# 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?

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## 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.

# Frameworks Protocols TRMs

#### 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 of our industry's investments 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.

# Satisfaction Interest Sources of awareness

WE NEED TO MOVE BEYOND "CHECK THE BOX" ITEMS, LIKE

#### TO FOCUS ON ISSUES SUCH AS...

- Market insights
- In-depth barriers analysis
- Message and product response
- Technology transfer and demonstration effectiveness and opportunities

#### THROUGH ADVANCED TOOLS SUCH AS...

- Ethnographic research
- \_ \_ \_
- Video diaries
- Design thinking and workshopping

Interactive interviews

• While focusing on the human-side of 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 <sup>™</sup> : 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.

Provide transparency on the

of research methods. Transparency

is key in the face of uncertainty.

**Recognize** we may need to shift limitations, benefits, and drawbacks

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

Be creative! Don't stay stuck in a

box. Just be clear about your

methodological considerations.

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 <mark>not a</mark>lways 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.

