning, and early engagement.

Here we provide some key considerations to help encourage the integration of evaluation for folks working in innovation, research and development, and emerging technologies, as well as for program managers tasked with piloting new interventions.

Set Objectives

Engage your evaluation team early to brainstorm and identify research questions you need to answer to determine if a new opportunity is a fit for your portfolio. And if it is, make sure you understand what you'll need to do to make its adoption successful. For example, move beyond common impact and process evaluation objectives like gross savings and customers satisfaction, and explore additional research questions that can help you understand **market barriers and readiness**. This includes identifying trusted messengers, as well as status quo bias and communication channels. Also consider research questions that will help you understand the viability and impacts of **scaling** up a technology or intervention, including installation costs, product costs, quantity, and the size and maturity of manufacturers and contractor networks.

- Create a logic model for your pilot to help identify and align your evaluation objectives. This may seem like more work up front, but the clarity created in this added step will save you pain and regret later.
- Reach out to the program manager(s) who might ultimately adopt the opportunity being evaluated. They can help you understand the **decision-making** criteria they would use to characterize a potential emerging offering as a good fit for their program, and what **supporting material** or data might help them with successful pilot-to-program transfer.

Define Metrics

Identify a full suite of metrics that will answer your research objectives and, where possible, characterize any outputs and outcomes from field tests or pilots that you established in your logic model. Some key metrics will likely remain central to this assessment, like gross and net energy savings for example, but new metrics might prove to be meaningful. These can include the effects of decarbonization, non-energy benefits, or economic development efforts.

Ensure Evaluability

Once your evaluation objectives and metrics are clearly identified, work with your evaluation team to ensure your field test or pilot design is optimized for an impact and cost-effectiveness assessment. This can involve working with implementation contractors during the **design phase** to make sure that relevant data is collected and to identify opportunities to reduce burden on participants and market actors. Get into the weeds! Some metrics may require very specific types of data or levels of granularity (census tracts or non-integer interval meter reads), or frequency (hourly, monthly) and the design phase is often the easiest (or only!) chance to make it possible to get this data.

Additionally, this is the time to think through whether you will implement an experimental design and, if so, how? Will you withhold customers to create a control group? What sample size is sufficiently large to allow for required precision of key metrics? Create time to make these important design decisions up front and encourage your evaluation team to proactively think through the implications of design decisions on their ability to meet evaluation objectives.

Assess Participant Experience

Help your evaluation team resist the urge to rely on existing and common question batteries and methodologies for important goals like understanding customer experience and estimating the influence of an emerging opportunity. A new program delivery model, intervention, or technology may feel "similar enough" to evaluators and may create the desire to use existing data collection instruments (surveys, interview scripts) and processes (sample designs, data collection modalities, etc.), but the nuance of emerging offerings should not be overlooked. In fact, this is precisely what should be assessed! Encourage your evaluation team to dig deeper.

Also consider quick, but critical tasks like **cognitive pre-tests** of survey or interview questions to be sure that language used in data collection activities describes the intervention in a way that participants understand. Confirming that customers understand questions' intent is important to ensure that that data accurately reflect participants' experiences. What's more, understanding the insights of those engaged with your technology, service, or program will be critical to successfully scaling your investments.

- Create an opportunity for observation. Often, people cannot articulate what is working and not working in a design. Observing people interact with a technology or engage in a process can provide far more insight than self-report.
- Successful adoption relies on mature market actor networks (manufacturer representatives, distributors, contractors, trusted messengers, community stakeholders, etc.). Identify other key actors in the network whose experience you'd also benefit from understanding. Work with your evaluation team to gain this insight.

We need to evolve our evaluation practices to meet key changes occurring in our industry.

These changes include but are not limited to financing mechanisms, energy efficiency and demand response integration, and the value stacking of energy efficiency with health and resiliency, and technological and behavioral interventions, including program design models.

> **Creating innovative evaluations** can be especially tricky where evaluators are used to using the values and approaches specified in local Technical Reference Manuals and/or evaluation guidelines. In these cases, early engagement is key, but expectation setting even more so.

Evaluation plans, budgets, and timelines are often tied to evaluation guidelines, methods, and calendars making evaluators unable or ill equipped to revamp evaluations without sufficient planning and runway. Create time and space for innovative evaluations by providing an early heads up and an invitation for fresh thinking and departures from the norm!

BASICS

for Innovation

The energy industry has been running demand side management (DSM) programs since the 1970s, a full 40 years. At the time, evaluating DSM programs represented a new frontier and a vexing challenge: how do we quantify energy that was never used? Or in other words, how can we measure what would have happened if we had not invested in energy-saving programs? While evaluation was practiced in other industries at the time, evaluation was relatively new to energy, which created exciting methodological challenges for evaluators entering this new frontier.

Can Evaluation Fundamentals Spur Innovation?
The past **40 years** have provided the opportunity to learn, refine, codify, and structure efficient and (relatively) effective evaluation processes.

In that time, as a collective body of evaluators and program administrators, we've developed a host of frameworks, technical resource manuals (TRMs), and structured guidance for measuring energy savings. As financial mechanisms and integrated resource planning were increasingly tied to energy savings, and while programs matured, impact evaluations became more and more important and process evaluations became more rote. Our industry is rapidly deploying new technologies and reinvigorating rate and energy solutions to combat climate change. To push the industry further, we are being called on to ensure that our investments are equitable at minimum, and ideally reparative.



EVALUATION'S SACRED TEXTS

Efficiency Valuation Organization international Performance Measurement and Verification Protocol (IPMVP) (1997, 2012, 2014)

California Evaluation Framework (2004)

National Action Plan for an Energy Efficiency Model Energy Efficiency Program Impact Guide (2007) NREL Uniform Methods Project Protocols for Determining Energy Efficiency Program Savings (2011-2016)

SEE Action Guide for States: Evaluatio, Measurement and Verification Frameworks - Guidance for Energy Efficiency Portfolios Funded by Utility Customers (2018) Players across the industry are rising to the challenge creating, identifying, testing, and piloting viable new savings opportunities. **But, have evaluators** joined the ranks?



While the initiatives we are deploying today are very different than standard energy efficiency programs, they are not new.

Our industry was researching the viability of electric vehicles decades ago. And the concept of distributed energy resources (DERs) has been around longer than some of our ILLUME team members have been alive. What is new is the importance that these initiatives play in the face of climate change and environmental impacts. Now more than ever, we need all hands (and initiatives) on deck.

The opportunities that challenge us are now a market reality. Energy consumption patterns are shifting because of acquired efficiency and the uptake of DERs. Across the nation, utilities are responding to changes in load shapes and capacity forecasts against a backdrop of evolving baselines, market conditions, climate events, and customer needs.

As the industry takes on emerging challenges, it is important that evaluation responds while also ensuring that our methods follow best practices. But in the case of new technologies and solutions, best practices do not necessarily mean standard practices. In fact, if we don't evolve evaluation, we might inadvertently truncate the evolution of opportunities necessary to meet critical capacity and resiliency demands.

Innovating while upholding the invaluable practices of "yesteryear."

At its core-no matter the initiatives and innovation—evaluation is a tool to enhance the effectiveness industry's investments of our across their lifecycle. Evaluation provides critical insights prior to the launch of investments, supports planning, measures impact, and provides feedback for continuous improvement. Evaluation lays out a storyboard of what we expect to happen if everything operates as we intend it to, determines whether it is operating as planned, and helps us identify gaps and strengths in our designs along the way.

These fundamentals are critical and oftentimes overlooked in our haste to roll out and deliver new solutions. They also require integrating evaluation in the planning stages, a best practice we've touted for years.

Evolving evaluation to meet today's emerging needs requires pairing these fundamentals with enhanced data and analysis tools. Access to real-time metered data provides impressive disaggregation capabilities and locational analysis. Connected devices bring additional insights to usage patterns and opportunities. Virtual tools allow for safe and less intrusive quality assurance and verification for participants and administrators.

Today there are few frameworks and fewer technical resource manuals that formulaically direct us toward prescribed ways of evaluating our investments. As an industry we are being called to be thoughtful, creative, and ensure methods are rigorous and defensible.

> Changes in our industry — and the urgency of these changes — demand that we align with the fundamentals of evaluation

- Understanding the theory of change
- Identifying the overarching goals and objectives
- Establishing metrics
- Identifying and collecting
 the right data

BREAKING THROUGH THE ROADBLOCKS TO INNOVATION

Our longstanding DSM evaluation approaches brought us many benefits, but they now pose challenges to innovation.

We need to go beyond DSM to meet climate change, social, and policy goals. The most notable example is cost-effectiveness. At one time the policy and economic objective of utility-run DSM programs was to avoid the cost of building power plants and purchasing expensive energy. Now there are bigger societal and sustainability objectives that go beyond economics. Cost-effective tests do not sufficiently recognize those objectives.

We also have to face the fact that our frameworks and protocols, while well intentioned and incredibly valuable when they were designed, could inadvertently squelch important EM&V creativity. It is problematic when an emerging program model is evaluated by established methodologies, especially if those methodologies aren't aligned with the program design and theory.

As we consider a new evaluation paradigm, it is important to ask ourselves several key questions about EM&V.

LEGISLATION

While we add new goals and targets for energy efficiency, we still need to meet our current regulatory requirements deadlines, independence, budgets, and highly defensible estimates of energy impacts. As we move toward new and emerging solutions, which of these are the most important?

PERFORMANCE MECHANISM

Some new goals are not easily measured (e.g., workforce, health), yet we need evidence to justify our investments in these areas—what is the right level of proof to show that these goals are being achieved? What information can help us better move toward these goals?

FUNDING / BUDGET

Funding sources and EM&V budgets can be limiting.



RIGOR VS. EXPEDIENCY

We can often provide more accurate results the longer we wait (for savings to accrue, other study results to become public, etc.). But the longer we wait, the less helpful the results often are. What matters most, rigor or expediency?

FRAMEWORK

Frameworks, TRMs, and other guidance documents are invaluable for efficiently evaluating traditional DSM programs and can provide fundamental guidance for establishing EM&V in general. How do we ensure that there is space outside of these documents to innovate EM&V methods for emerging initiatives, while also instilling confidence in the process?

DATA SECURITY

As more and more data about customers exists, our data security challenges become more pronounced. How do we ensure the systems are in place to protect the necessary integrity of the data while making it accessible for EM&V?

Formative research in evaluation need to come back to the forefront to spur innovation.

Once a retrospective activity, Evaluation, Measurement, and Verification (EM&V) has become more integrated in programs. This integration is even more important when evaluating emerging opportunities. This integrated evaluation can include:

- Evaluability assessment to provide forward-looking risk analysis, ranging from savings potential to new measure opportunities to keeping program managers informed of issues that could potentially arise
- Developmental evaluation (providing research and advising in the development of the program)
- Embedded evaluation (providing real-time research to inform progress against metrics)

Formative research in evaluation is even more critical for new and emerging products and services.

No one knows this better than the retail and service industry, who continually use formative research to ensure the viability and relevance of their products in the market.

We need to once again consider the systemic benefit of a well-rounded evaluation that goes beyond the survey to address the hard questions. Core components of a welldesigned and in-depth process evaluation, one focused on continuous improvement and advancing initiatives, are sound, appropriate, and inventive research techniques.

Over the years, market research has become a commoditized component of the evaluation process. Many evaluations simply design sample sizes and data collection methodologies to reach a 90/10 level of precision, but we need to be digging deeper. Understanding the markets requires understanding barriers to participation (such as language and income). Advanced research is also needed

to identify the needs of specific markets that may have never been served.

What if we pair scientifically designed survey-based studies with targeted quantitative and qualitative research to address these important questions? That might look like:

- Engaging community organizations and stakeholders at the beginning of evaluations, especially those related to low- and moderate-income programs, focusing on those that serve important subgroups of interest.
- Identifying customers and speaking with them in their own environments to gain the most honest, authentic, in-the-moment feedback possible, such as through conducting intercept interviews at local organizations.
- Using targeted sampling approaches to reach the hardest-to-reach customers more efficiently.
- Using research teams that have the experience and are relatable to target respondent groups of interest to elicit trust and responses; for example, we found using native Spanish- and Portuguese-speaking researchers garnered better cooperation and information from similar respondents.
- Thinking outside the box in analytic and research techniques to gather information on perceptions and customers through sentiment analysis, mobile intercept surveys with geofencing, and video diaries.
- Using design-thinking principles and activities to encourage ideation feedback, in-person or through online facilitated whiteboarding sessions.



There is a lot to consider when thinking through evaluating emerging initiatives. But we are also seeing exciting innovation in our approaches to evaluate DSM programs, in large part thanks to the availability of data and virtual inspections. Arguably, the greatest innovation in impact evaluation is within metering and consumption analysis. The ability to use AMI disaggregation, connected metering, and data provided by connected devices is game-changing for understanding equipment usage and human behaviors. When evaluating savings for larger customers using AMI data, Normalized Metered Energy Consumption (NMEC) and efforts toward "M&V 2.0" help normalize and estimate energy savings in near-real time.

Finally, the activities and tools we use for impact evaluations may be the same as "best practices" (albeit modified to account for technology and data advances) but interrelationships and shifting goals mean we need to rethink and refine the analytics. As an example, evaluating decarbonization measures is challenging because decarbonization doesn't fit cleanly in the EE box. We don't have great data or means of researching the components outside of our typical purview (e.g., gas leaks vs. refrigerant leaks, and life cycle carbon analysis). We need to be cognizant of what we don't know and provide continual thoughtfulness and transparency not just in our methodologies, but also our results.



- Video diaries
- Design thinking and workshopping

innovation

Moving Beyond Energy Efficiency

- Distributed Energy Resources (DERs)
- Electrification including electric vehicles
- Energy storage
- Rates
- Workforce development
- Green rates / renewables
- Reliability and natural disaster mitigation
- Equity

Evaluation's tools may be the same "best practices" for emerging areas, but shifting goals require we rethink and refine our metrics.

- Non-energy impacts (comfort, safety, health, etc.)
- Environmental impacts (defensible, beyond multipliers, hourly vs annual emissions)
- Workforce development/ economic impacts (measurable)
- Demand flexibility and reliability impacts (defensible, beyond multipliers)
- Impacts of interactive or competing initiatives (e.g., BE and EE)
- System-wide impacts (e.g., market effects)
- Behavioral and choice decisions (e.g., renewables) based on rate choices

ACTIVITIES	WHAT THE ACTIVITY ACHIEVES	HOW THE PRACTICE IS INNOVATING
VERIFICATION	Confirm accuracy of inputs, installations, and reported values	Virtual audits, connected device data
ENERGY SIMULATION MODELING	Estimate building energy consumption, consumption by end-use, and/or load shapes	EnergyPlus [™] : adding better interoperability for software add-ons, improving modeling capabilities (e.g., adding VRF heat pumps)
METERING	Validate inputs for engineering analysis; estimate end-use specific usage, in-field efficiency, or load shapes	AMI disaggregation, connected metering, connected device data
BILLING OR CONSUMPTION ANALYSIS	Estimate per building or per unit savings	AMI data instead of monthly usage, open-source M&V2.0 platforms, Normalized Metered Energy Consumption (NMEC)

At **ILLUME** we are committed to addressing new evaluation challenges.

We challenge ourselves, evaluators, reviewers, and policymakers to take the following actions.

Proactively engage and solicit feedback from stakeholders on methodologies, data needs, and trade-offs. Ensure everyone is on board and clear about the process.

box. Just be clear about your methodological considerations.

Be creative! Don't stay stuck in a

Provide transparency on the limitations, benefits, and drawbacks of research methods. Transparency is key in the face of uncertainty.

Recognize we may need to shift methods and that the feasible methods may be imperfect. Frameworks and guidance will take us only so far, and that's okay.

Consider and design for data collection and measurability when thinking through new programs and offerings. Do not assume another inexpensive online survey is the right way to go.

Rethink and challenge what makes data reliable or valid. The 90/10 rule is not always golden, nor is it always right or valid. Reframe evaluation and expectations from a commodity service, a means to a financial end, to an important resource and tool as we continue to re-envision our clean energy future. It is a key component of successful planning and measurement, after all.

Looking Ahead in Uncertain Times:

How Evaluation Can Help Lead the Way

The tumult of 2020 onwards—with COVID-19, racial justice reckoning, climate disasters, and supply chain disruptions— challenges us to think differently about how we do our work. How do we plan for uncertainties in the market? How can utilities serve customers better and with greater impact? Traditionally, our industry has focused on solving energy problems through customers, but this moment calls us to flip our perspective to focus on solving energy problems *for* customers.

ILLUME Founder, **Anne Dougherty**, sits down with ILLUME evaluation experts **Lisa LeBeau Obear** and **Pace Goodman** to reflect on major changes in the energy industry and in our world. They discuss how analytics and evaluation tools can help us navigate these uncertain and challenging times, with customers at the forefront.

Anne Dougherty: The energy industry is innovating quickly – from the technologies being deployed, to how we are delivering solutions to customers, to expanding who benefits from our solutions. What do you see as the most significant change our industry is facing right now?

Pace Goodman: This uncertainty with COVID-19 drives home what is most important in our lives and gives us a sense of security, including access to energy services. This moment spurs our efforts to ensure access to reliable energy in the face of climate change, and decarbonization plays a key role toward that end.

It's reassuring to see energy efficiency funding going toward decarbonization measures, without pushback. If there is pushback, it's about how we decarbonize most reasonably, cost-effectively, and beneficially to customers, without ignoring our legacy infrastructure. Seeing energy efficiency funding going to decarbonization has been a big, exciting change.

Anne: Expanding on that, how do you see these changes impacting the practice of evaluation? How is this moment calling on us to think differently about evaluation?

Pace: One area is measuring carbon impacts. We've been metering energy usage, we have ENERGY STAR© for appliances, and we have certified protocols for measuring the efficiency of appliances – all based on energy use. We have a nice clean box around how much energy things use, and we have a nice clean way to compare them. Carbon impacts are trickier, and we don't have a great way to measure them. We'll continue to standardize methods for estimating carbon impacts. Like all new standards, they'll probably start off too simple, some measures won't be as beneficial as we thought, and we'll improve over time.

Another area is evaluating customer financial impacts. When replacing a heating system with a more energy efficient model, for example, a customer likely will find the new model beneficial. But if switching to a more expensive fuel type, the customer could experience a negative financial impact. Rather than thinking that a program on average benefited customers financially, we need to think about what percentage of customers benefited financially, because some customers will experience negative impacts.

The last area worth noting is quantifying the benefits of reliability. We don't have a great way to include reliability in cost-effectiveness tests. For example, with Midcontinent Independent System Operator (MISO) or Pennsylvania-New Jersey-Maryland Interconnection (PJM), we have more available data on wholesale energy prices, so we can triage to provide some indication of the value of reliability and capacity.^{1,2}

Whereas in more vertically integrated utilities, it's opaque. If you're a vendor coming up with a new technology around reliability, you don't know if you'll have something viable in certain regions. For example, if a vendor or agency developed a systematic approach to enable communities to implement micro-grids for reliability needs, this vendor or agency could access data from PJM and MISO to identify areas where this service might be most beneficial for the utilities and community, but outside of these wholesale markets, they'd have no data available to understand whether their service has market viability. **Lisa LeBeau Obear:** How can we help clients predict and adapt to what will happen in the next year, let alone, three months?

We need to move away from a narrow view and broaden how evaluators are consulting with clients. The norm has been to expect the status quo to continue. We need to change that mindset and help our clients come up with a plan B, C, and D. How will they continue to serve customers in the face of uncertainty? There's no other light bulb coming to energy efficiency, so what will programs offer beyond the low-hanging fruits? We must start with what problem are we solving for customers, what's the value proposition for them?

At ILLUME we talk a lot about equity and who gets left behind, and the evaluation space has transitioned to looking at this more closely. On average, participants saved X amount. But who wasn't included in that group? Who got left behind? Who didn't have the same experience, even within participants, as others? We need to drill down and be more granular in how we evaluate programs, because we know the experience and access is not the same for everyone.

Anne: Do you think evaluation can move to more nuanced understandings of our impact on communities and regions in a way that we haven't explored before?

Lisa: If we have narrow definitions of program success, it remains a challenge for programs to serve low-income customers or reach customers that are more expensive to reach. Cost-effectiveness and cost savings are important goals that can be relatively straightforward to measure.

But addressing human and socio-economic considerations requires coordination across multiple groups within and beyond a utility, across industries and sectors. The power of evaluation to elucidate impacts on a more nuanced level is limited by the program goalposts. We can only measure what clients ask us to measure.

Pace: Programs are doing their best to reduce administrative costs to be good stewards of ratepayer dollars. With limited funding, programs may focus on the largest pockets of opportunity, which may result in an inequitable approach that serves, say, 70% of customers and leaves 30% behind. As technology enables us to set up and administer programs more cost-effectively—such as with smart thermostat demand response—technology can help provide a more tailored experience to customers from different backgrounds.

Anne: Much of process evaluation looks at what we do and how we do it, as it relates to programs and program participation. What do you see as evaluation's primary role in these areas, as we see our industry innovating and evolving?

Lisa: What problem does this offering solve for customers? This is a question we'll focus on more in the future. A light bulb is easy for customers to understand, but more complex and behavior-based measures are harder for customers to understand and harder for us to explain. Moving forward, evaluators should engage earlier in the process. We can use pilot evaluations as a strategic consulting moment to help clients before an offering goes to market. Figuring out what problem we are solving for customers can help clients think through everything customers will experience down the line.

Anne: What do you see as the role of evaluation in standing up new opportunities for the market?

Pace: Evaluation plays a large role in supporting emerging tech. Traditionally, we evaluate programs to see if they're achieving their intended consequence – savings, participation, cost-effectiveness. An exciting, important shift is that our clients are asking us evaluators more questions about unintended consequences. Are we distributing the benefits of energy efficiency, are we building any barriers to access to these programs, are we changing stocking practices in a way that decreases customers' options?

Evaluators play a significant role in supporting pilots and R&D led by energy efficiency programs. Traditionally, we test whether an emerging tech will perform in the field per its specs and determine what financial incentives will lower customer upfront costs to support market adoption. That's the traditional lens, but we can help overcome different barriers beyond upfront costs. For some technologies, the main barrier is customer or contractor awareness or training. Stocking practices are another potential barrier, as are health and safety concerns.

For pilots, we're considering a range of new approaches, including delivery mechanisms and marketing tactics.

We're not seeing new light bulbs that will transform the energy efficiency space, so we'll have a portfolio of new approaches to increase energy efficiency and move the market. We can't wait for a new widget to come along that's going to save the whole portfolio, because it doesn't seem like anything like that is coming, at least not yet.

Anne: What tried-and-true evaluation tools should we keep investing in or keep utilizing?

Lisa: We need to continue using an equity lens. A New York Times article recently came out about the fact that dollar stores still primarily sell incandescent bulbs.³ Access to energy efficient light bulbs is not equal. With the near ubiquity of LED bulbs, the lighting market has transformed, but folks have been left behind. The problem of incandescent bulbs still being in dollar stores will go away in the next couple years because the backstop will be in place.⁴ But I wonder whether all customers can afford more expensive LED bulbs. Are there ways we can more equitably bring everyone along in these transitions?

Pace: We can continue to improve our methods over time – especially around measuring carbon impacts, customer financial impacts, and benefits of reliability. But we're not without the tools right now. Evaluation limitations are less about the tools at our disposal and more about the oftennarrow program goalposts defining our work. ■



Lisa Obear has spent more than a decade exploring the relationships between people, utilities, and energy efficiency. Her background in sociology has given her an eye for designing robust quantitative research and insightful qualitative research, and her years designing and implementing evaluations for utilities across the country has given her real-life context and experience. She is a creative methodologist, comfortable designing research plans best suited to the task at hand using traditional or exploratory and leading-edge methods. At ILLUME, Lisa leads process, impact, and market evaluations for numerous utilities, across residential and commercial customer sectors.



Pace Goodman has more than a decade of experience in the energy utility space using data science, engineering, and applied mathematics to facilitate and strengthen demand-side management programs. He has experience leading complex impact evaluations of emerging technologies, such as thermostat optimization and other Internet of Things (IoT) services. Pace has led projects to mitigate load constrained times using energy efficiency, developed dashboards to help energy efficiency programs reach new participants, and built advanced measurement and verification analytics for an innovative energy efficiency service provider. Pace also provides service for industry groups, such as by participating in the Regional Technical Forum as a voting member, offering peer review for conference papers, and serving as an expert evaluator and reviewer for certain protocols within the Uniform Methods Project.



We Embody an Entrepreneurial Spirit to Equitably Transform the Energy Industry. . .

- And push boundaries to move beyond zero-sum thinking to ensure that all benefit from our solutions.
- By naming and shedding light on actions that do not benefit people or cause harm so that innovation does not occur at the expense of people.
- Through experimenting and exploring our environment to find progressive solutions that are possible, feasible, and just.

• We Conscientiously Serve our Communities and Clients. . .

- By centering people in our work and dignifying their needs, values, and aspirations.
- By taking seriously the challenges facing our industry and working to solve those challenges from an abundance mindset.
- Through our commitment to professional integrity and by imbuing each task with a purpose greater than ourselves.

We Empower One Another and Co-Conspire for Change...

- Working shoulder-to-shoulder as colleagues toward growth for ourselves, our company, and our clients.
- To create solutions that move our industry toward a just transition.
- By honoring the unique contributions of our colleagues and leveraging our differences to create breakthroughs and foster thought-leadership.

At ILLUME, we are uniquely positioned to meet the needs of the emerging landscape of the energy industry. Our team's expertise spans social and data science and covers a wide-range of technical capabilities.

The size of the planets represent the number of ILLUME staff who hold degrees in each area of expertise.

Our diversified and extensive expertise places ILLUME at the forefront of innovative human-centered solutions to building more resilient energy infrastructure and healthier more sustainable communities.

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Applied Mathematics

Mathematics

Engineering



Biology

Social Sciences

Environmental Studies & Sciences

Business, Management & HR

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Physics

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Georgians Transforming the Lives of Neighbors

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"Change is inevitable, but transformation is by conscious choice." -Heather Ash Amara