

ENERGY EFFICIENCY
MARKET
TRANSFORMATION
SUMMIT
REPORT



INITIATIVES, DESIGNS, AND KEY THEMES

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FEBRUARY 2019

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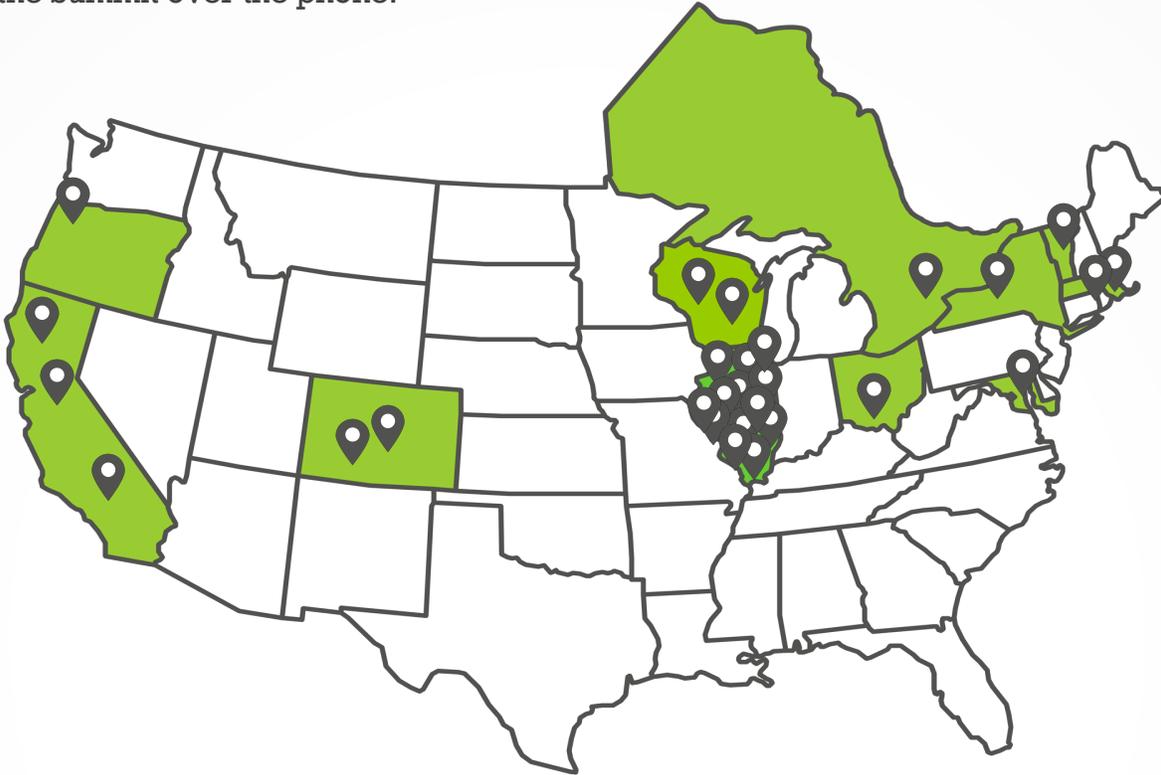
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ACKNOWLEDGEMENTS

Navigant gratefully acknowledges the generous and timely input from the experts that attended the Market Transformation Summit. These experts gave two days of their time and provided thoughtful input throughout the interactive summit. The experts are listed below.

Note: * indicates experts who also gave a presentation during the Summit. ** indicates those who listened to the Summit over the phone.



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EXECUTIVE SUMMARY

A SUMMARY

ComEd is in the 10th year of implementing its energy efficiency portfolio. The recently passed Future Energy Jobs Act (FEJA) legislation transferred market transformation program administration from the Illinois Department of Commerce and Economic Opportunity (DCEO) to the utilities in the state. With this change, ComEd wanted to learn more about planning and executing market transformation programs.

The Market Transformation Summit was held in Chicago on September 12-13, 2018. It included national market transformation subject matter experts, representatives and experts from North

American utilities, and municipal and regulatory experts (e.g., City of Chicago and Illinois Commerce Commission). This interdisciplinary set of experts provided insights on energy efficiency markets and different approaches to and recommendations on market transformation initiatives.

The team organized the Summit's breakout sessions, full participant discussions, and expert presentations to focus on three interest areas. Several themes emerged in each of the issue areas.

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How does market transformation work in today's energy efficiency portfolio?

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Synergies exist between resource acquisition and market transformation programs.

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A holistic view of energy efficiency activities across resource acquisition and market transformation programs is important.

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Cross-cutting support strategies needed to develop market transformation initiatives.

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INITIATIVES THEME 3

Initiatives that could be started right away (or are already started).

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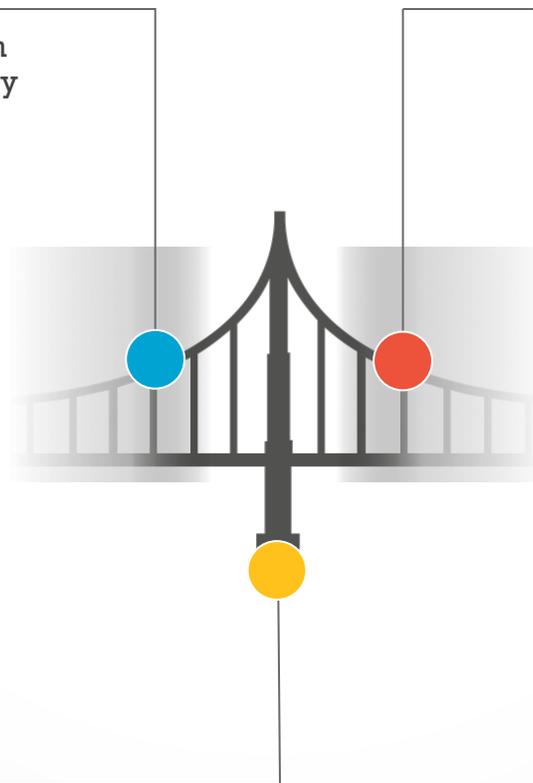
INITIATIVES THEME 4

Initiatives that leverage existing resource acquisition programs and accelerate new technology adoption.

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INITIATIVES THEME 5

Initiatives that leverage regional or national efforts.



ISSUE AREA 1

How does market transformation work in today's energy efficiency portfolio?

The first issue area focused on how market transformation programs are addressed as part of an overall energy efficiency portfolio. The discussion on this topic is organized into three themes.

PORTFOLIO THEME

1

Synergies exist between resource acquisition and market transformation programs. Every energy efficiency program represents an intervention in a market. Resource acquisition programs can influence markets and potentially have market transformation impacts that often are not measured. Market transformation initiatives can also dovetail with resource acquisition programs at certain stages to accelerate change.

PORTFOLIO THEME

2

A holistic view of energy efficiency activities across resource acquisition and market transformation programs is important. Taking into account the Theme 1 discussion, the design of market transformation programs should explore potential points of leverage and synergies with resource acquisition programs. Gaps in market and customer coverage in existing energy efficiency programs should also be considered. For example, a market transformation program can address those market segments that may serve specific customer groups the utility would like to reach. However, some of these target groups do not present the leverage points that are essential to market transformation success, so a fine balance is required.

PORTFOLIO THEME

3

Regulatory treatment of market transformation programs will need to differ from resource acquisition programs. There was a recurring discussion of the need to have a regulatory framework that is aligned with market transformation efforts. For example, market transformation programs typically require resource commitments over a longer period of time and may have savings impacts that are longer term and different to quantify than those from resource acquisition programs. In addition, the evaluation methods for market transformation programs will differ from those used for resource acquisition programs because of the emphasis on tracking market indicators and metrics over time. These issues should be addressed in advance of major market transformation investments to ensure there are shared views and expectations among stakeholders regarding market transformation goals and success measures.

ISSUE AREA 2

What are the must-have components of a market transformation initiative?

The second area of focus was to identify and prioritize the key components of successful market transformation initiatives.

A few high level themes are presented below.

COMPONENTS THEME

1

In-depth knowledge of targeted energy efficiency markets is critical.

Designing and implementing successful market transformation initiatives requires a deep understanding of the target market. This understanding includes knowing:

- How the market works
- The market actors and how they work together to provide a good or service
- The market baseline

COMPONENTS THEME

2

The intervention strategy, including leverage points, must be clearly defined.

Emphasis was placed on clearly defining the market intervention strategy and leverage points. The intervention strategy needs to be based on knowledge of the market, including a good hypothesis about the leverage points that will allow the utility's efforts to be multiplied by other market actors. This often takes the form of a logic model. Once the target market and the intervention strategy are defined, a business plan can be developed including implementation strategies and tactics, interim milestones, and success metrics.

COMPONENTS THEME

3

A regulatory framework supporting the intervention strategy is needed.

This theme reinforces Portfolio Theme 3 presented above and addresses the need to have an overall regulatory framework that supports market transformation. However, it is also important that each individual initiative fit into the regulatory framework. The need to align market transformation initiatives and regulatory policies was a recurring theme. Market transformation intervention strategies need to be transparent and accessible at all stages of development. Program development needs to be coordinated such that buy-in occurs along the way for all stakeholders. Regulatory policies that support and provide for this coordination can be an important success factor.

ISSUE AREA 3

What market transformation initiatives could be pursued in the Midwest today?

The goal of these sessions was to identify some candidate market transformation activities and programs for ComEd to consider. The discussion also indicated that basic regional research on markets would be needed to refine the market transformation actions prior to making specific programmatic decisions. As outlined in preceding sections, a regulatory framework that understands and values market transformation must also be in place prior to developing specific program plans.

The Summit's experts set out five groups of candidate market transformation activities:

1. Develop the planning context for market transformation
2. Cross-cutting support strategies needed to develop market transformation initiatives
3. Initiatives that could be started right away
4. Initiatives that leverage existing resource acquisition programs and accelerate new technology adoption
5. Initiatives that leverage regional or national efforts

INITIATIVES THEME

1

Develop the planning context for market transformation.

The group discussed how any market transformation initiative should first develop an overall policy and market transformation framework that can be used to assess specific alternatives. In addition, initial planning is typically based on high level research that provides a top-down assessment of market transformation opportunities as a platform to consider more detailed market transformation initiatives. Several sub-components of this theme are presented in the main body of the report.

INITIATIVES THEME

2

Cross-cutting support strategies needed to develop market transformation initiatives.

A second theme involved developing cross-cutting support strategies important for market transformation initiatives. These activities include supporting workforce development skills needed across a range of markets, working with financial institutions to address issues in financing energy efficiency investments across markets, and providing processes for regular information sharing across energy efficiency stakeholders.

INITIATIVES THEME

3

Initiatives that could be started right away (or are already started). Candidate initiatives were developed that could have a short ramp-up time and possibly help program sponsors quickly learn about markets and market transformation processes. Six candidate initiatives were recommended that leverage existing capabilities and programs to facilitate rapid deployment of selected market transformation initiatives. They are:

- Code compliance initiative
- Residential HVAC quality install
- ENERGY STAR® Retail Products Platform
- Commercial benchmarking and transparency (B&T) initiatives
- Strategic Energy Management (SEM) Program
- Building Operator Certification Program

ISSUE AREA 3

What market transformation initiatives could be pursued in the Midwest today?

INITIATIVES THEME

4

Initiatives that leverage existing resource acquisition programs and accelerate new technology adoption. This theme addressed candidate market transformation initiatives that involve accelerating the diffusion of new energy efficiency technologies into the marketplace. This approach leverages existing resource acquisition incentive-based energy efficiency programs and adds momentum through training, education, demonstrations, and other market transformation approaches. Five technology-based markets were identified as candidates for these efforts:

- Cold climate heat pumps
- Advanced HVAC
- Advanced lighting controls
- Smart commercial buildings
- Clean water pumps

INITIATIVES THEME

5

Initiatives that leverage regional or national efforts. This theme included two ideas for market transformation initiatives that are already widely used in other areas of the country. This would take advantage of experience from market transformation programs regarding what works and what does not work in select markets. Two initiatives were proposed as candidates:

- Stretch code adoption initiatives
- Existing municipal building upgrade requirements

CONCLUSIONS

The conclusions section of the report addresses additional issues that influence the success of market transformation programs. There was a relative consensus among experts around the design components of a successful market transformation program. Overall success of market transformation programs not only requires quality in design but also in implementation. The implementer, whether in-house or a third party, needs the correct skills and experiences for their role. A focus on quality across all the activities required to deliver a program is important independent of program design.

The experts raised the importance of the regulatory environment in almost every session. The attendees suggested that regions with successful market transformation had regulatory environments that were aligned with market transformation offerings. For market transformation programs to be successful, the regulators and stakeholders need to agree that market transformation is focused on long-term impacts and there may not be the same near-term rewards that are associated with resource acquisition programs. In addition, it may be harder to estimate energy savings with the same level of accuracy attained for resource acquisition programs, and market transformation program evaluations may focus on tracking market indicators over time with energy savings linked to these indicators. Regardless, the regulators, interveners, and stakeholders need to have an appropriate level of comfort with the different attributes of market transformation programs if utilities and program implementers are to have success and manage the regulatory risks associated with market transformation initiatives.

Another recurring comment was that market transformation requires scale. Market transformation focuses on changing a market and the relevant definition of these markets may not align with utility service territories. The message from the Summit was that it is important to look for allies to work with that would allow for appropriate levels of scale needed for success in certain market transformation activities. It was noted that Nicor Gas and ComEd are already partnering to develop market transformation initiatives Illinois-wide or potentially Midwest-wide as a means to gather market share, increase impact, and lower costs.

Finally, experts agree that market transformation has historically been successful. Industry leaders at the Summit were able to discuss and represent market transformation approaches that can and have produced long-term energy savings. The wide-ranging discussions produced candidate market transformation initiatives that can help accelerate efforts by ComEd and potential Midwest partners.

INTRODUCTION

A MARKET TRANSFORMATION SUMMIT WAS HELD IN SEPTEMBER 2018

ComEd is in the 10th year of implementing its energy efficiency portfolio. The recent Future Energy Jobs Act (FEJA) legislation transferred market transformation program administration from the Illinois Department of Commerce and Economic Opportunity (DCEO) to the utilities in the state. Because of this shift, ComEd wanted to learn more about planning and executing market transformation programs. The utility requested Navigant Consulting, Inc. (Navigant) plan, convene, and facilitate a meeting of subject matter experts and practitioners of energy efficiency programs—a Market Transformation Summit.

The Market Transformation Summit was held in Chicago on September 12-13, 2018. The Summit's 33 participants (listed in the Acknowledgments) included market transformation subject matter

experts, regional utility experts (e.g., ComEd, DTE, and Nicor Gas), national utility experts (e.g., PG&E, Duke Energy, Xcel, and Con Edison), major industry associations (ACEEE, CEE, and MEEA), regional energy organizations (e.g., NEEA, VEIC, and the Ontario IESO), and municipal and regulatory experts (e.g., City of Chicago and Illinois Commerce Commission). This interdisciplinary set of experts provided insights on energy efficiency markets and different approaches to and recommendations on market transformation initiatives.

This report presents key themes from the Summit. Goals of the Summit revolved around three questions, with each question representing an issue to be addressed. The report is organized around these three issues.

ISSUE AREA 1

How does market transformation work in today's energy efficiency portfolio?

ISSUE AREA 2

What are the must-have components of a market transformation initiative?

ISSUE AREA 3

What market transformation initiatives could be pursued in the Midwest today?

“

Market transformation is the strategic process of intervening in a market to create lasting change in market behavior by removing identified barriers or exploiting opportunities to accelerate the adoption of all cost-effective energy efficiency as a matter of standard practice.

”

American Council for an Energy-Efficient Economy (ACEEE)
and the Northwest Energy Efficiency Alliance (NEEA)

SUMMARY OF SUMMIT ACTIVITIES

AGENDA

The Market Transformation Summit convened some of the leading thinkers on energy efficiency market transformation. The Summit was designed to share ideas and experiences. The two-day event was structured with several information sharing opportunities and interactive exercises.

SESSION 1

Introductory Remarks and Summit Objectives

Session 1 set out goals for the Summit and described Illinois legislation, focusing on the recently passed FEJA legislation and its impacts in energy efficiency goals and targets.

SESSION 2

Define Market Transformation

Session 2 discussed the definition of market transformation and market transformation initiatives.

SESSION 3

Invited Expert Speakers

In Session 3, eight invited experts provided presentations on market transformation initiatives and designs.

SESSION 4

Brainstorm Ideas for Market Transformation Initiatives

Session 4 focused on identifying candidate market transformation activities and initiatives for the Midwest with a wide range of opportunities identified.

SESSION 5

Components of a Successful Market Transformation Initiative

In Session 5, experts worked in groups to identify the key components of a successful market transformation initiative.

SESSION 6

Transcribe Market Transformation Brainstorm Ideas to Table 1

Sessions 6 and 7 were used to further develop the identified market transformation concepts, identifying keys to success and prioritizing near-term and longer-term activities. This included a focus on specifying key components of successful market transformation initiatives.

SESSION 7

Prioritize Market Transformation Brainstorm Ideas on Table 2

SESSION 8

Discuss Regulatory Issues

Session 8 on regulatory issues was added to the agenda during the Summit. There was considerable discussion of the need for a regulatory framework that will appropriately support market transformation initiatives.

SESSION 9

Prioritize Brainstorm Ideas

SESSION 10

Closing and Discussion of Key Takeaways

Sessions 9 and 10 focused on prioritizing activities and developing a set of takeaways from the Summit.

ISSUE AREA 1

**How does market
transformation work
in today's energy
efficiency portfolio?**

ISSUE AREA 1
**How does market transformation
work in today's energy efficiency portfolio?**

Three themes are discussed in this section. All are linked to the design of a portfolio of energy efficiency activities and the relative roles of resource acquisition and market transformation programs. The themes addressed are:

**PORTFOLIO
THEME**

1

**PORTFOLIO
THEME**

2

**PORTFOLIO
THEME**

3

Synergies exist between resource acquisition and market transformation programs.

A holistic view of energy efficiency activities across resource acquisition and market transformation programs is important.

Regulatory treatment of market transformation programs will need to differ from resource acquisition programs.

Synergies exist between resource acquisition and market transformation programs.

The market transformation definition from the preceding section included the “process of intervening in a market to create lasting change in market behavior.” All energy efficiency programs are in one sense or another a form of market intervention. These may include rebates to bring down the cost of energy efficiency measures and/or financing to address initial out-of-pocket costs. Resource acquisition program interventions affect the overall market to some degree and may, in themselves, lead to some market transformation. As a result, all energy efficiency programs may have at least some market transformation aspects, and the boundary line between programs defined as resource acquisition and market transformation may not always be clear.¹ Programs that are mostly focused on near-term savings may be classified as resource acquisition programs, while those programs designed to achieve deeper savings over a longer timeframe may be classified as market transformation. Every resource acquisition program likely results in some market effects that may persist over time, and every market transformation program

likely produces some near-term initial savings. In fact, some programs designed as resource acquisition activities have significant long-lasting effects on regional markets.²

The difficulty in classifying programs as resource acquisition and market transformation does not keep these designations from being assigned to programs. For example, a designation as a resource acquisition or market transformation program can change the way programs are evaluated, how they contribute to meeting state and regional savings targets, and how shareholder incentives are calculated for portfolios of programs. In general, there seems to be a view that programs can be defined as “mostly resource acquisition” or “mostly market transformation.” The Northwest has different organizations focused on delivering programs designated as resource acquisition and market transformation. The Northwest Energy Efficiency Alliance (NEEA) generally takes the lead in delivering regional market transformation programs, while utilities in the region often take the lead in providing resource acquisition programs. The region's ability to deliver both types of programs is seen as beneficial because the region achieves overall energy efficiency savings.

1. Steve Schiller’s presentation led to a discussion of resource acquisition and market transformation programs as being part of the same continuum of activities, which makes it difficult to classify programs as purely resource acquisition or market transformation. Instead, they can be placed on a continuum of energy efficiency activities where some programs are more at one end or the other of a band that ranges from “mostly resource acquisition activities and objectives” to “mostly market transformation activities and objectives.” As a result, resource acquisition and market transformation distinctions are viewed as useful constructs, but overlaps in design and objectives should still be recognized.

2. Chris Neme’s presentation at the Market Transformation Summit discussed a cold climate heat pump program that was not explicitly designed to be an market transformation effort but effectively transformed the market in the Northeast. The market expanded from three manufacturers to 35 manufacturers providing qualifying equipment and a few products to hundreds of products.

This theme of at least some overlap between resource acquisition and market transformation program attributes led to a discussion of two related issues:

1. Whether current portfolios that mostly focus on resource acquisition should also be evaluated to see how much market transformation they may be producing—i.e., should resource acquisition portfolios be credited with some market transformation effects and savings?
2. The fact that resource acquisition programs are interventions in markets may result in certain market transformation programs being more effective than others—i.e., some market transformation programs may be able to better build on synergies with resource acquisition programs. ComEd and the Midwest region have generally focused on resource acquisition programs and may benefit from market transformation programs that consider existing trade ally and market activities as part of the overall energy efficiency portfolio. For example, if several resource acquisition programs target specific residential or commercial energy sectors (e.g., lighting or space conditioning), then market transformation programs that can build off these existing program activities might be considered as a bridge to a more aggressive market transformation portfolio of activities.

A holistic view of energy efficiency activities across resource acquisition and market transformation programs is important.

Resource acquisition and market transformation programs are designed and implemented within energy sectors and markets. As a result, it is useful to look at all the energy efficiency activities occurring within a market regardless of whether they are resource acquisition or market transformation programs. This view draws from the issues addressed in Theme 1, but the holistic approach was also discussed as an important concept distinct from Theme 1.

Perspectives aligned with this theme include the importance of maintaining consistent messages within an energy market and to help ensure some continuity over time by not having programs stop and start. This helps maintain program and market momentum and build confidence between program implementers and market actors (trade allies and end users). It can take years to recover the confidence lost from an interruption in program delivery once started.

An expert summary accompanying this Summit Report (Levin 2018) addresses midstream programs designed to engage and influence the supply chain. These midstream programs have aspects of both resource acquisition and market transformation programs. They can deliver significant, measurable energy savings within the first year, allowing them to fit within

resource acquisition frameworks at many utilities. However, they also lead to true market transformation through sustained increases in the stocking and sales of efficient products and equipment, as well as accelerated introduction and deployment of new measures.

A holistic view should also be taken within the portfolio itself. Currently, many utilities have programs designed to encourage the installation of energy efficient products and behavior changes. These different programs (e.g., HVAC program, lighting program, insulation program) often work in silos and may be confusing to the customer. Taking a holistic view of the goal of the utility may result in a structure different than the current multiple program model.

A holistic view of energy efficiency activities might lead to portfolio designs where some resource acquisition program activities serve as a transition to longer-term market transformation activities. The time-sequencing of resource acquisition and market transformation activities may help achieve effective energy efficiency objectives over 5- and 10-year periods. Additionally, the holistic approach requires synergies across resource acquisition and market transformation programs be identified and captured.

Regulatory treatment of market transformation programs will need to differ from resource acquisition programs.

A consistent view expressed in the Market Transformation Summit was that appropriate regulatory rules and policies will be important for successful market transformation efforts. Some Summit attendees believe one reason why some market transformation initiatives have not achieved their potential is due to regulatory barriers. States with policies developed for resource acquisition program portfolios may not fully take into account the differing objectives of market transformation efforts, resulting in misaligned policies. This topic was discussed at some length in the Summit and a session was added to the agenda to address issues related to regulatory policies.

One focus of the discussion was how the use of regulatory policies suitable for resource acquisition programs may actually result in barriers to the successful design and implementation of market transformation programs. An expert summary accompanying this Summit Report (Levin 2018) discusses regulatory issues related to midstream market transformation programs focused on market development including partnering with supply channel partners. Market development programs involve implementers working with supply chain actors to build their technical and sales capacities in addition to providing financial incentives. Programs should offer both technical and sales training to the distribution, installation, and commissioning supply chain actors to achieve increased adoption in a market.

Midstream programs have issues that mirrored those discussed in Themes 1 and 2: they have aspects of both resource acquisition and market transformation programs. They can deliver first-year savings, which allows them to fit within resource acquisition frameworks at many utilities. However, they also lead to true market transformation in terms of stocking and sales of efficient products.

Midstream program implementers cited several regulatory issues that stem from a resource acquisition framework. The first two items below should be treated differently in a market transformation framework.

- Net-to-gross and savings attribution challenges that may have difficulty capturing the attribution associated with supply channel changes. One suggested solution is to allow for negotiated net-to-gross values to address these impacts. It is also important to note that the baseline in market transformation is very different than a traditional net-to-gross. Setting and agreeing on a baseline early in market transformation is important.
- Coordination and attribution challenges across program implementers and regions, which can inhibit collective partnership and action. Attribution issues should be discussed and resolved early for a market transformation initiative.
- Sudden and unexpected changes to Technical Resource Manual (TRM) assumptions that terminate programs suddenly and leave market actors with a surplus of equipment.

Other regulatory policy challenges that can impact the success of market transformation programs include the following:

- Market transformation savings accrue over a longer time horizon and may have more uncertainty than short-term, widget-based savings (e.g., equipment replacement). Developing policies that provide measurement and evaluation given the uncertainties in savings and market metrics will be important, as will setting savings targets over longer time horizons to encourage robust investment in market transformation activities.
- Market transformation initiatives may have success metrics that go beyond potentially hard-to-measure energy savings (e.g., tracking changes in stocking practices). These need to be agreed upon in advance of program implementation.
- Longer-term market transformation implementation plans may need more flexibility as market conditions may change over time due to technology change and any number of external market factors.

There are regions that can be looked to for regulatory policy ideas including the Northwest, the recent California Public Utilities Commission (CPUC) Staff Proposals for market transformation programs, and the subsequent comments on the CPUC proposal (2018). Developing the regulatory framework for a portfolio of programs that includes appropriate resource acquisition efforts and robust market transformation activities will require collaboration. Overlaying market transformation activities in a policy setting designed to focus on near-term resource

acquisition efforts is not likely to address important obstacles to achieving the promise of deep, cost-effective market transformation.

A detailed discussion on evaluating resource acquisition and market transformation programs is located in the Supporting Material section and is titled "Regulatory Spotlight: Estimating energy savings from resource acquisition and market transformation programs."

ISSUE AREA 2

What are the must-have components of a market transformation initiative?

ISSUE AREA 2

What are the must-have **components** of a market transformation initiative?

One goal of the Summit was to learn about the components of successful market transformation initiatives by answering these questions:

1. What are the must-have components of a best-in-class market transformation initiative?
2. Why are those components important?
3. What components should be avoided?

This section details the key components of a market transformation initiative as an answer to these questions. Experts at the Summit provided input on what they viewed as the key components of a market transformation initiative. This section details these components under three themes.

COMPONENTS THEME

1

In-depth knowledge of targeted energy efficiency markets is critical.

COMPONENTS THEME

2

The intervention strategy, including leverage points, must be clearly defined.

COMPONENTS THEME

3

A regulatory framework supporting the intervention strategy is needed.

WHAT ARE THE MUST-HAVE COMPONENTS OF A MARKET TRANSFORMATION INITIATIVE?

A bridge exists to allow people to cross a barrier like a river or a ravine. All of the components of a bridge must exist and be strong in order for the bridge to be structurally sound. Like a bridge, the components of a

successful market transformation initiative must exist in order for the initiative to overcome a market barrier. The components are summarized below under each theme.

Components Theme 1

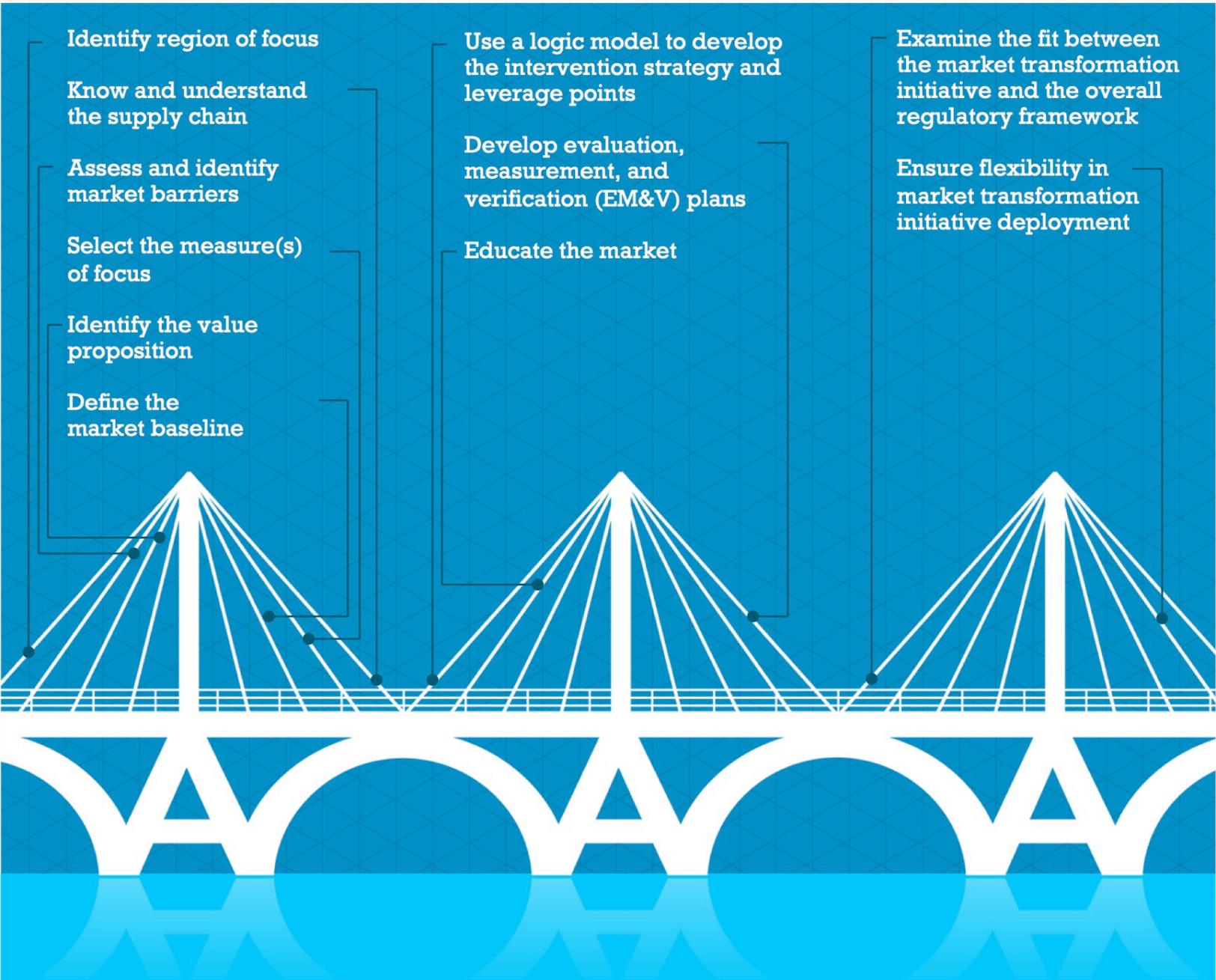
- Identify region of focus
- Know and understand the supply chain
- Assess and identify market barriers
- Select the measure(s) of focus
- Identify the value proposition
- Define the market baseline

Components Theme 2

- Use a logic model to develop the intervention strategy and leverage points
- Develop evaluation, measurement, and verification (EM&V) plans
- Educate the market

Components Theme 3

- Examine the fit between the market transformation initiative and the overall regulatory framework
- Ensure flexibility in market transformation initiative deployment



EXPERTS WERE ALIGNED ON THE IMPORTANT COMPONENTS OF A SUCCESSFUL MARKET TRANSFORMATION INITIATIVE

The experts at the Summit were generally in agreement regarding components that were important for a successful market transformation initiative. Because of this alignment, a question was raised by one attendee: “If we all agree on the components of a successful market transformation initiative, why isn’t market transformation happening more?” Knowing which components are important is different from developing an executable plan for specific initiatives, so knowing where to place focus is important when designing an initiative

Another issue concerned “Where is market transformation happening?” Experts provided several reasons as to where market transformation is happening and why it might not be happening more:

- Happening regionally, not nationally³
- The long-term nature of market transformation might be too difficult for some utilities in today’s regulatory structure
- The history and perceived need for programs to provide clear and easily identified energy savings in a program year

Despite these potential reasons, it is important to note that the experts generally agreed on the components needed for a successful market transformation initiative.

Source of Information

The information on market transformation initiative components drew from the market transformation expert presentations and from the Summit sessions. One session specifically focused on identifying components of successful market transformation initiatives. The experts, broken into groups, identified the components of a best-in-class/cutting-edge market transformation initiative and why those components were important. They also noted components that lead to an unsuccessful market transformation initiative and why. Each group presented their ideas and then the session concluded with a prioritization exercise.

3. This comment was referring to utility driven initiatives, but there are national programs and efforts, as noted by Margie Gardner, such as ASHRAE changes and appliance standard changes.

In-depth knowledge of targeted energy efficiency markets is critical.

The first theme around designing or implementing a successful market transformation initiative is to know the market. Though this seems simple, it is a critical step to success. It involves knowing how the market works, knowing the market actors and how they work together to provide a good or service, and knowing the market baseline. Knowing the market requires researching, characterizing, and defining the market. This theme involves the following key components:

Identify region of focus: Determine the region/geography to focus on. Is it local, regional, national? Does it only cover a utility service area? You may need to revisit the focus region once there is a plan for an intervention. At that point, the focus region may need to be expanded or narrowed depending on the intervention strategy.

Know and understand the supply chain: Mapping out the supply chain addresses how products and services flow from manufacturer to the end user. Do they go from manufacturer to distributor, to contractor, to customer? It is important to know who the market actors are in each part of the supply chain and to involve

these actors. Identify the names of the manufacturers, distributors, contractors, and customers. Examine how they can benefit from the market transformation initiative. It is also important to know what drives each of these market actors and how each market actor makes decisions. Knowledge of the types and magnitudes of the product flows is needed to categorize trade allies and understand key decisions in terms of stocking and supply considerations. This understanding of the supply chain will help the initiative avoid placing demands on suppliers without having clear values to them.

Assess and identify market barriers: This component is critical to recognize where the market needs an intervention. This component involves research with the market actors and supply chain. Truly knowing the market involves seeing where the market needs an intervention to be able to provide more energy efficient goods or services. Why is the market not adopting the technology or service on its own? What are the best leverage points for multiplying the utility intervention through other market actors to affect more widespread and lasting change?

Select the measure(s) of focus: A program initiative may have started with one idea for the measures (e.g., lighting, HVAC, food service equipment) for a market transformation initiative. Preceding components may be designed with that set of measures as the focus, but there may need to be an iterative process as decisions are made regarding which measures need support. Is the market not adopting certain energy efficiency technologies or services on its own? Why not? This component includes identifying the candidate technologies or services with potential, understanding the scope and availability of those technologies or services, and understanding the cost of those technologies or services.

Identify the value proposition: People do not buy energy efficient products based on energy or cost savings alone; other motivators are needed. The value proposition is not just energy savings or monetary but—and maybe more so—the non-energy benefits. What else is important to the consumer that drives their decision-making? Do they want consistent energy supply? Is comfort a better seller? Are clean clothes and less dirty lint screens more important than energy savings for a clothes washer? Hands-on market research with customers would provide insights into this value proposition.

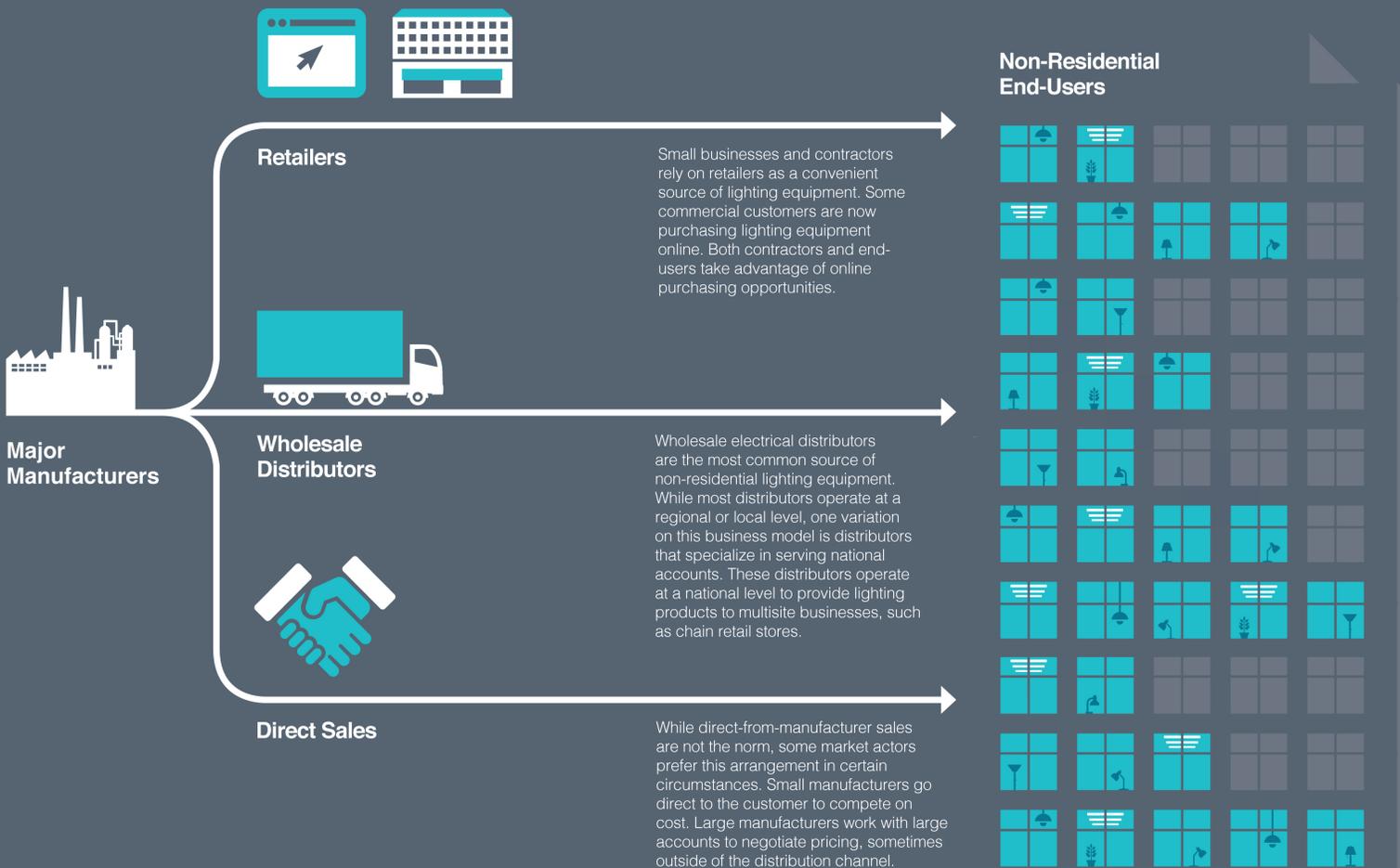
Define the market baseline: Knowing where the market is today in terms of sales and adoption is key to knowing the market. This translates into knowing, for example, what percentage of the measure of focus being sold is high efficiency. This component includes exploring using a fixed baseline for a certain period versus a dynamic baseline that is updated over time. The use of fixed versus dynamic baselines is an issue for market transformation programs and will depend upon the program and market. Importantly, agreement at the outset on the method for setting baselines is needed among stakeholders. The baseline will influence the potential savings claimed by the initiative both in the initial planning phase and during its deployment as market metrics are met.

EXAMPLE SUPPLY CHAIN DIAGRAM

Unpacking The Non-Residential Supply Chain

Market Actors Adapt

As the non-residential lighting market evolves, market actors throughout the supply chain are adapting their tactics to make the most of new challenges and opportunities. In response to competition and the increasing complexity of lighting technology, distributors, manufacturer representatives, and contractors are all moving toward consultative sales strategies, such as conducting payback analysis and offering design consultation. Those taking this approach reported that these additional roles have increased their ability to make a sale in a competitive marketplace.



Source of example supply chain diagram: BPA, "Lighting Market Intelligence Report: A Bright Future for Efficiency, February 2017, "https://www.bpa.gov/EE/Utility/research-archive/Documents/Momentum-Savings-Resources/2017_Market_Intel_Booklet.pdf

The intervention strategy, including leverage points, must be clearly defined.

One attendee likened a clearly defined intervention strategy to a business plan. Once you know the market, you can develop a business plan to transform it, including strategies, interim milestones, and ways to measure success. A clearly defined intervention strategy (Components Theme 2) should be developed in tandem with setting up the regulatory framework (Components Theme 3). This way the planning will be a coordinated process with buy-in along the way for both regulators and industry/customer stakeholders.

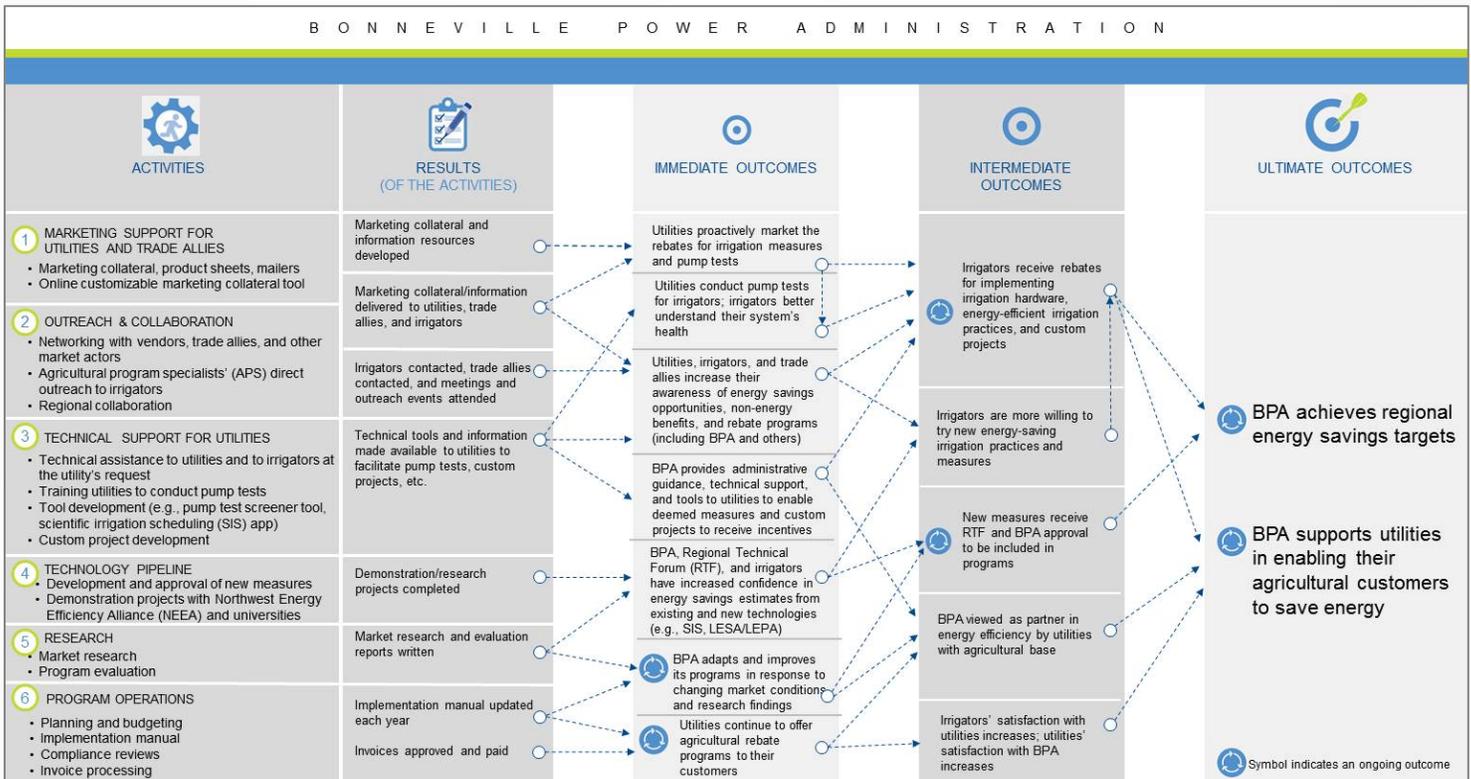
Use a logic model to develop the intervention strategy and define leverage points: Experts agreed that a logic model is a useful tool to plan and share candidate intervention strategies. A logic model can use different formats but often is based on a theory of change and includes inputs, barriers, external forces, partners in the initiative, activities, results, immediate outcomes (short-term indicators), intermediate outcomes, and long-term outcomes (goals prior to exit). Logic models can and should be living documents. Sub-components to the logic model identified by the Summit experts include:

- **Theory of change:** The logic model should include the theory of change (If..., then...) or a hypothesis. This way an organization can measure how the initiative is functioning against the hypothesis.
- **Inputs:** The inputs include the resources required to implement the initiative such as people, time, materials, and funds dedicated to or consumed by the initiative. Determine who will implement the initiative. Ensure resources for the long haul.

- **Barriers:** Taken from the knowledge of the market in Components Theme 1.
- **External forces:** What other (non-program) factors might influence the outcome? Identifying these is important for attribution analysis.
- **Identify partners in the initiative:** Market transformation initiatives should look to collaborate widely and develop partners both regionally and nationally, looking for partnerships based on the needs of key market actors in the supply chain. Attendees noted that collaboration is critical—lack of collaboration can lead to unsuccessful initiatives. An initiative will be less likely to be successful if different organizations are doing things on their own as opposed to working together. One attendee noted that synergies can exist across multiple utilities and/or municipalities.
- **Supporting activities:** This can include items such as workforce education and training and collectively developing sales and market strategies.
- **Immediate outcomes:** Developing short-term indicators is viewed as very important. There needs to be some way to measure the success of the initiative, and these metrics should be defined at the beginning. It is important to identify non-energy impacts (such as market structure changes, behavior changes, and replication in other jurisdictions) in addition to energy impacts. Attendees noted that part of the process of identifying metrics is also establishing a data collection process to report on the metrics. This could include identifying the claimable savings potential.

EXAMPLE LOGIC MODEL

B O N N E V I L L E P O W E R A D M I N I S T R A T I O N



Taken directly from Bonneville Power Administration, "2016 Agriculture Irrigation Market Research," October 2016, https://www.bpa.gov/EE/Utility/research-archive/Documents/Momentum-Savings-Resources/2016_BPA_Ag_Market_Study.pdf. Figure F-28: The Logic Model: How Program Activities Lead to Ultimate Outcomes. Source: Navigant analysis from the BPA Agricultural program logic model session, 2016.

- **Intermediate outcomes:** This can include metrics such as whether consumers are able to distinguish between the high efficiency and the conventional measures, the utility's ability to compare costs and benefits, whether more trade allies are promoting the high efficiency measures, and whether there is a change in the stocking level of the efficient equipment. Periodic market characterization and awareness surveys can be used to establish a range of intermediate market outcomes aligned with the specified market transformation initiative.
- **Long-term outcomes:** These are the goals to be attained prior to exit. What does the transformed market look like? Experts noted that defining success and having clear objectives is critical to a market transformation initiative. Including the long-term outcomes in the logic model allows the objectives to be expressed and sets out the commitment required to achieve the desired long-term outcomes. Planning for a long-term commitment includes setting appropriate incentive levels and overall longevity of resources. It also includes goals allowing the implementer to recognize when the market has been transformed (per program design).

Develop evaluation, measurement, and verification (EM&V) plans: Many attendees noted that knowing how you plan to evaluate, measure, and verify savings and how you meet

other market metrics is important in making the case for an intervention strategy. The EM&V plan can also link to the regulatory environment by helping regulators see how the initiative will be evaluated and measured. Ongoing EM&V efforts are needed:

- Continue to convene stakeholders throughout the value chain and solicit feedback
- Adapt the initiative based on feedback—flexibility in implementation allows feedback to be useful
- Widen collaboration (one attendee defined this as exporting the revolution) and continually work to add other entities to the effort
- Non-energy impacts can be particularly important in market transformation initiatives and the EM&V plan should have processes for identifying and assessing the magnitudes of non-energy impacts

Educate the market: The market needs to know about the intervention strategy. This can involve a variety of outreach efforts including training for key market actors and information programs for customers.

A regulatory framework supporting the intervention strategy is needed.

The Portfolio Theme 3 discusses the need to have an overall framework that supports market transformation across initiatives, but it is also important that each individual initiative fits into the framework. This was a recurring theme across discussion topics and concerns were consistently expressed about how the lack of appropriate regulatory structures can make it difficult for market transformation initiatives to succeed.

Examine the fit between the market transformation initiative and the overall regulatory framework: It is important to collaborate with regulators to ensure that a specific market transformation initiative will be accepted and that there are agreed upon goals in terms of energy savings and market metrics. This component includes engaging regulators and other policymakers to justify spending on each market transformation initiative that makes up a portfolio of activities. Key things discussed include the following:

- Make success about all indicators, both energy savings and non-energy metrics (market transformation initiatives should have other success metrics beyond just energy savings). These need to be vetted with the regulator prior to implementation. Long-term energy savings will likely be more uncertain than savings estimates for short-term resource acquisition programs. The regulator(s) will need to be comfortable with these uncertainties (see Portfolio Theme 3 above).

- The regulatory framework should include funding approval, agreement on a baseline, and a picture of how upfront costs will be recovered over time.

Ensure flexibility in market transformation initiative deployment: Many experts noted the importance of flexibility—i.e., the regulatory framework should include some budget flexibility and the ability to learn from mistakes. This is necessary for programs with long-term commitments. Having rules defined at the beginning is important so the program has the ability to adjust to changing circumstances and new information as it progresses. The regulatory construct should allow for programs to fail without overly harsh penalties as better, more successful programs will result once more is learned about a market. Not many new products across all industries have been successful when regulation sets out exactly what is to be done. It is a mistake to presume that the program is perfect from the start and that market forces are stagnant. Rather, the expectation should be built in that the program design will be revised. Preemptively building in this ability gives the program implementer time and opportunity to work through issues to achieve success.

For example, a motto of 3M corporation was to “make a little and sell a little” so it could benefit from lessons learned from the market.

ISSUE AREA 3

What market transformation initiatives could be pursued in the Midwest today?

ISSUE AREA 3

What market transformation initiatives could be pursued in the Midwest today?

There was a consensus among participants that resource acquisition incentive programs can work synergistically to meet market transformation objectives alongside or within market transformation initiatives. Market transformation initiatives generally include demonstrations and case studies to bolster awareness of the energy efficient product or service being targeted. Experts also discussed moving the incentives upstream as a successful approach to modify resource acquisition programs to have market transformation effects. Training the workforce was seen as a universal barrier to more widespread adoption of energy efficiency and, therefore, an element to be integrated into the market.

Based on discussions at the Summit, the candidate market transformation activities/initiatives fell under five themes.

INITIATIVES THEME

1

Develop the planning context for market transformation.

INITIATIVES THEME

2

Cross-cutting support strategies needed to develop market transformation initiatives.

INITIATIVES THEME

3

Initiatives that could be started right away (or are already started).

ISSUE AREA 3

What market transformation initiatives could be pursued in the Midwest today?

INITIATIVES THEME

4

Initiatives that leverage existing resource acquisition programs and accelerate new technology adoption.

INITIATIVES THEME

5

Initiatives that leverage regional or national efforts.

Source of Information

Five categories of activities were discussed in breakout sessions consisting of groups of 5-7 people. Each group presented its top ideas and explained them to all of the participants. The five market transformation categories were:

1. Education/behavior
2. Products/standards
3. Emerging technologies
4. Building design and construction practices/codes
5. Other – all that do not fall into a category above

Approximately 18 candidate market transformation concepts were developed and presented to the group. *It was difficult for participants to make explicit recommendations in a two-day Summit, particularly without information on specific markets in the Midwest, budgets, or other available resources. As a result, these were framed as candidate concepts that should be considered as part of an initial screening of market transformation activities.*

Develop the planning context for market transformation.

The group agreed that to develop any specific programmatic initiatives first requires several overarching preparatory activities. These include creating an overall policy framework within which a utility can assess specific alternatives and developing a high level portfolio view based on a top-down assessment of the market. The two market transformation supporting activities listed below were viewed as “must do” by Summit participants.

Develop the policy framework: The group decided that creating an overall policy framework that supports market transformation is needed prior to selecting specific market transformation initiatives. This should be applied to any and all market transformation initiatives being considered for development. This item was defined as assessing the regulatory risk, understanding legislative and policy objectives, and clarifying the plan for

actionability. Assessing regulatory risk implies that a regulatory structure is in place against which risks are evaluated. Experts suggested that a regulatory and stakeholder process may be needed to update the framework with an appropriate balance of regulatory risk. Portfolio Theme 3 (presented above) discusses attributes of a policy framework that can help market transformation efforts be successful.

Assess market transformation initiatives within a top-down portfolio approach: This was a recurring theme throughout the Summit. Developing a portfolio approach with a top-down focus was considered a must-do activity to allow for the design of specific market transformation initiatives in the proper context. This activity was defined as assessing the markets and supply chains for ripe opportunities, mapping new market transformation efforts to existing resource acquisition programs, and talking with key market actors throughout supply chains to assess multiple opportunities.

Cross-cutting support strategies needed to develop market transformation initiatives.

A second theme involved developing cross-cutting support strategies that are important for consideration in all market transformation initiatives. This includes supporting workforce development to enable energy efficiency activities across a range of markets and with a variety of supply chain actors. These support strategies also include developing financing mechanisms for a range of energy efficiency investments and an information sharing process across energy efficiency stakeholders.

Workforce development: Workforce development was identified as one of the largest barriers to more widespread implementation of energy efficiency activities. One expert noted that programs may not be penetrating diverse or disadvantaged communities because there is no trained workforce in those communities. This was seen as a strategy to incorporate into multiple initiatives.

Financing: Like workforce development, the experts agreed that financing is a primary barrier to broader implementation of energy efficiency activities. It was discussed as a tool, a support strategy, an enabler for market transformation initiatives, and something that can work in tandem with and reduce the need for incentives for resource acquisition programs.

Information sharing: The group discussed the need for information sharing among all stakeholders. There should be a strategic approach that can be applied to assessments and implemented by all market transformation initiatives. The discussion focused on open and transparent processes to develop and implement market transformation initiatives. There should be multiple opportunities for all market actors to be heard. This promotes a sense of ownership that results in a higher likelihood of buy-in with this participatory process.

Initiatives that could be started right away (or are already started).

This theme focuses on candidate initiatives that could be started quickly. These initiatives could have a short ramp-up time and provide an opportunity for sponsors to learn about markets and market transformation processes. The six candidate initiatives listed below leverage existing capabilities and programs to facilitate rapid deployment of selected market transformation initiatives, recognizing that these selections should first fit into the overall framework and portfolio approach as discussed in Initiative Theme 1.

Code compliance initiative: Code compliance programs are designed to increase compliance with existing energy codes through education and training efforts for building officials and construction professionals. To claim savings for such an effort, a code compliance baseline study must first be undertaken. A baseline code compliance study for residential new construction is already underway in ComEd's territory, being implemented by Midwest Energy Efficiency Alliance (MEEA) with strategic and analytic support from Pacific Northwest National Laboratory (PNNL). A commercial baseline study is scheduled for 2019. A code collaborative has also been established as a way to engage, share information, and solicit input from key stakeholders.⁴

Residential HVAC quality install: Quality installation is more than just using high efficiency products and systems. The correct design and sizing, proper installation, and final testing have a large effect on occupant satisfaction and energy savings. The standard defines a level of performance that, if satisfactorily achieved, indicates that sound industry practices were followed during the design and equipment installation phases. The core areas that characterize a quality installation are design, equipment installation, distribution, and system documentation and owner education.⁵ A market transformation quality install program should be folded into a resource acquisition program, such as an HVAC program. Utility support could also include trade ally training and contribution to software choice/development.

Support could also include efforts to raise awareness of consumers and building owners/operators about the benefits provided by professional contractors following industry-recognized quality installation practices. Participants commented that savings to date have not been impressive for quality install initiatives, and there is a need to prove out a viable model for this approach.

4. <http://www.mwalliance.org/illinois-energy-code-compliance-collaborative>

5. <https://www.acca.org/standards/quality>

ENERGY STAR Retail Products Platform: The ENERGY STAR Retail Products Platform (ESRPP) is an existing national market transformation effort focusing on residential plug loads through a specific set of products (clothes dryers, clothes washers, freezers, refrigerators, room air conditioners, air purifiers, sound bars, and dehumidifiers). The focus is asking retailers to take a more comprehensive view of energy efficient products and providing them with incentives from utilities and other energy efficiency program sponsors to change their inventories to sell increasing numbers of ENERGY STAR certified products. Attendees said that there are currently 13 utilities from 14 states participating (see the graphic on the next page).

Attendees suggested the ESRPP as a quick approach to furthering involvement in and understanding market transformation initiatives because it has many of the pieces already in place and is close to a turnkey initiative. ESRPP allows participants to use each other's resources and shared objectives to avoid duplication of effort and redundancy across neighboring service territories and to streamline operations. Taking a national grassroots approach, the ESRPP has created voluntary working groups dedicated to developing key program pillars, including EM&V, data management, product specifications, marketing, field services, and implementation and outreach.⁶

6. <https://www.energystar.gov/esrpp>

7. Schiller and others, "Evaluation of U.S. Building Energy Benchmarking and Transparency Programs: Attributes, Impacts, and Best Practices" Lawrence Berkeley National Laboratory. April 28, 2017 https://emp.lbl.gov/sites/default/files/lbnl_benchmarking_final_050417_0.pdf

8. <https://www.cee1.org/content/business-energy-management>

9. Contact Ethan Rogers at ACEEE for information – erogers@aceee.org

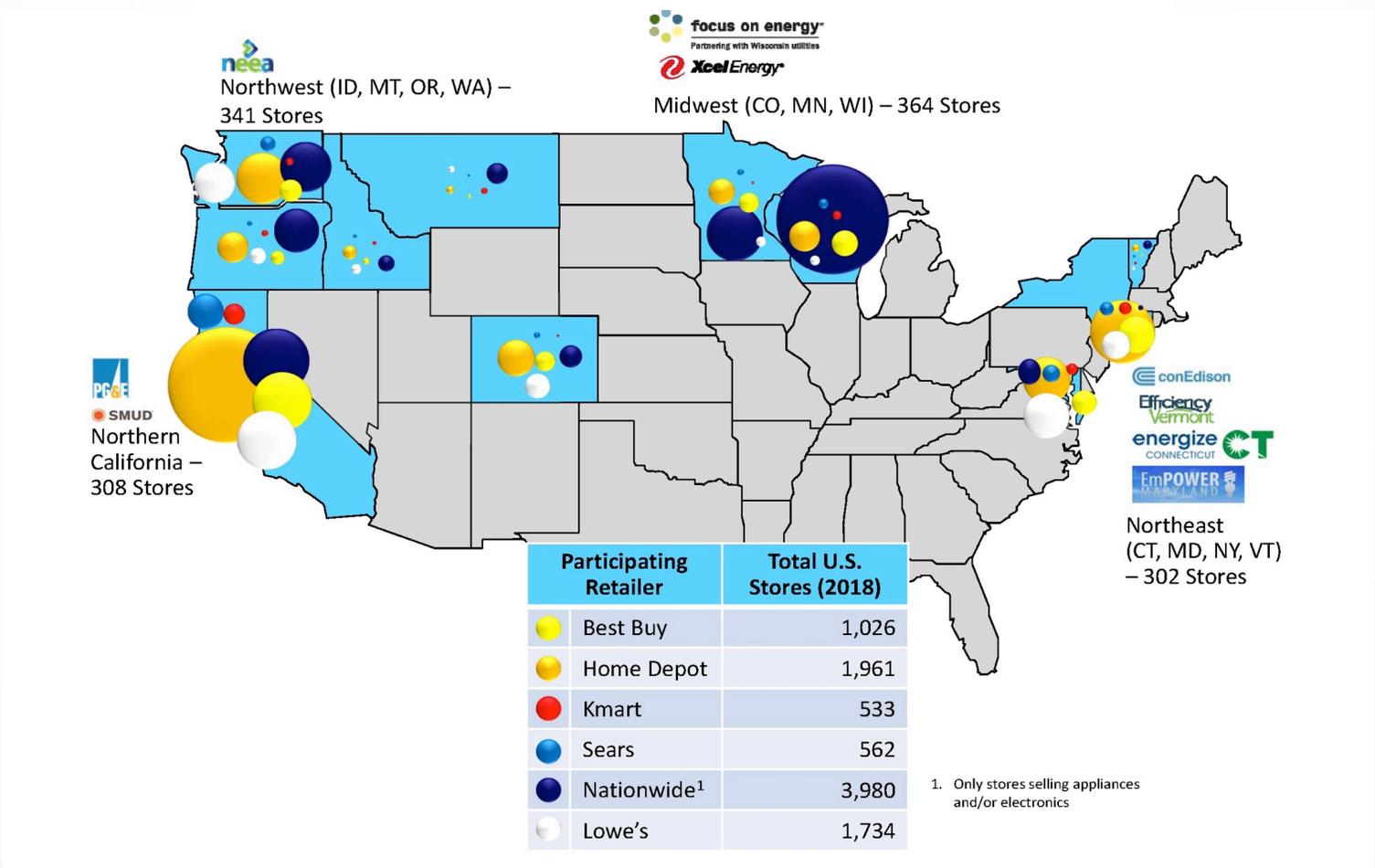
Commercial benchmarking and transparency (B&T) Initiatives: B&T policies require the building's energy use to be measured and publicly reported. There are currently about 26 jurisdictions implementing these policies in the US. These policies serve to increase awareness of energy use by owners and occupants, thereby addressing the barrier of inadequate information on energy use and waste in buildings. This data can be used in programs to achieve economic, sustainability, and pollution reduction goals. This information and awareness leads to customers and contractors engaging in energy efficiency activities. Energy efficiency activities resulting from B&T policies have been shown through independent evaluation to yield 3%-8% reductions in energy use intensity (EUI).⁷

Strategic Energy Management (SEM)

Program: This candidate initiative is an approach to energy management in large facilities that establishes a process of continuous improvement, typically starting with operations and maintenance measures and ultimately proceeding to capital improvement measures. SEM has been particularly effective in industrial and institutional facilities. ComEd and Nicor Gas are currently offering a join SEM Program. The Consortium for Energy Efficiency also has an initiative in this area.⁸ Programs have advanced the farthest in the Northwest but are also advancing in California, the Northeast, and other regions. A SEM Collaborative is forming to assist efforts nationwide.⁹

Building Operator Certification Program: Building operator certification programs are currently being operated by MEEA in ComEd’s territory. Recent FEJA policy shifted responsibility for administering this (and other market transformation) programs from the DCEO to the utilities. Previously, the DCEO was not claiming savings for these trainings. Efforts are currently underway to get this program to produce more market transformation effects.¹⁰

ENERGY STAR RETAIL PRODUCTS PLATFORM



10. <http://www.mwalliance.org/initiatives/training-education/commercial-training>

ESRPP graphic taken directly from <https://www.energystar.gov/esrpp>

Initiatives that leverage existing resource acquisition programs and accelerate new technology adoption.

This theme includes candidate market transformation initiatives that accelerate the diffusion of newer energy efficiency technologies into the marketplace. This approach leverages existing resource acquisition incentives-based energy efficiency programs and adds momentum through training, education, demonstrations, and other market transformation approaches.¹¹

Cold climate heat pumps¹²: Heat pumps optimized for cold climates can reduce energy use and greenhouse gas emissions but should be considered a long-term effort extending over several decades as it will likely be expensive to start and may not realize big savings for some time. One attendee also noted the term “cold climate heat pumps” may be a misnomer as they work in warmer climates as well.

To start, systems can be installed in homes with electric resistance, oil and propane heat, as part of a strategic electrification program. Such an effort might include contractor and architect education, coordination with a resource acquisition incentive program, or demonstration projects. For example, this program could be combined with an HVAC quality installation program and or an advanced HVAC program.

Advanced HVAC: This was defined by the group to include advanced air conditioners, cold climate heat pumps, automated fault detection and diagnostics (AFDD), variable speed HVAC, thermostats, and some version of quality installation. Air conditioning is a key summer load and with the evolution of variable speed technology, energy use can be reduced by roughly 30% from residential air conditioners meeting the ENERGY STAR Most Efficient specification and from commercial air conditioners meeting the specifications of Department of Energy’s Rooftop Challenge. Quality installation should be built into such an initiative. Utility efforts could include demonstrations, case studies, trade ally training and recognition.

Advanced lighting controls: Lighting has been a mainstay of energy efficiency efforts, but as LED lights become common, there will be less remaining program savings from lamps and fixtures. However, a recent DesignLights Consortium paper found large remaining opportunities with lighting controls.¹³ A market transformation initiative could pursue these savings. Utility support could include local demonstrations and case studies as well as training and incentives for designers, installers, and property managers. It is important to develop an initiative in coordination with C&I lighting upgrades and LED fixture programs. Non-energy impacts include occupant comfort and productivity. This approach has demand response potential as well and could be a part of a smart commercial buildings initiative.

11. During the review of this report, Ed Wisniewski noted that current ComEd programs can incorporate market transformation elements such as additional product performance tiers as a signal to the market.

12. <https://www.encyclopedia.com/technology/energy-and-transportation/energy-efficiency/cold-climate-heat-pumps>

13. Dan Mellinger, Energy Futures Group, “Energy Savings Potential of DLC Commercial Lighting and Networked Lighting Controls” Design Lights Consortium. July 2018 <https://www.designlights.org/resources/energy-savings-potential-of-dlc-commercial-lighting-and-networked-lighting-controls/>

Smart commercial buildings: Smart building and manufacturing systems use data from sensors and controls as well as consumption data to optimize building and manufacturing performance. ACEEE estimates that energy savings of 20% or more are possible. To start, smart building approaches can be used in large commercial buildings that already have an energy management system. Examples of program approaches are discussed in a recent ACEEE paper on intelligent efficiency in buildings.¹⁴ ACEEE further asserts that smart thermostats alone can save 8%-10% of energy bills. A market transformation initiative could build on ComEd's current resource acquisition programs.

Clean water pumps: This was discussed as a new opportunity, with development efforts underway at NEEA and CEE that could be leveraged. The DOE put out a standard in 2015 that covers only clean water pumps ranging from 1 to 200 horsepower. This includes those found in heating and cooling systems or drinking water treatment plants. These pumps consume 0.6% of all energy used annually in the US. That is roughly equivalent to the annual energy use of the entire state of Wyoming.^{15,16}

14. ACEEE "Intelligent Efficiency in Commercial and Industrial Buildings" May 2018. <https://aceee.org/sector/state-policy/toolkit/intelligent-efficiency>

15. <https://www.nrdc.org/experts/lauren-urbanek/doe-sets-first-ever-standards-commercial-and-industrial-pumps>

16. DOE "Energy Conservation Standards for Pumps" Apr. 30, 2015 <https://www.energy.gov/sites/prod/files/2015/12/f28/Pumps%20ECS%20Final%20Rule.pdf>

Initiatives that leverage regional or national efforts.

Initiatives Theme 5 includes two ideas for market transformation initiatives that are already widely in use in other areas of the country. This approach takes advantage of experience from other deployments regarding what works and what does not work to achieve more widespread energy efficiency in the marketplace.

Stretch code adoption initiative: A stretch code for energy efficiency is a voluntary addition or appendix to a state's mandatory minimum energy code. This voluntary appendix allows municipalities to adopt a uniform beyond the minimum code option to achieve greater levels of energy efficiency. Stretch codes pull the construction market upward, priming the construction industry for changes that could be part of the next update for the state baseline energy code.¹⁷ A stretch code can align many of the relevant market actors. By making future base code requirements known in advance, it motivates manufacturers and distributors to compete for market share of what will ultimately be required products. This tends to lower prices to builders, and these savings can be passed on to

developers and owners. Utilities can support these codes by providing incentives and education and training on compliance strategies, materials, and techniques.¹⁸ Utilities would need to ensure that their regulatory framework would give them credit for savings from code adoption. However, as stated in the code compliance program description, regulatory approval of this approach to generating savings is a prerequisite to code support type programs.

Municipal existing building upgrade requirements: This approach ties in with commercial building benchmarking and follow-up policies. Chicago, Evanston, and Minneapolis have adopted commercial building benchmarking policies. Other cities in the region can be encouraged to follow suit. Medium-sized buildings could be included (25,000-50,000 sq. ft.). Policies could be adopted to encourage and/or require retrofits like what is now taking place in New York City and Los Angeles.¹⁹

The contributors want to emphasize that all of these market transformation program suggestions were made during a two-day event and do not follow the best practices described in the components section of this report.

For more current examples of market transformation initiatives being operated across North America, see CEE Has Efficiency Covered, <https://library.ceel.org/content/cee-has-efficiency-covered>.

17. <https://bcapcodes.org/beyond-code-portal/stretch-and-reach-codes/>

18. https://newbuildings.org/code_policy/stretch-codes-advanced-codes/

19. <https://database.aceee.org/city/requirements-incentives>

CONCLUSION

CONCLUDING REMARKS

ComEd expressed a goal of becoming a leader in market transformation initiatives. To help move toward this goal, the utility recruited industry leaders to a Market Transformation Summit in Chicago in 2018. The overall goal of the Summit was to help ensure that ComEd benefits from other market transformation activity experiences across North America and that its efforts are appropriate given the context of overall market transformation activities in the Midwest.

These conclusions are not intended to list all the contributions from the Summit. Instead, they are meant to feature several cross-cutting ideas that are viewed as influential. The goal of the Summit was to explore three areas:

1. How does market transformation work in today's energy efficiency portfolio?
2. What are the must-have components of a market transformation initiative?
3. What market transformation initiatives could be pursued in the Midwest today?

These goals were met and are expressed in the three sections of this report that correspond to each of these issues. In addition to this information, the dialogue at the Summit returned to a few topics that seemed to be basic truths about market transformation. These are discussed below.

SUCCESS IN MARKET TRANSFORMATION

INITIATIVE IMPLEMENTATION: One of the Summit's most robust discussions was on the components needed for successful market transformation programs. The question was raised, "If there is some consensus around what a good market transformation program looks like, why aren't there more successful market transformation programs around the country?" This observation led to side conversations among the experts and the authors of this report.

Below are some observations from the authors based on interactions at the market transformation Summit:

- **Theory and practice:** There is a difference between theory and practice—theory is easy and practice is hard. Practice is linked to all the hard work and day-to-day minutiae that are needed to make any strategic initiative successful. In the context of market transformation initiatives, it is easy to say that the utility needs to work with market actors and establish relationships throughout the supply chain. However, it is hard to have the people in place implementing the program that have the ability, skills, and personality to truly engage the market actors in the supply chain. It takes time, talent, and hard work to implement a successful market transformation initiative.
- **Knowledge and experience:** A corollary from the point above, success in an undertaking may be, in part, a function of the team working on the initiative rather than the design of the effort. A team with the experience and expertise can help find ways to modify activities as needed, engage the customers and market actors (e.g., manufacturers, distributors, architecture and engineering firms), and work around issues that arise to help achieve success. There are programs where one utility or program implementer borrows a design from another implementer but does not achieve the same results (i.e., the program is more or less successful). If there are many commonalities between the areas in terms of customers, energy use, prices, etc. then what is the difference? A quality design is not a substitute for having quality in implementation. The implementer, whether in-house or a third party, needs the correct skills and experiences for their role.

CONCLUDING REMARKS

A quality focus on all the activities in delivering a program, whether it is a resource acquisition energy efficiency effort and or a market transformation energy efficiency effort, is important independent of program design.

- **Regulatory environment:** This was a concept that kept coming up in the Summit dialogue. The observation was made that regions with successful market transformation had a regulatory environment that was aligned with market transformation offerings. You cannot overlay a regulatory environment designed to support resource acquisition programs and apply that to market transformation initiatives. For market transformation programs to be successful, the regulators and stakeholders need to agree that market transformation is focused on long-term impacts and there may not be the same near-term rewards as with resource acquisition programs. In addition, it can be harder to measure energy savings with the same level of accuracy as is attained for resource acquisition programs. The evaluation of market transformation programs may focus on tracking market indicators over time with energy savings linked to these indicators. Regardless, the regulators, interveners, and stakeholders need to have an appropriate level of comfort with the unique attributes of market transformation programs if utilities and program implementers are to have success in designing and implementing market transformation programs.

SCALE IS NEEDED FOR MARKET

TRANSFORMATION: Another recurring comment was that market transformation requires scale. Market transformation focuses

on changing a market. Markets for certain types of equipment/appliances may be national or, at a minimum, regional. These markets may not align with utility service territories. For a market transformation initiative to impact stocking practices across a market, the utility or program implementer may need to partner with other regional or national entities to attain the scale needed. This is the idea behind national programs such as the US EPA ENERGY STAR programs. However, regional organizations such as the Northwest Energy Efficiency Alliance (NEEA) have had success with multi-state, regional market transformation efforts. The message from the Summit was that it is important to look for allies to work with that would allow for appropriate levels of scale needed for success in certain market transformation activities.

MARKET TRANSFORMATION HAS BEEN SUCCESSFUL:

One of the benefits of a Market Transformation Summit is bringing together industry leaders that have had success in designing and implementing these types of programs. They can discuss and represent successful programs that promote excitement around this topic. These experts were successful in demonstrating that market transformation initiatives are an approach by which long-term, deep savings in energy use can be obtained. This report documents themes in portfolio design, program/initiative components required for success, and the ideation that resulted in several candidate market transformation initiatives that can be assessed by ComEd and Midwest partners. The sections of this report addressing these specific issues illustrate approaches and lessons learned from successes in market transformation that can help guide a path forward for ComEd and the Midwest.

SUPPORTING MATERIAL

SUPPORTING MATERIAL

REGULATORY SPOTLIGHT

Estimating energy savings
from resource acquisition
and market transformation
programs



REGULATORY SPOTLIGHT

Estimating Energy Savings From Resource Acquisition and Market Transformation Programs

This section focuses on the concepts and methods used to estimate savings from resource acquisition and market transformation programs. This section is not intended to cover every approach. Rather, it is intended to illustrate general concepts. It is noted earlier in this report that the line between resource acquisition programs and market transformation programs can be fuzzy. Both program types represent a market intervention and may share similar objectives. As a result, evaluation approaches used for these types of programs can overlap.

The approaches used to estimate energy savings and market impacts from resource acquisition and market transformation

programs often vary due to program design and differing goals. These differences in design and implementation tend to provide different types of programmatic data and information, which can drive evaluation choices. The common view is that cost-effective portfolios of energy efficiency activities will include both resource acquisition and market transformation programs to address different market barriers and objectives that may have different time dimensions. As a result, an understanding of how evaluations can assess whether goals are being met and helping programs achieve these goals is a key component of an overall set of energy efficiency activities.

REGULATORY SPOTLIGHT: ESTIMATING ENERGY SAVINGS FROM RESOURCE ACQUISITION AND MARKET TRANSFORMATION PROGRAMS

Resource acquisition programs often target and market to specific sets of customers, resulting in tracking data that identifies program participants over a specified period of time.¹ If the evaluation objective is to assess the savings that occurred among this identified set of participating customers, then statistical approaches can be used to examine changes in energy use over time for this group. Many of the evaluation methods used for resource acquisition programs are predicated on having identified program participants, and sampling and analysis procedures are designed to address this estimation problem. In addition, data on program participants can be used to address what have become known as net-to-gross (NTG) issues, where processes can be used to assess customer actions as being program-induced savings, free ridership, or spillover.

Market transformation programs, on the other hand, are designed to influence the market more broadly and often do not have identified sets of customers as participants. The data available from market transformation programs includes market metrics (e.g., equipment stocking practices and trade ally activities) and market-wide adoption of efficient technologies. Customer-specific data is often not available for use as inputs into customer-based evaluation models. Market transformation program evaluations have typically been designed to use data consistent with their implementation design and overall objectives (i.e., market metrics tracked over longer timeframes). In addition, the customer-

based concepts of NTG used in resource acquisition evaluations may not fit with market transformation programs.

Differences in resource acquisition and market transformation program evaluation methods may not be due to differences in overall evaluation philosophy; instead, they are driven by differences in the types of data made available by these program designs and the objectives to be verified by an evaluation. The concepts of counterfactual baselines and causality underpin any program evaluation. No regulatory body or program implementer wants to implement a program where the effects of that program would have occurred if the program had not been offered.

1. Some programs included in resource acquisition portfolios may not identify participants through program implementation. One example is a residential mid-market lighting program where big box or hardware stores provide rebates for efficient lighting equipment funded by a program. In these programs there may be a count of the equipment rebated, but individual customers may not be identified. This can pose challenges for statistical approaches commonly associated with resource acquisition programs and has led to attempts to gather customer participant information through customer-intercept surveys or data gathered by the store in which the purchase is made. These mid-market programs represent program types that could be part of resource acquisition or market transformation portfolios.

DISTINCTIONS BETWEEN RESOURCE ACQUISITION AND MARKET TRANSFORMATION

A starting point for examining distinctions between resource acquisition and market transformation evaluations is provided in a recent report by NYSERDA.² The table below is drawn from this report.

	RESOURCE ACQUISITION	MARKET TRANSFORMATION
Scale	Program	Entire defined market
Target	Participants	All consumers
Goal	Near-term savings	Structural changes in the market leading to long-term savings
Approach	Save energy through customer participation	Save energy by mobilizing the market
Scope of Effect	Usually from a single program	Results from effects of multiple programs or interventions
Amount of Program Administrator's (PA's) Control	PAs can control the pace, scale, and geographic location and can identify participants in general	Markets are very dynamic, and the PAs are only one narrow set of market actors; if, how, where, and when the impacts occur are usually well beyond the control of the PAs
What is Tracked, Measured, and Evaluated	Energy savings and number of participants	Interim and long-term indicators of market penetration and structural changes, attribution to the program, and cumulative energy impacts
Timeframe for Cost-Effectiveness	Usually based on first year or cycle savings	Usually planned over a 5-10 year timeframe

2. From MTPA Working Group (2018), *Market Transformation Metrics and EM&V Coordination Report*, NYSERDA, which was derived from Keating, et al. ops cit. Table appears in the Ken Keating, 12/9/14 paper "Guidance on Designing and Implementing Energy Efficiency Market Transformation Initiatives."

RESOURCE ACQUISITION PROGRAM EVALUATION: ENERGY SAVINGS

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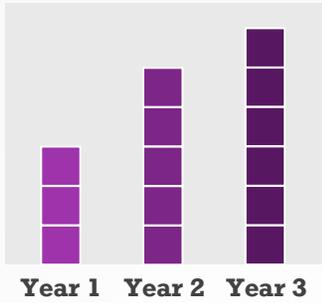


Figure provided as an example only.
Not all methods follow this structure.

Estimating energy savings from typical resource acquisition programs is part of the evaluation, measurement, and verification (EM&V) of the programs. EM&V assesses the performance of energy efficiency activities and provides regulators with verified estimates of energy savings, which can be used to track progress toward goals. EM&V can also involve estimating the cost-effectiveness of energy efficiency activities. There is extensive literature on EM&V of energy efficiency programs, including information from ACEEE,³ SEE Action,⁴ the International Performance Measurement and Verification Protocol (IPMVP) from the Efficiency Valuation Organization,⁵ and the Uniform Methods Project from the US Department of Energy (DOE)⁶ (this list is not exhaustive). This section provides a high level overview of approaches.

Total program energy savings (assessed through impact evaluations): For utility resource acquisition portfolio evaluations, the evaluator typically will estimate savings for each program in the portfolio⁷ and sum the savings for the programs to get portfolio savings. The savings goals at the program and portfolio level are often goals included in an energy efficiency plan. The utility energy efficiency plan is submitted to the regulatory agency and typically covers several years (e.g., 3-5 years). A process to estimate total program savings is outlined below:

- Review savings (ex ante) in the program files. These are savings estimated for each project in the program prior to evaluation.
- Decide on an approach to estimate evaluated savings (ex post) for the program.
 - **Deemed savings** are per-measure energy and demand savings typically provided in a Technical Reference Manual (TRM) or other savings database (e.g., Illinois has the Illinois Statewide Technical Reference Manual⁸).
 - **Measurement and verification (M&V)** can include deemed calculations from TRMs, statistical analysis, and/or computer simulation modeling. A few of these methods are detailed in the next column.

Engineering methods combined with onsite data use algorithms and/or simulation modeling supported by field data measurements on equipment installed through the program. This can include end-use kilowatt-hour metering, equipment runtimes, power measurements, and building orientation and use (where appropriate) to produce high quality savings estimates for a set of sampled sites. The sampling design then allows for extrapolation to the overall set of program participants. This method is often used when the cost of directly metering all participants pre- and post-measure installation is costly and appropriate sample sizes can provide the required program-level precision.

Statistical analyses using comparison groups is another method evaluators use. This method includes randomized controlled trials and quasi-experimental methods. The data in these analyses can come from several sources including monthly, daily, or hourly advanced metering infrastructure (AMI) data as well as site-specific end-use metering. The sophistication of the approach can depend on the types of data available and when they are available. Data available in near real-time is starting to be termed M&V 2.0 or advanced M&V, but the structure of the analyses of this data still uses the same statistical and experimental design constructs (i.e., analyses of consumption data against a comparison/control construct).

3. ACEEE, *Evaluation, Measurement, & Verification*, <https://aceee.org/sector/state-policy/toolkit/emv>.

4. SEE Action, *Energy Efficiency Program Impact Evaluation Guide*, <https://www4.eere.energy.gov/seeaction/publication/energy-efficiency-program-impact-evaluation-guide>.

5. Efficiency Valuation Organization (EVO), *International Performance Measurement and Verification Protocol (IPMVP)*, <https://evo-world.org/en/products-services-mainmenu-en/protocols/ipmvp>. The IPMVP protocols were originally developed for use in performance contracting. The methods focused on verifying savings for use in contracts between customers and energy service companies. However, the protocols also provide valuable insights into methods to determine energy savings for any customer-specific project.

6. DOE, Office of Energy Efficiency & Renewable Energy, *Uniform Methods Project for Determining Energy Efficiency Program Savings*, <https://www.energy.gov/eere/about-us/ump-home>.

7. Some program evaluations can look at synergies across programs. To the extent these synergies examine how separate programs can impact the same end-use or market, these resource acquisition program evaluations can include certain concepts of market transformation.

8. Illinois Energy Efficiency Stakeholder Advisory Group. *Illinois Statewide Technical Reference Manual*. <http://www.ilsag.info/technical-reference-manual.html>

RESOURCE ACQUISITION PROGRAM EVALUATION: ENERGY SAVINGS

- Set a baseline approach. Selecting the baseline approach is often the most challenging part of an evaluation. Baseline options include energy use of participants prior to participation, codes and standards, cross-sectional comparison of energy use for non-participants and comparable nonparticipants, or cross-section/time-series analyses where the change in energy use over time is examined for both groups of participants and non-participants. Baselines for energy use of participants prior to participation can be estimated by widget (e.g., baseline for a new efficient air conditioner) or by project (e.g., a facility's energy use prior to installing energy efficiency measures). Baselines can be assumed to be a common practice baseline, existing condition baseline, or some other baseline condition. Randomized control trials are viewed as the most reliable evaluation method and are based on randomly assigning customers to participant and non-participant groups. Where practical concerns make randomization impractical and comparison groups are constructed after or jointly with program participation, best practice quasi-experimental design approaches are used.⁹
 - Estimate savings for the program based on the sample design and statistical calculations. The estimate of savings for the program is typically based on the use of a realization rate where the ex post savings (evaluated savings) are divided by the ex ante savings (claimed savings).
- Total portfolio energy savings:** Portfolio-level savings are the sum of all program-level savings in the portfolio.
- Prepare a sampling plan and data collection instruments for site visits depending on the approach chosen. Data could be collected via surveys or site visits. Data may also be collected directly from the customer who participated in a program, visually confirmed, or measured onsite (e.g., measure lighting hours of use).

9. Violette, Daniel M.; Rathbun, Pamela. (2017). Chapter 21: Estimating Net Savings – Common Practices: The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/ SR-7A40-68578.<http://www.nrel.gov/docs/fy17osti/68578.pdf>

Estimating the project, program, and portfolio level savings is one step in the evaluation process. However, there are many other items to consider through the evaluation. A few of these are outlined here.



Attribution (NTG)

Many of the statistical methods described above are designed to provide energy savings that are viewed as attributable to the program, depending on the baseline used.¹⁰ In contrast, some evaluation methods focus on technical savings resulting from the installation of energy efficiency measures for a sample or population of participants and may not fold in other behavioral and market considerations. These methods typically do not consider what would have happened in the absence of the program. They provide the estimated technical savings from the installed measures regardless of the influence of the program on customer actions. In these cases, a gross savings estimate is initially estimated and a NTG ratio is used to produce estimates of attributable savings. The Uniform Methods Project chapter¹¹ details net savings including the factors most often considered: free ridership, spillover, and market effects.

DOE's Uniform Methods Project defines gross and net savings as follows:

Gross savings: “The difference in energy consumption *with the energy-efficiency measures promoted by the program in place* versus what consumption would have been *without those measures in place.*”

Net savings: “The difference in energy consumption *with the program in place* versus what consumption would have been *without the program in place.*”

10. Attribution can be complex in that certain aspects of attribution such as non-participant spillover may not be captured by certain experimental designs and may need to be addressed with additional research. See Violette, Daniel M.; Rathbun, Pamela. (2017). Chapter 21: Estimating Net Savings – Common Practices: The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40-68578. <http://www.nrel.gov/docs/fy17osti/68578.pdf>

11. See Violette, Daniel M. et al. (2017). <http://www.nrel.gov/docs/fy17osti/68578.pdf>

Estimating the project, program, and portfolio level savings is one step in the evaluation process. However, there are many other items to consider through the evaluation. A few of these are outlined here.



Timeframe

Impact evaluations for resource acquisition programs tend to estimate savings for program participants in a given timeframe—often in one year (or a few) of the program. While the evaluation is focused on program participants for one (or a few) year, overall program savings values used in cost-effectiveness tests consider the estimated persistence of savings over time. This is because energy efficiency savings will extend beyond the year in which the measure was installed.¹²



Other Impacts

Other impacts could include non-energy impacts (e.g., comfort, reduced maintenance, health), environmental externalities like avoided greenhouse gas emissions, water savings, job creation, and utility system impacts.

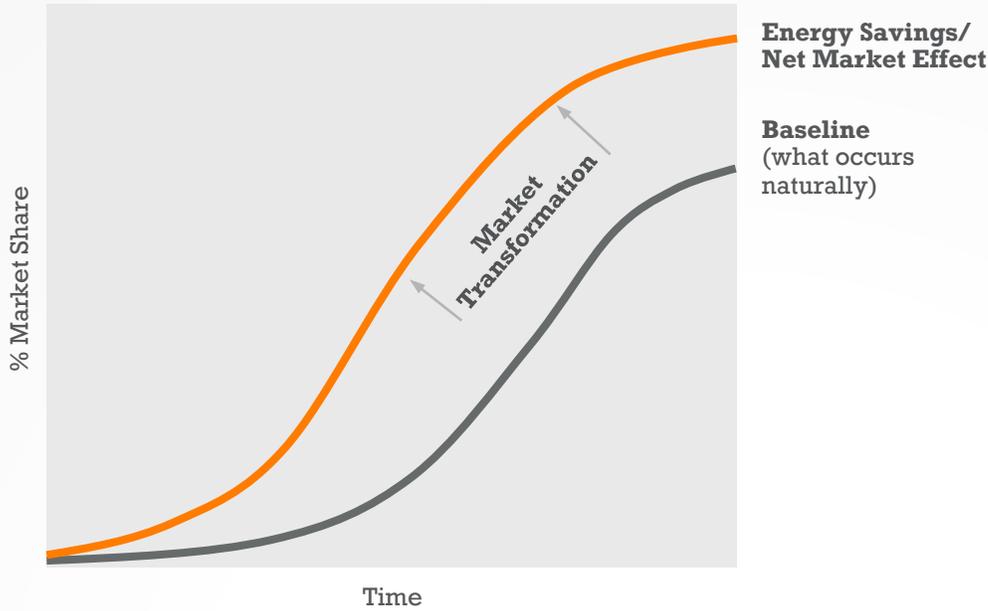


Continuous Improvement

All programs should be part of a continuous improvement framework where implementation processes are reviewed and evaluated, often through a process evaluation.

12. The persistence of program savings from installed energy efficient measures can pose additional estimation challenges. A number of these are discussed in: Violette, Daniel M. (2017) Chapter 13: Assessing Persistence and Other Evaluation Issues Cross-Cutting Protocol – The Uniform Methods Project. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40-68569 September 2017. <https://www.nrel.gov/docs/fy17osti/68569.pdf>

MARKET TRANSFORMATION PROGRAM EVALUATION: ENERGY SAVINGS



Approaches to estimating energy savings from market transformation initiatives are varied. Different approaches are used in different jurisdictions depending on the market being addressed and the goals set out for that program. A difference that often stands out between market transformation program evaluations and typical resource program evaluations is the difficulty in identifying individual customers as program participants. This somewhat defining characteristic allows for different evaluation approaches and statistical methods to be used in a resource acquisition setting. Conversely, market transformation efforts tend to be market-wide and specific end users of a new technology are not as easily identified. This has led to methods that tend to track market indicators and overall market adoption rates.

Market transformation evaluation should match the evaluation strategy in the program logic. The logic model and the intervention strategy should identify the outputs and outcomes and the metrics that define them. These interim and long-term indicators of market effects become the indicators by which progress can be measured. Examples include market share for energy efficient products and services, the saturation of energy efficient products, price of the product or service compared to less efficient alternatives, availability of efficient products and efficiency services, levels of product or service awareness, knowledge among market actors, and, ultimately, energy and demand savings.

Several organizations have recently convened working groups to discuss market transformation evaluation. Much of the information in this section is drawn from the following resources, all published in 2018:

- NYSERDA's *Market Transformation Metrics and EM&V Coordination Report*¹³ (referenced in this section as the NYSERDA Market Transformation Report)
- CPUC Energy Efficiency Market Transformation Draft Staff Proposal¹⁴ (referenced in this section as the CPUC Market Transformation Proposal)
- *ENERGY STAR® Retail Products Platform (RPP): Conditions and Considerations in Evaluating Market Transformation Programs and Evaluation Guidance for RPP* report¹⁵ (referenced in this section as the RPP Report)

13. MTPA Working Group (2018), *Market Transformation Metrics and EM&V Coordination Report*, NYSERDA.

14. CPUC (2018), Administrative Law Judge's Ruling Seeking Comment on Market Transformation Staff Proposal, Rulemaking 13-11-005.

15. Sara Conzemius and Alexandra Dunn (2018). *ENERGY STAR® Retail Products Platform (RPP): Conditions and Considerations in Evaluating Market Transformation Programs and Evaluation Guidance for RPP*. Prepared by ILLUME Advising, LLC, for the State and Local Energy Efficiency Action Network.

MARKET TRANSFORMATION PROGRAM EVALUATION: ENERGY SAVINGS

Total market transformation initiative energy savings: Approaches for estimating savings from market transformation initiatives have typically varied by the organization implementing the market transformation effort. At a high level, this market-driven savings approach compares a baseline curve for the market to the actual market curve. The list below outlines an approach from New York.

The **NYSERDA Market Transformation Report** notes that the following steps are typically followed when assessing a market transformation program.

1. Define the market targeted by the program or initiative.
2. Develop and refine a program theory and logic model. This model generates hypotheses about the specific ways in which the program will accelerate the pace of development and adoption of the targeted products and practices.
3. Define market metrics that can be used to characterize the market in relation to the program theory and logic model. In the early stages of the initiative, metrics such as the number of products that receive efficiency certification and the variety of certified products on retailer shelves can be used to track market progress. These results can be used to validate or revise the program logic models and to guide changes in program design and management. As the initiative progresses, PAs will want to focus on assessing its impacts on measure adoption and energy use, as described in the next three steps.
4. Characterize the actual past and current level of development and adoption for the targeted technology, using the metrics developed in the previous step.
5. As appropriate, characterize the market baseline—that is, the level of technology development and adoption that will most likely have occurred in the absence of the program.
6. Estimate the energy savings associated with the program-induced sales. NYSERDA outlines two approaches to estimate energy savings.

Measure-/technology-specific programs: This approach uses an algorithm to assess the energy savings from market transformation progress. It would also include removing any program-incented units to avoid double counting.

$$\text{Total Energy Savings} = \text{Change in Units Sold} \times \text{Unit Energy Savings.}$$

Comprehensive programs: For programs like Strategic Energy Management (SEM), the assessment may be more complex. More data is required to form inputs for an algorithm for this approach.

$$\text{Total Energy Savings} = \text{Change in Adoption of Approach} \times \text{Average Energy Savings from Adopting}$$

MARKET TRANSFORMATION PROGRAM EVALUATION: ENERGY SAVINGS

Total market transformation initiative energy savings: Approaches for estimating savings from market transformation initiatives have typically varied by the organization implementing the market transformation effort. At a high level, this market-driven savings approach compares a baseline curve for the market to the actual market curve. The list below outlines an approach from California.

The **CPUC Market Transformation Proposal** details items a Market Transformation Development Plan should include, which would be further detailed in a Market Transformation Accord.

1. Identify a target market that is clearly defined and manageable.
2. Define target technologies, behaviors, sectors, and applications.
3. Assess product (or behavior) performance, including an assessment of energy savings potential and non-energy benefits.
4. Assess competing (not energy efficient) products and the costs and benefits associated with those products.
5. Describe the supply chain, product demand and delivery methods, the role of each market actor, and how the market operates and functions.
6. Present a preliminary assessment of market drivers and barriers.
7. Present a preliminary program theory and logic model, identifying market leverage points and intervention strategies.
8. Describe potential strategies and available or preliminary data for sizing the market and for projecting a naturally occurring adoption curve—i.e., baseline forecast for the market.
9. Describe additional research and/or market assessments needed to finalize the proposal and set an initial baseline forecast that extends over the projected timeline of the program.

MARKET TRANSFORMATION PROGRAM EVALUATION: ENERGY SAVINGS

Organizations in the Northwest also have a history of assessing impacts from market transformation programs. Examples from the Northwest Energy Efficiency Alliance (NEEA) and Bonneville Power Administration (BPA) are below.

NEEA APPROACH

The NYSERDA Market Transformation Report discussed the NEEA approach as part of its best practices review: “In assessing the market impact from its efforts, NEEA does not claim regional savings; instead, NEEA employs a ‘co-created savings’ approach. To arrive at ‘co-created savings,’ total regional savings are assessed using a savings rate multiplied by unit calculation. Then, baseline savings are removed from the total based on third-party research. The remaining savings are categorized as ‘co-created savings’ and encompass discrete savings from local utility programs and an overarching estimate of net effects. The net effects are not attributed to any particular entity but are considered created across funders through the market-wide engagement by NEEA and its partners.”

BPA APPROACH¹⁶

BPA tracks Momentum Savings. Momentum Savings are defined as: “all the energy efficiency occurring above the Northwest Power and Conservation Council's Power Plan baseline that are not directly reported by utilities and not part of the Northwest Energy Efficiency Alliance's Net Market Effects.” The general equation for Momentum Savings is:

$$\text{Momentum Savings} = \text{Total Market Savings} - \text{Total Program Savings}$$

BPA is quantifying Momentum Savings by collecting information on how much energy efficiency is happening in the total market. It builds market models to track changes over time in energy consumption, sales trends, stock turnover, energy savings, and baselines. These models incorporate sales data from the market (e.g., distributors).

The RPP Report also details BPA’s approach: “BPA analyzes both the efficient and inefficient products entering the marketplace. The data to support this analysis comes from multiple sources which characterize the building stock (the installed products consuming energy) and the product flow (the new products every year, which create change in the building stock). One critical data source is regular onsite stock assessments, which provide the physical characteristics of buildings and the technologies installed in homes. This is combined with information on the new equipment being sold annually (the product flow), generally via sales data. The combination of the stock- and product-flow data provides a bottom-up look at energy consumption and how that energy consumption changes over time.”

The baseline for a market transformation initiative is for the market as a whole. Some jurisdictions use a fixed baseline for a period of time, while others use a baseline that changes over time. The CPUC Market Transformation Proposal notes that Market Transformation Accords should establish an initial forecast market baseline using a Delphi process with PAs and market actors. The paper details approaches for defining baselines and notes these baselines will serve as the basis for energy savings estimates.

The RPP report also says : “The evaluation of market-transformation programs relies heavily on establishing a baseline against which the program impacts can be measured. Unlike resource-acquisition programs, market-transformation evaluations require more upfront coordination between the evaluation and implementation teams, data-collection needs must be clarified prior to launch, metrics established, short-term, midterm, and long-term market indicators defined. Without early and closer coordination, sponsors risk developing indicators that cannot be measured or collecting data that does not meet evaluation needs. Additionally, a comprehensive market study must be conducted to establish the market’s baseline conditions.”

16. BPA, *Energy Efficiency Market Research & Momentum Savings*, <https://www.bpa.gov/EE/Utility/research-archive/Pages/Momentum%20Savings.aspx>



Attribution and Causality

This is another area of overlapping interest. However, the methods and terminology developed for resource acquisition and market transformation programs have been designed to meet the needs for assessing each program type in an appropriate context. The concept of NTG is generally associated with resource acquisition programs, although the overall concept of causality is important to both resource acquisition and market transformation program types. No regulatory authority wants to spend funds on impacts that would have occurred even in the absence of a program—whether it is a market transformation or resource acquisition program.

The NYSERDA Market Transformation Report uses the terms causal or program-induced effects as opposed to NTG, which is generally used for methods based around identified program participants more commonly associated with resource acquisition programs. NYSERDA states that, by design, measuring free riders and spillover does not apply to market transformation initiatives, but the causality/attribution of the savings to the program's efforts should still be estimated.

Estimating the energy savings from a market transformation initiative is only one way to evaluate the success of the initiative. Other items are important to consider.

For some initiatives, it may be appropriate to assume any market effect was caused by the program, while for other initiatives evaluators may need to show evidence of causality—e.g., through market actor interviews or Delphi panels. The CPUC Market Transformation Proposal notes that the “baseline reflects an estimate of how all of the non-program market forces and influencing factors would interact and evolve in the market over time if there were no Market Transformation Initiative in place.” This is referred to as the counterfactual and is an important concept in both market transformation and resource acquisition evaluations.



Timeframe

The effects of market transformation initiatives are typically seen after a longer time period than resource acquisition—often 5-10+ years. Market transformation effects may last longer than resource acquisition effects as their intent is to create lasting (permanent) changes to the market.



Other Impacts

Market transformation metrics are important to outline in a logic model and measure over time. Metrics could include market awareness of a product, percentage of sales of efficiency equipment, penetration of equipment in the stock, or stocking practices among others. These metrics provide a way to gauge if the market transformation initiative is effective.



Continuous Improvement

All programs should be part of a continuous improvement framework where implementation processes are reviewed and evaluated, often through a process evaluation.

CONCLUSION

Three Portfolio Themes were derived from the Market Transformation Summit:

- Synergies exist between resource acquisition and market transformation programs.
- A holistic view of energy efficiency activities across resource acquisition and market transformation programs is important.
- Regulatory treatment of market transformation programs will need to differ from resource acquisition programs.

The evaluation of a market transformation initiative should support these themes. The evaluation should recognize that synergies exist between program types and taking a holistic view to evaluating the portfolio of programs is important. In addition, it is important to work with regulators and other stakeholders on evaluation approaches. Key takeaways include the following:

- **Evaluating portfolios with a holistic perspective is important.** A cost-effective energy efficiency portfolio will need programs targeted to specific customer segments with short-term energy reduction goals. Other programs will need to work synergistically with these programs to achieve the longer-term goals involved in transforming markets. Evaluation is needed to provide feedback that assesses the contributions from both resource acquisition and market transformation programs, including the synergies across these programs. The evaluation methods will involve both customer-centric approaches associated mostly with resource acquisition programs and market metrics and tracking for longer-term investment efforts in energy efficiency. Regulators and stakeholders will need to recognize the value of evaluations that support both resource acquisition and market transformation investments.
- **Data availability will drive the evaluation approach.** It is important to recognize that different data availability will influence the choice of the evaluation approach across programs. In some cases, a high level of rigor can be expected for evaluations focused on an identified population of program participants. For other market-based programs, information will have to be accumulated over time. As a result, expectations for evaluations focused on providing different views of the portfolio of energy efficiency activities will need to align with the purpose of the evaluation.
- **Market-based evaluations will require longer timeframes and designs that are aligned with the objectives of these programs.** It will be more difficult to develop standards and protocols for market transformation evaluations across changing technologies and market maturities. These evaluations will likely require additional planning and agreement among stakeholders as well as multi-year timeframes for execution.

SUPPORTING MATERIAL

EXPERT SUMMARIES

Summit attendees were provided the opportunity to summarize their take-aways from the Summit. This section provides those summaries.



MARGIE GARDNER

Resource Innovations



LAUREN CASENTINI

Resource Innovations

Collaboration is Key for Market Transformation Success

Margie Gardner, Senior Advisor and Lauren Casentini, CEO, Resource Innovations

“No one can whistle a symphony. It takes a whole orchestra.” H.E. Luccock

Market Transformation (MT) has been pursued in various regions of the country for decades because it uses the power of markets to secure energy efficiency. This can result in large savings at low cost once the market forces have catalyzed the efficient product/service to increase in market share. But markets by nature are interactive ecosystems; to effectively work in a market requires collaborating with strategic market partners within those ecosystems.

Strategic Partnerships

Strategic market partners can be found in many roles within a market of buyers and sellers, and also within the set of government entities or businesses who want to influence that market. The particular partner(s) targeted by an initiative will depend on the market intervention strategy. So each initiative must consider the possible set of actors in that market and then decide which offers the greatest leverage point(s).

In general market transformation initiatives should consider the following categories of potential partners.

- Partners who are internal to the supply or demand of the product/service. This includes suppliers of materials to manufacturers; manufacturers; distributors; retailers and consumers.
- Government entities or independent businesses who's goals overlap with the energy efficiency goals. This could include agencies such as the US Department of Energy, City of Chicago, or even an insurance company, if they see a benefit to energy efficiency.
- Other utilities or administrators who want to influence the same market.

Partners in the first two bullets will depend entirely on the market you are trying to influence – for example, electrically-heated homes with two or fewer dwelling units.

In terms of the third bullet, it's essential to make sure that you have utility partners who match the size and scope of the market you are trying to influence as you develop an initiative. For example, if the leverage point is urging manufacturers to change what is offered in the national appliance market, an initiative will be more successful if utilities across the nation band together to send a unified signal to the manufacturers.

Similarly, in a region such as the Midwest, there is benefit to utilities banding together to touch regional markets. The goal of collaborating in these cases is to reduce the cost of MT initiative development and evaluation, create greater leverage through larger market effects, and enhance savings. The Northwest Energy Efficiency Alliance has successfully brought all the

utilities of its region together to conduct collaborative market transformation for the last 20 years, and their programs have been highly successful.

Midwest Regional Initiative

In the Midwest, Nicor Gas is spearheading an initiative that intends to cultivate collaborative market transformation. The concept is to recruit other utilities and administrators to develop a common understanding of market transformation; develop tools that everyone can use (such as clarity on the purpose of logic models, or a template for a market transformation initiative business plan), and work collaboratively to design and implement initiatives.

Already, Nicor Gas and ComEd have started collaborating and are executing a series of educational events (including the Summit on best practices held September 12, 2018, and a Market Transformation Overlay Workshop held on October 11, 2018) to inform utilities and stakeholders of the opportunity to join in the effort.

We anticipate a first “convening” committee to discuss the goals and operations of the MT Collaborative in early December, continuing into the first half of 2019. The first initiatives that will be reviewed to evolve toward market transformation will be building operator certification (BOC) and Illinois Home Performance (IHP).

If you’d like further information on MT development in the Midwest, please contact Lauren Casentiti: LCasentini@resource-innovations.com.



EMILY LEVIN

VEIC

Transforming Markets Through Midstream Program Models

Emily Levin, Howard Merson, and Frances Huessy, VEIC
Brian Barnacle and Chris Burmester, Energy Solutions

Midstream programs have proven to be an effective model to rapidly transform markets for products and equipment sold through both retail and wholesale channels. What can we learn from successful midstream programs, and how might we update energy efficiency policies and programs to encourage greater deployment of these program designs?

Lessons Learned from Midstream Programs

Successful midstream programs that have succeeded in transforming markets have two key characteristics:

- 1) Effective engagement and proactive collaboration with the supply channel; and
- 2) Strategic use of data to track progress and inform and refine program design.

Since 2012, Efficiency Vermont, a statewide energy efficiency utility operated by VEIC, has successfully transformed markets for products sold in Vermont through wholesale distributors, using a comprehensive strategy to engage the supply chain. VEIC's SMIT model – a **s**ales, **m**arketing, **i**nventory, and **t**raining protocol for product distributors – applies a systems approach to engage, understand, and influence the supply chain through an 11-step process:

- Step 1. Draw up a detailed program plan.
- Step 2. Determine the value proposition for supply channel partners.
- Step 3. Map the supply channel, from start to finish.
- Step 4. Decide on equipment eligibility and performance requirements.
- Step 5. Design protocols for optimal data collection at the supply channel level.
- Step 6. Conduct planning sessions with supply channel partners.
- Step 7. Invite the supply channel to collaborate on a SMIT plan.
- Step 8. Establish program incentives and fees that are responsive to supply channel feedback.
- Step 9. Send memorandum of understanding (MOU) to strategic partners.
- Step 10. Draft evaluation, measurement, and verification (EM&V) plans.
- Step 11. Establish a single point of contact from the program to the market.¹

Energy Solutions, a leading implementer of midstream market transformation programs, has focused on the key performance indicators, metrics, and data needs to deploy midstream program models tailored to the degree of market maturity. Successful midstream programs apply a systematic, data-driven approach to track market engagement, streamline data collection, validation, processing and reporting, and access key data that highlight market trends

¹ Merson, H., F. Huessy, E. Levin, and M. Russom. 2016. "Driving Upstream Markets through Strategic Partnerships and Excellence in Supply Chain Management." Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE.

and inform program refinements, such as stocking percentages, full-category sales information, product performance information, warranties, and incremental measure costs.^{2,3}

Policies Needed to Scale Midstream Programs for Market Transformation

Many utilities and energy efficiency program administrators have been moving forward with deployment of midstream programs, and are achieving good results. However, as VEIC and Energy Solutions work with utilities to scale up these program models, we have encountered a few persistent regulatory and programmatic barriers that can impede growth – and slow market transformation.

These barriers stem from the fact that midstream and upstream programs have aspects of both resource acquisition (RA) and market transformation (MT) programs. They can deliver significant, measurable energy savings within the first year, which allows them to fit within resource acquisition frameworks at many utilities. However, they also lead to true market transformation through sustained increases in the stocking and sales of efficient products and equipment, as well as accelerated introduction and deployment of new measures. Regulators and program administrators often do not value the transformative aspects of these programs, and in some cases, impose restrictions that prevent them from reaching their full potential.

The regulatory barriers that midstream programs face fall mainly into three categories:

- 1) Net-to-gross and savings attribution challenges
- 2) Coordination and attribution challenges across program implementers and regions, which can inhibit collective partnership and action
- 3) Sudden and unexpected changes to technical Resource Manual (TRM) assumptions that terminate programs suddenly and leave market actors with a surplus of equipment

Rather than imposing strict boundaries between RA and MT programs, as is currently proposed in California,⁴ we recommend that regulators and program administrators instead make RA frameworks more flexible and better able to incorporate MT elements.⁵

Specifically, regulators should update savings methods to overcome regulatory barriers and provide an incentive for RA programs to undertake MT activities without incurring cost-effectiveness penalties by:

² Kisch, T., B. Barnacle, P. Savio, S. Smith, and J. Clyburn. 2016. “Market Development Programs—Addressing Barriers for Emerging Technologies through Scaled Deployments and Strategic Supply Chain Interventions.” Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE.

³ Energy Solutions and VEIC are now collaborating on an initiative known as SourceUpstream™ to accelerate adoption of high-performing, energy-efficient products by combining strategic engagement of the supply chain with midstream program best practices. SourceUpstream is currently working with utilities, manufacturers, and other actors across the country to transform markets for efficient products and equipment through midstream programs. See: Merson, H., et al. 2018. “Five Years and Beyond with Supply Chain Engagement: What’s Next with Upstream and Midstream?” Proceedings of the 2018 ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE

⁴ CPUC, Energy Efficiency Market Transformation: A Staff Proposal, August 8, 2018.

⁵ Comments of Energy Solutions and VEIC on the Administrative Law Judge’s Ruling Seeking Comment on Market Transformation Staff Proposal, October 5, 2018.

- Using MT methods to establish an initial forecast market baseline that reflects the best estimate of how the market would evolve both with and without the midstream program intervention
- Allowing for negotiated net-to-gross adjustments
- Setting savings metrics over longer time horizons, to encourage RA programs to invest more robustly in MT activities, such as training, scaled deployments, supply channel engagement, and ratings, codes and standards advancement, in ways that contribute to future cost-effectiveness and savings, even if those results come in future years

The utility boundaries and state regulations that govern energy efficiency programs can create significant barriers for large market actors, including large manufacturers, retailers, wholesale distributors, and building owners and operators. We recommend that, instead of fragmenting the market, regulators and evaluators should encourage program administrators to achieve results at scale through successful collaborations within and beyond state boundaries. Key steps include:

- Structuring goals in ways that encourage collaboration and shared savings across state lines and utility service territories, rather than a narrow focus on savings attribution that creates competition among program administrators
- Encouraging development of statewide or regional umbrella initiatives with consistent program design elements to more effectively engage the market. Under this model, one entity would serve as a central portal to provide: 1) upstream program administration; 2) standard administrative fees for distributors and, if needed, incentives for installation contractors; 3) consistent training requirements for participating contractors; 4) consistent equipment performance standards to drive scale and efficiency; 5) engagement with manufacturers, distributors, and contractors around marketing and sales campaigns and strategies; and 6) data collection, processing and reporting protocols including sales data, rebate tracking data, utility surveys, and installer surveys.⁶

Through these steps, regulators and program administrators can incorporate the best elements of both RA and MT programs and unlock the potential of midstream programs to transform markets, in Illinois and beyond.

⁶ VEIC, Ramping Up Heat Pump Adoption in New York State: Targets and Programs to Accelerate Savings, September 25, 2018. <https://www.veic.org/documents/default-source/resources/reports/veic-ramping-up-heat-pump-adoption-in-new-york-state.pdf>.



STEVE NADEL

ACEEE

Components of Successful Market Transformation Programs and Thoughts on Illinois/Midwest Initiatives

Steven Nadel

American Council for an Energy-Efficient Economy (ACEEE)

ACEEE has worked on market transformation ever since the concept was first proposed by Eckman, Benner and Gordon in a paper at our 1992 Summer Study.¹ Over the years we have participated in the planning, implementation and evaluation of many market transformation initiatives. For example, in 2003 we published a report on *Market Transformation: Substantial Progress from a Decade of Work* that examined the success and lessons of 28 different market transformation initiatives.² We found that successful initiatives (meaning initiatives that made substantial progress transforming their target markets) generally targeted energy efficiency measures (technologies and practices) that had many of the following characteristics:

Target Market and EE Measure Characteristics

- a. Low incremental cost (e.g., home electronics and dishwasher initiatives);
- b. Rapid paybacks (e.g., LED exit signs and traffic signals, and CFL initiatives);
- c. Substantial other benefits besides energy savings (e.g., LED exit signs and traffic lights have long lives, efficient clothes washers provide improved cleaning performance, and efficient new homes can be more comfortable);
- d. Involve measures that are improvements in the efficiency of an existing technology, rather than a totally new technology or changes in practices or design methods; and
- e. The measures can be incorporated into new codes and standards (e.g., residential and commercial clothes washers, residential and commercial air conditioners, transformers, LED traffic lights and exit signs, and packaged commercial refrigeration equipment).

More recently, in 2017, in *Transforming Energy Efficiency Markets*,³ we looked again at initiatives, with an emphasis on more recent efforts, and found several keys to success:

Keys to Success

- a. Market understanding;
- b. Collaborative effort with common vision;
- c. A structured process and multi-pronged effort;
- d. National/regional scope and coordination;
- e. Long-term commitment;
- f. Effective marketing that address multiple benefits of a measure;
- g. Flexibility and adaptability; and
- h. Inclusion of transition and/or exit strategies

Based on these findings as well as our review of areas where market transformation might achieve substantial energy savings and other benefits, and the results of discussions at the recent Commonwealth Edison sponsored dialog, we recommend several initiatives for

¹ <https://aceee.org/files/proceedings/1992/data/index.htm> .

² <https://aceee.org/research-report/a036> .

³ <https://aceee.org/research-report/u1715> .

consideration by Commonwealth Edison, other Illinois program administrators, and other program administrators from the Midwest. We recommend consideration of:

1. Enhancing the efficiency of new homes and buildings, ultimately leading to zero energy buildings in many cases. Such an initiative could include stretch codes, enhanced code implementation, and design assistance and incentives for zero energy buildings,⁴ with the ultimate objective of constructing homes and buildings as efficiently as possible, so that new buildings will not need to be retrofit in the future. Such an initiative could build on past progress and emerging efforts in the region and ultimately lead to a series of periodic building code upgrades.
2. Smart building and manufacturing systems including smart thermostats. Smart building and manufacturing systems use data from sensors and controls as well as “big data” to optimize building and manufacturing performance. Energy savings of 20% or more are possible. To start, smart building approaches can be used in large commercial buildings that already have an energy management system. Examples of program approaches are discussed in a recent ACEEE briefing paper.⁵ Likewise, smart thermostats can save on the order of 8-10% and an initiative can build on Commonwealth Edison’s current programs.
3. Strategic energy management (SEM). SEM is an approach to energy management in large facilities that establishes a process of continuous improvement, typically starting with operations and maintenance measures and ultimately proceeding to capital measures. SEM has been particularly effective in industrial and institutional facilities. The Consortium for Energy Efficiency has an initiative in this area.⁶ Programs have advanced the farthest in the Northwest but are also advancing in California, the Northeast and other regions. Comm Ed and its partners should build on these efforts. An SEM Collaborative is forming to assist efforts nationwide.⁷
4. Advanced lighting controls. Lighting has been a mainstay of energy efficiency efforts, but as LED lights become common, there will be less remaining savings from lamps and fixtures. However, a recent Design Lights paper found large remaining opportunities with lighting controls.⁸ A market transformation initiative could pursue these savings.
5. Advanced air conditioners and heat pumps including cold-climate heat pumps and improved installation and maintenance. Air conditioning is a key summer load and with the evolution of variable speed technology, energy use can be reduced by roughly 30% from residential air conditioners meeting the Energy Star Most Efficient specification and

⁴ See for example the programs of the Energy Trust of Oregon (<https://www.energytrust.org/commercial/new-buildings-path-to-net-zero/>) and the New York State Energy Research and Development Authority (<https://www.nyserda.ny.gov/All%20Programs/Programs/Low%20Rise%20Residential/Low%20Rise%20Net%20Zero%20Energy%20Housing>).

⁵ <https://aceee.org/sector/state-policy/toolkit/intelligent-efficiency>.

⁶ <https://www.cee1.org/content/business-energy-management>.

⁷ Contact Ethan Rogers at ACEEE for information – erogers@aceee.org.

⁸ <https://www.designlights.org/resources/energy-savings-potential-of-dlc-commercial-lighting-and-networked-lighting-controls/>.

from commercial air conditioners meeting the specifications of DOE's Rooftop Challenge.⁹ Quality installation should be built into such an initiative. Likewise, heat pumps optimized for cold climates can reduce energy use and greenhouse gas emissions, but should be considered a long-term effort extending over several decades since cold-climate heat pumps do not meet some of the criteria discussed above that can lead to rapid success. To start, systems can be installed in homes with electric resistance, oil and propane heat, and efforts made to improve the availability of cold-climate ducted systems (duct/less systems are now available from multiple manufacturers).

6. Amorphous-core distribution transformers. Distribution transformers are used by utilities and medium to large C&I customers to reduce voltage from distribution voltage to the voltage used in buildings and factories. More efficient transformers use low loss metals in the core and more copper wire. The most common types of distribution transformers are subject to minimum efficiency standards established by DOE, eliminating low efficiency designs from the new equipment market. However, higher-efficiency transformers are available on the market, particularly units using amorphous metal cores, which have lower losses than the much more common steel cores. These amorphous cores typically reduce core losses by 50-70%. Some utilities and large customers purchase amorphous core transformers, but these are probably only a few percent of total US transformer sales due to a variety of market barriers such as higher costs, resistance from steel manufacturers, the fact that the costs of transformer losses are generally passed on to all utility ratepayers and not the utility, and lack of attention to transformer losses by most state regulators. Amorphous core sales appear to be higher in countries like China and India than in the US, although sales are higher in a few U.S. jurisdictions (e.g., DC and Maryland) where policy-makers have paid attention to transformer efficiency. A market transformation initiative could help spread these practices to Illinois and nearby states.

In addition, to these initiatives, another area worth pursuing is retrofits of existing homes and commercial buildings. Such an initiative does not meet some of the criteria for successful initiatives discussed above, but the savings are very large and such retrofits should be pursued on a long-term basis. An initial focus could be:

7. Commercial building benchmarking and follow-up policies. Chicago, Evanston and Minneapolis have adopted commercial building benchmarking policies but other cities in the region can be encouraged to follow suit. Medium-sized buildings could be included (25,000-50,000 sq. ft.) and policies adopted to encourage and/or require retrofits as it now taking place in New York City¹⁰ and Los Angeles.

⁹ See <https://aceee.org/fact-sheet/he-air-conditioners>.

¹⁰ Requires retrocommissioning, audits and lighting upgrades and considering a tradable system to achieve 20% energy savings by 2030 – see https://www.huffingtonpost.com/entry/nyc-carbon-footprint_us_5b7a338ee4b018b93e952f64. And Los Angeles has energy audit and retrocommissioning requirements – see <https://www.betterbuildingsla.com/whats-required>.



STEVE SCHILLER

Berkeley National Lab

Considerations for Market Transformation Design and Evaluation – Logic Models, Market Effects Evaluations, and Performance Metrics

Steven R. Schiller

Senior Advisor, Electricity Markets and Policy Group
Lawrence Berkeley National Laboratory

These comments draw from discussions at the MT Summit and the historical context for MT design and evaluation, including the alignment of evaluation with program logic models and program theory.

Market Transformation Context and Evaluation

To a large extent, all energy efficiency programs can be considered market transformation (MT) programs in that they involve a change in how energy efficiency activities take place in the marketplace. However, for specific MT programs, the primary objective is to change the way in which efficiency markets operate (e.g., how manufacturers, distributors, retailers, consumers, and others sell and buy energy-related products and services), which tends to result in more indirect energy and demand savings. MT programs attempt to reduce market barriers through market interventions.

During the 1990s, the focus of many end-use efficiency efforts shifted from resource acquisition to market transformation. Subsequently, there was a shift back to more resource acquisition-focused programs that did not necessarily include market intervention components, or at least did not include components defined as such. However, current best practices involve all efficiency programs having at least some MT elements. These program elements involve changing how efficiency activities take place in the marketplace. As a result, best practice today involves MT and other program types being implemented in a complementary manner.

Given that the ultimate aim of MT programs is to increase the lasting adoption of energy-efficient technologies and practices, MT program designs usually focus first on efficiency adoption rates by market actors and second on the directly associated energy and demand savings. Thus, evaluation of MT interventions needs to focus on the mechanisms through which changes in adoptions and energy use are ultimately induced. MT evaluation tends to be a combination of impact, process, and market effect evaluation, and can also include cost-effectiveness evaluations. However, many current evaluation efforts focus on quantitative market effects measurement¹ and do not fully address the mechanisms and processes set out in the MT program design.

This means that considerable initial evaluation attention often is focused on indicators of, or metrics associated with, market effects through market tracking. For example, an MT evaluation might first report changes in sales patterns and volumes for particular efficiency products as an indication of program progress in meeting program goals. However, evaluation also plays an important role in providing the kind of feedback that can be used to refine the design of market interventions. This role is also important for resource acquisition but it is critical for MT interventions and is arguably more complex for MT programs, because the interest is in long-

¹ Market Effects Evaluation looks at the change in the structure or functioning of a market, or the behavior of participants in a market, that results from one or more program efforts.

term changes in the market versus more immediate and direct energy savings for resource acquisition programs.

Logic Models and Theory Based Evaluation

Best practices in the design and evaluation of MT programs start with understanding the logic and strategies behind the market intervention. The logic and strategies are incorporated into tools known as *logic models*. Understanding the logic behind MT is important for establishing appropriate performance metrics. Furthermore, MT program evaluations should entail collecting information that can be used to refine the underlying program theory.

Theory-based evaluation (TBE) involves assessing a well-articulated program theory, established up front, that specifies the sequence of events a program is intended to cause, along with the precise causal mechanisms leading to these events.

Evaluation then focuses on testing the congruence of observed events with the overall program theory. TBE can be considered a process of determining whether a program theory is correct or not (i.e., testing a hypothesis). TBE is particularly well adapted to evaluating the effectiveness of MT initiatives since MT tends to take a relatively long time, involves a relatively large number of causal steps and mechanisms, and encompasses changing the behavior of multiple categories of market actors—all of which makes it particularly important to focus on specifying and testing a detailed and articulated program theory.

Market Effects Evaluation

The goal of market effects evaluations² is to characterize and quantify the effects of a program on supplier promotion and customer adoption of the targeted energy efficiency measures, regardless of whether those suppliers and customers participated in the program. Effects that cannot be captured by standard program records are particularly important for certain kinds of initiatives, including “upstream” promotions of mass-market goods, such as consumer electronics as well as training programs aimed at inducing engineers and contractors to adopt efficiency design and specification practices. Studies have shown that even straightforward equipment rebate programs may have effects “outside the program” (spillover) by exposing contractors and large customers to the benefits of efficient technologies. This in turn leads to increased specification of efficient technologies on projects that do not receive program support. In some cases, market effects evaluation results can be combined with impact evaluation findings to estimate program-induced energy savings that were not tracked by the program itself.

Logic Models

Logic modeling is a thought process that efficiency program managers and evaluators use to develop a plausible and sensible model of how a program will work under defined conditions to solve identified problems. The logic model can be the basis for presenting a convincing story of the program’s expected performance—telling stakeholders and others the problems the program focuses on, how the program will address the problems, and what outcomes and metrics can be used to assess success.

Source: <http://energy.gov/eere/analysis/program-evaluation-program-logic>

² Market effects evaluation as used here is discussed in Section 5.3.2 of State and Local Energy Efficiency Action Network (SEEACTION). 2012. *Energy Efficiency Program Impact Evaluation Guide*. Prepared by Steven R. Schiller, Schiller Consulting, Inc.

https://www4.eere.energy.gov/seeaction/system/files/documents/emv_ee_program_impact_guide_0.pdf

Market effects studies are usually associated with programs that have a specific MT focus and often involve a significant undertaking, because they require collection and analysis of data from a wide range of market actors, as well as analysis of those data against a background developed out of secondary sources. Market effects are sometimes called the ultimate test of a program's success, answering the question: "Will energy efficiency (best) practices continue in the marketplace, even after the current program ends?" The difference between a market change and a market effect is attribution: the ability to trace back a change in the market to a specific program or group of programs.

Two excellent historic references on market effects and market effects studies are:

- Eto, J.; Prael, R.; Schegel, J. (1996). *A Scoping Study on Energy- Efficiency Market Transformation by California Utility DSM Programs*. Lawrence Berkeley National Laboratory. <https://emp.lbl.gov/publications/scoping-study-energy-efficiency>
- Rosenberg, M.; Hoefgen, L. (March 2009). *Market Effects and Market Transformation: Their Role in Energy Efficiency Program Design and Evaluation*. Prepared for California Institute for Energy and Environment (CIEE) by KEMA, Inc.; Nexus Market Research. http://uc-ciee.org/downloads/mrkt_effts_wp.pdf.

Performance Metrics

To determine MT impacts, program designers and evaluators must identify specific measurable performance metrics,³ whether interim or long-term. Interim performance metrics are associated with actions and measurable outcomes that support or lead to the long-term impacts. These interim metrics include meeting MT program implementation milestones and reaching defined MT achievements. MT achievements might include, for example, increased awareness among building owners and operators, contractors, and designers of efficient products and services, increased stocking of efficient products by distributors, and outcomes of efficiency trainings for tradespeople. While straightforward in concept, in practice, MT metrics are unfortunately not commonly reported or even tracked by jurisdictions with MT programs.

Performance Metrics

A *performance metric* is defined as a quantifiable measure that is used to track and assess a specific objective, such as energy savings. However, performance metrics can also address market processes and therefore need to be aligned with the logic model and the set out program theory or objectives.

Long-term performance metrics of MT programs are associated with energy and non-energy impacts.⁴ The goal of most MT policies is the achievement of cost-effective efficiency investments, resulting in buildings and other facilities that provide benefits for building owners and occupants, utility systems, and society. Thus, such metrics include energy and water use

³ Performance metrics in this context are discussed in section 4.3 of *Evaluation of U.S. Building Energy Benchmarking and Transparency Programs: Attributes, Impacts, and Best Practices*, Natalie Mims, Steven R. Schiller, Elizabeth Stuart, Lisa Schwartz, Chris Kramer, and Richard Faesy. Energy Analysis and Environmental Impacts Division Lawrence Berkeley National Laboratory, Electricity Markets and Policy Group, April 28, 2017. https://emp.lbl.gov/sites/default/files/lbnl_benchmarking_final_050417_0.pdf

⁴ These energy and non-energy impacts are called long-term because of the interest in them being ongoing, sustained impacts, not necessarily because they take a long time to occur.

reductions and cost savings, as well as other impacts than can result from such savings such as improving grid reliability and pollution reduction.

Some examples of Market Transformation/Adoption Metrics are:

Overall Awareness Metrics

- Increased awareness of energy use by building owners
- Increased energy awareness by occupants/users
- Increased promotion of efficiency by contractors and vendors

Metrics Over Time

- Short-term outcomes focus on the initial effects on market participants and on early stage energy savings
- Intermediate outcomes focus on continued changes and enhancement of market structure or market actor behavior in support of the policy goals, such as supply chain growth
- Long-term outcomes are the intended market effects that follow the erosion of market barriers



ED WISNIEWSKI

Consortium for Energy Efficiency

Catalyzing Markets for Unprecedented Utility System Benefit

Ed Wisniewski, Executive Director, CEE

Market Transformation, The Early Days

The theory of Market Transformation was first seriously tested by a group of 24 utilities who in the early 1990's pooled \$30 million to encourage a major manufacturer to design, develop and market a refrigerator that would be 25 to 50 percent more efficient than the 1993 standard and free from CFC materials. Dubbed the Golden Carrot Initiative, the effort successfully attracted Whirlpool corporation to produce the SERP (Super Efficient Refrigerator Program) model which was 30 percent more efficient than standard and the rest is history. Organizers of SERP established the Consortium for Energy Efficiency to pursue national market transformation across a range of opportunities and gifted the Golden Carrot trademark.

Market Transformation, 20 Years of Success

Since that time, consensus based bi national product performance specifications supported voluntarily across major US and Canadian geographies, drove competition among manufacturers, established the foundation for the ENERGY STAR Program and the \$450 billion in energy saved under the program banner, and eventually enabled significant advancements in federal minimum standards for refrigerators, clothes washers, water heating, space heating and cooling equipment, lighting, motors, and a host of other product categories.

Demand Side Management, The Challenges of Today

With the great advancements in federal minimum performance standards, the remaining per unit energy savings potential is greatly diminished particularly for lighting and appliances. Accordingly, utility programs are challenged to reduce direct customer incentive levels dramatically, change the nature of the marketing mix employed within a program (emphasize distributor buy downs, sales incentives or other channel tactics), or redirect attention to new areas of opportunity including energy related systems and/or entire facilities.

At the same time, wireless communication infrastructure has advanced, computing and communication capabilities are increasingly embedded within many energy consuming products, the availability of low-cost sensors has increased, and regulatory and legislative policy have encouraged the advancement of distributed energy resources. According to Mckinsey & Company, the projected new economic value associated with the internet is as much as \$6 trillion by 2025, exceeding the entire gross domestic product of Germany. While only a portion of this new value is energy related, the conditions enable opportunity to achieve new levels of temporal and locational value of energy efficiency by equipping the masses with capabilities only available previously to the most sophisticated of customers.

Market Transformation, The Next 20 Years: Catalyzing Strategic Market Relationships and IOT Capabilities for Unprecedented Utility System Benefit

“Utilities today have a window of opportunity to specify beneficial product capabilities they wish engineered into the digital products and efficient energy systems of tomorrow. To do so, the Program Industry is specifying shared need in two major IDSM Platforms, the CEE Integrated Home and CEE’s Strategic Energy Management Initiative.”

The obligation to provide safe, reliable and low cost service is a serious responsibility utilities share. With the emergence of new distributed energy resources, growing electronic loads and variable capacity equipment, the complexity and risk of maintaining energy systems has escalated and increased the temporal and locational value of energy efficiency. At the same time, new low cost sensors, computing capabilities and wireless communications afford the opportunity to create interoperable virtual energy management systems for unsophisticated customer classes.

The challenge of simultaneously engaging and motivating major end use industries to develop open source and interoperable equipment to complement energy system objectives is daunting. Fortunately, the \$9 billion DSM industry is well organized with those responsible for \$7 billion annually working together as the Consortium, supporting 16 bi national market initiatives (see attached for a summary of initiatives) with major industry and trade partners and 2 major integrated demand side management frameworks (CEE Integrated Home and CEE Strategic Energy Management for C&I Customers).

The frameworks under development since 2013 are intended to support important utility functions including load forecasting, systems planning, and operations management; are designed with important public policy and regulatory objectives in mind that include climate change mitigation, public health, safety, and other benefit streams associated with the time and locational value of energy efficiency; and are intended to serve the unique obligations of providing safe, reliable and cost effective energy service in an increasingly dynamic utility system environment.

The CEE Integrated Home Framework was conceived by the Consortium following years of trust building within and across the utility industry and numerous manufacturing industries and individual companies, making use of CEE’s tested process. SEM is being conceived in parallel. The Framework consists of:

- A set of shared principals regarding customer privacy, cyber security, open source capability for desired functionality, and interoperability with other devices that operate within a household;
- A named set of energy consuming products with defined and/or soon to be defined performance specifications that are currently of focus;
- A set of data definitions that represent desired industry standards essential to delivering anticipated customer and utility system benefit;
- Enabled capabilities that provide particular utility system and customer energy related benefit;
- Identification of anticipated uses of enabled capabilities by key functions of utilities.

Working together in partnership with key industries, Consortium members are seizing on the opportunity to provide unprecedented levels of utility system benefit. Representatives from Commonwealth Edison, DTE Energy, Duke Energy, Southern California Edison, Con Edison, Southern California Gas and others are involved in leading this important work.

SUPPORTING MATERIAL

PRESENTATIONS FROM THE SUMMIT

In Session 3, eight experts provided presentations on market transformation initiatives and designs. This section contains those presentations.

Market Transformation: Where it Has Worked and Where it Hasn't

Steven Nadel, Executive Director

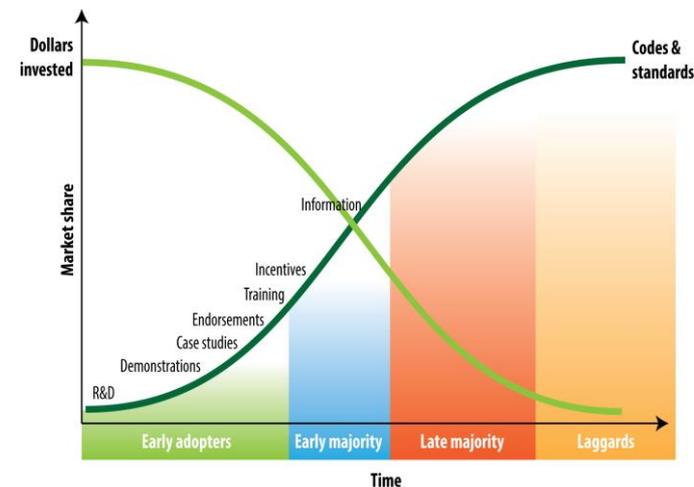
ACEEE

September, 2018



Market Transformation: Substantial Progress from a Decade of Work

- ACEEE 2003 study examined 28 MT initiatives and classified markets from “largely transformed” to “little progress”
- Found a correlation between level of effort and progress towards market transformation
- Measures that have made significant progress share one or more of the attributes on the next slide.



MT Measures Making Substantial Progress

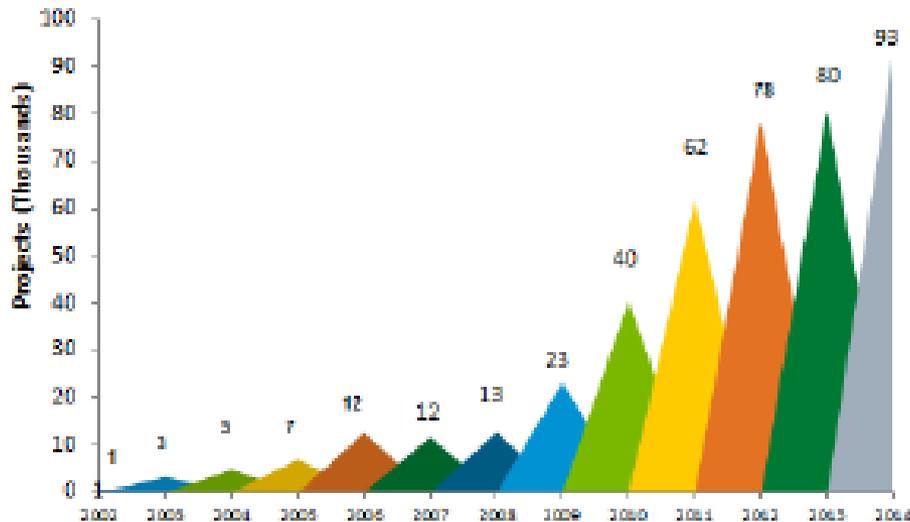
- The measures have low incremental cost (e.g., home electronics and dishwashers).
- The measures have rapid paybacks (e.g., LED exit signs and traffic signals, and CFLs).
- The measures have substantial other benefits besides energy savings (e.g., LED exit signs and traffic lights have long lives, efficient clothes washers provide improved cleaning performance, and efficient new homes can be more comfortable).
- The measures generally are improvements in the efficiency of an existing technology, rather than a totally new technology or changes in practices or design methods.
- The measures are incorporated into new codes and standards (e.g., residential and commercial clothes washers, residential and commercial air conditioners, transformers, LED traffic lights and exit signs, and packaged commercial refrigeration equipment).

Cost per kWh of Some Successful Market Transformation Initiatives

Initiative	Measure Cost	Admin Cost	Total Cost
Energy Star office equip.	Low	\$0.0002	Low
New homes in NW	\$0.027	\$0.003	\$0.030
Electric motors in BC	\$0.011	\$0.0007	\$0.012
Efficient magnetic ballasts	\$0.014	\$0.0001	\$0.014
High-efficiency refrigerators	\$0.027	\$0.0001	\$0.028
	Per therm		
High-effic. furnaces in Wisc.	\$0.27	\$0.004	\$0.27

Some Markets Hard to Change

Home Performance with Energy Star



About 1% of homes/year

Source: DOE

Heat Pump Water Heaters



Less than 2% of electric water heater shipments in 2016

Source: PNNL

Some Keys for Success



- Market understanding
- Collaborative effort with common vision
- A structured process and multi-pronged effort
- National/regional scope and coordination
- Long-term commitment
- Effective marketing that address multiple benefits of a measure
- Flexibility and adaptability
- Transition and exit strategies

Some Promising Areas for Initiatives

- Strategic energy management
- Smart thermostats
- Smart commercial buildings
- Advanced variable-speed commercial and residential AC
- Zero energy buildings
- Amorphous-core distribution transformers
- Electric vehicles



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Consortium for Energy Efficiency

Market Transformation Insights

September 2018

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CEE Members Working Together

Program Administrators

Alabama Power
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Atmos Energy Corporation
Austin Energy
Avista
Baltimore Gas and Electric Company
BC Hydro
Berkshire Gas
Cape Light Compact
Columbia Gas of Massachusetts
Columbia Gas of Ohio
Commonwealth Edison Company
Connecticut Natural Gas
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DC Sustainable Energy Utility (DCSEU)
Dominion Energy—Utah
DTE Energy
Duke Energy
Efficiency Maine
Efficiency Vermont
Énergir
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Focus on Energy—Wisconsin

FortisBC
Georgia Power
Gulf Power
Hawai'i Energy
Hydro One
Hydro-Québec
Idaho Power
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Massachusetts Department of Energy Resources
MidAmerican Energy Company
Mississippi Power
Montana-Dakota Utilities
National Grid
Natural Resources Canada
NB Power
New Hampshire Electric Co-Op
New Jersey Natural Gas
New Mexico Gas Company
New York Power Authority
New York State Energy Research and Development Authority
Nicor Gas
Northern California Power Agency
NW Natural

Oncor
Oregon Department of Energy
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PECO
Peoples Gas
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PNM
PSEG Long Island
Puget Sound Energy
Questar Gas
Sacramento Municipal Utility District
Salt River Project
San Diego Gas & Electric Company
Seattle City Light
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Tennessee Valley Authority
Union Gas
United Illuminating Company
Unitil
Vectren Corporation—Ohio
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Vermont Gas
Xcel Energy

Efficiency Organizations National Laboratories

American Council for an Energy-Efficient Economy
California Energy Commission
California Institute for Energy and Environment
Fraunhofer Center for Sustainable Energy Systems
Lawrence Berkeley National Laboratory
Massachusetts Department of Energy Resources
National Renewable Energy Laboratory

Natural Resources Defense Council
Northeast Energy Efficiency Partnerships
Northwest Energy Efficiency Alliance
Oak Ridge National Laboratory
Pacific Northwest National Laboratory
Southwest Energy Efficiency Project

Federal Advisors

Natural Resources Canada
US DOE
US EPA

Members Leverage \$7B Standing with Major Manufacturing and Trades



Residential

Integrated Home

New Construction

Space Heating and Cooling

Appliances

Water Heating

Lighting

Consumer Electronics

Swimming Pools



Commercial

Building Performance

Air-conditioning and Heat Pumps

Gas Boiler Systems

Kitchens

Gas Water Heating

Lighting Systems

Data Centers and Servers



Industrial

Industrial Program Planning

Strategic Energy Management

Motor Systems: pumps

Compressed Air Systems

Municipal Water and Wastewater

Steam Systems

Agricultural Gas

“Innovative” MT Models

- ▶ Golden Carrot™ (SERP) Refrigerator – 1980’s
 - Manufacturer Competition
 - Pool Funds
 - Secure the Design, Manufacturer and Promotion of a New-to-the-Market Product (Refrigerator)

- ▶ Bulk Procurement (CEE/NYPA SEAR) Ref. – 1990’s
 - Encourage Competition for New Markets or Market Share
 - Potentially Alleviate Market Risk
 - Attract Attention to Issue, Sponsors and Winner

“Innovative” Models

- ▶ Design Charrette (CEE/ALA/DOE) Lighting – early 2000’s
 - Inform Designers of Technical Capabilities
 - Encourage Interaction between Designers and Technical Staff
 - Emphasize Unique Properties of Technology
 - Capture General Conclusions on New Applications/Uses
- ▶ Design Competition (CEE/ALA/UL) LFT – mid 2000’s
 - Encourage Development and Production
 - Attract Key Market Player Attention
 - Prime the Sales and Distribution Pipeline

“Innovative” Models

- ▶ Common Program Components (CEE HVAC Initiatives) 1990’s
 - Market Strategy
 - Performance Specs
 - Tiers
 - Guidance/Messaging
- ▶ Joint Campaigns/Branding (ENERGY STAR/MDM) 1990’s
 - Establish Credibility of Concept/Ease of Identification
 - Create Focus on Desired Issue
 - Establish Multi-Stakeholder Endorsement
 - Leverage as a Platform for Efficient Delivery of Messages, Tools and Calls to Action
- ▶ Equipment Directories (CEE/ARI and others) 1990’s
 - Credible Guidance Particularly in “Noisy” Markets

Sample Considerations

Program Administrators

1. Desired Outcomes
2. Time Horizon
3. Assets Available
 - a. Financial
 - b. Endorsement
 - c. Technical Expertise
 - d. Business/Market Expertise
 - e. Communication Infrastructure
 - f. Service Areas Coverage
 - g. Relationship with Market Stakeholders
4. Tolerance for Failure
5. Restrictions
 - a. Legal
 - b. Regulatory
 - c. Management
 - d. Political
6. Level of Flexibility

Sample Considerations

Market Considerations

1. Magnitude of Savings Potential and Other Benefit
2. Important Factors that Define Gain and Pain
 - a. Number of End Users
 - b. End User Responsible for Purchase?
 - c. Useful Life of Equipment or Measure
 - d. Price Sensitivity
 - e. Product Performance Implications
 - f. Energy Performance Significantly Different and Noticeable
 - g. Savings Accrue to End User/Decision Maker
 - h. Complexity of Distribution/Installer Network
 - i. Communication Infrastructure in Place
3. Stakeholder Circumstances
 - a. Number of Stakeholder Industries
 - b. Presence of Dominant Stakeholder(s)
 - c. Motivations
 - d. Business Sophistication/Marketing Capabilities
4. Defining Industry Characteristics
 - a. Commodity Goods
 - b. Seeking Differentiation
 - c. Duration of Product Cycles

Residential Space Heating and Cooling Initiative



This Initiative takes a whole systems approach across fuel types to achieve in-field efficiency.



Strategies

- ▼ Binational equipment specification
- ▼ Binational database of qualifying products
- ▼ ANSI-ACCA installation standard
- ▼ NATE Efficiency Analyst Technician Certification
- ▼ ENERGY STAR and higher tier promotion
- ▼ ANSI-AHRI Connected/Auto DR Standard
- ▼ Communicating thermostat program guide

Unitary Air-Conditioning and Heat Pump Initiative



Promotes market availability and encourages efficient upgrades to commercial HVAC systems

61 Members

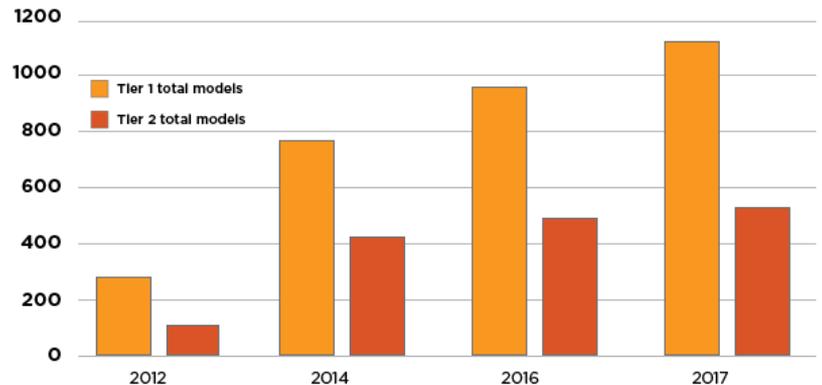


Strategies

- ▶ Binational specification
- ▶ Mass-market approach
- ▶ Higher tier differentiation

Under Consideration

- ▶ Connected, automated control retrofits
- ▶ Higher tier differentiation
- ▶ Enhanced support for variable refrigerant flow (VRF) systems
- ▶ Advanced rooftop control retrofits



Transformative Binational Impact

CEE Directory of Efficient Equipment



Search the **CEE Tiers** for efficient equipment for your home or business.

Commercial Boilers

Split or Packaged Heat Pumps

Split or Packaged Air Conditioners

Residential Furnaces

Variable Speed Mini-Split and Multi-Split Heat Pumps

Variable Speed Mini-Split and Multi-Split Air Conditioners

Residential Boilers

Residential Water Heaters

Commercial Water Heaters

Home

Find an Incentive Program

Why Choose ENERGY STAR

How and Why of Certified



Welcome to the CEE Directory of Efficient Equipment.

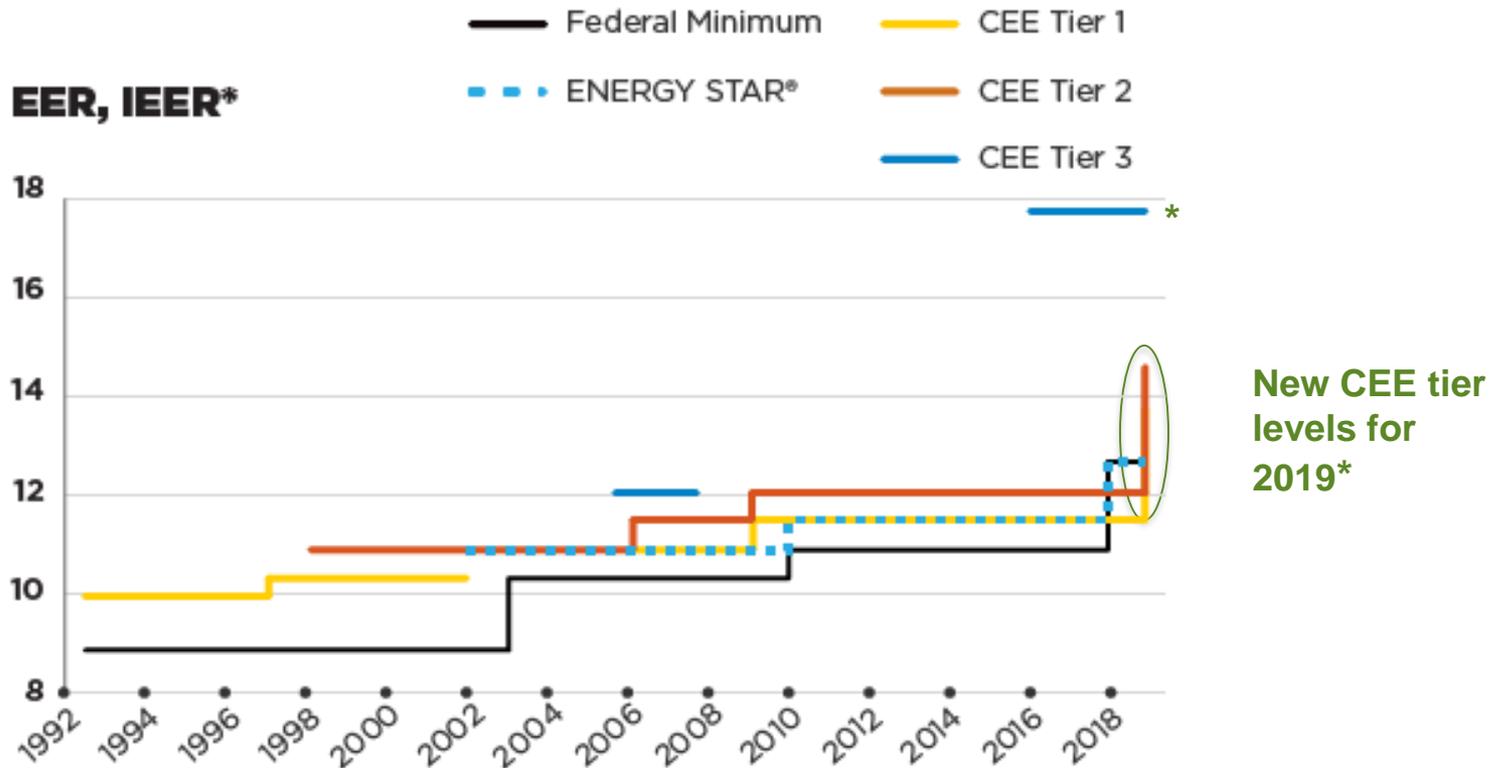
Whether you're a consumer or a contractor, use this site to search for the most efficient residential and small commercial equipment on the market. Manufacturers work with AHRI to verify that their equipment meets the criteria established by the federal ENERGY STAR® program and by the Consortium for Energy Efficiency.

When you choose efficient equipment for your home or small business, you may be eligible for a rebate. Your comfort and satisfaction will be greater, your operating costs lower, plus you're benefiting the environment. A Quality Installation of the equipment increases the benefits.

By using this Directory, you have assurance that the equipment you find has the backing of AHRI and achieves the stated

CEE High Efficiency Commercial AC and Heat Pumps (HECAC) Initiative

CEE Specification Comparison with ENERGY STAR® and Federal Standards
(unitary AC $\geq 65,000$ and $< 135,000$ Btu/h)



*IEER for the federal standard and ENERGY STAR from 2018 forward, CEE Advanced Tier (Tier 3) introduced in 2016, and proposed 2019 CEE tiers

General Take Aways/Observations

- ▼ Specify Clearly what it is you Seek and Expose Assumptions and Strategy
- ▼ Dynamic Nature and Complexity of Markets Contribute to Difficulty of Assessment
- ▼ Unintended Consequences, Good or Bad, are Likely
- ▼ Avoid Use of a Jack Hammer When a Screwdriver Will Do
- ▼ Be Respectful to those Whose Industry You Wish to Disrupt
- ▼ A Cooperative, Inclusive, Considered and Focused Approach can Leverage the Assets of Those You Wish to Change and Open Opportunities of Shared Interest



Energy Technologies Area

Lawrence Berkeley National Laboratory

Benchmarking and Transparency Programs **A Market Transformation Example:** **The Five Minute Overview**

Steve Schiller, Senior Advisor/Affiliate
Electricity Markets and Policy Group

Market Transformation Summit
September 12-13, 2018
Chicago, Illinois

This presentation is supported by the DOE's Office of Electricity's Transmission Permitting and Technical Assistance Division and the underlying research was supported by DOE's Energy Efficiency & Renewable Energy Building Technologies Office

Benchmarking and Transparency (B&T) Policies

- ◆ B&T policies require that buildings' energy use and other relevant data be measured and reported annually
- ◆ About 26 U.S. jurisdictions (including Chicago) have adopted B&T policies for reporting and disclosure of energy consumption of privately owned commercial or multifamily buildings, or both
- ◆ MT Concept: Leverage data to identify opportunities for reducing energy waste to achieve economic, sustainability, and pollution reduction goals. Examples:
 - Building owners, operators, contractors: Use metrics to rank each building against others (e.g., in a portfolio), allowing prioritization of energy efficiency investments
 - Utilities: Use benchmarking data to make efficiency programs more effective
 - Governments: Provide indicators that enable a better understanding of building stocks for publicly funded programs

Understanding How B&T Policies Support Lower Building Energy Use and Cost

An analogy for B&T policies are information labels on food products that compare their nutritional content to an established benchmark. In this case, the primary goal is healthier people. The nutritional information does not directly result in healthier people or healthier eating habits, but provides the information that allows people to make their own eating habit choices.

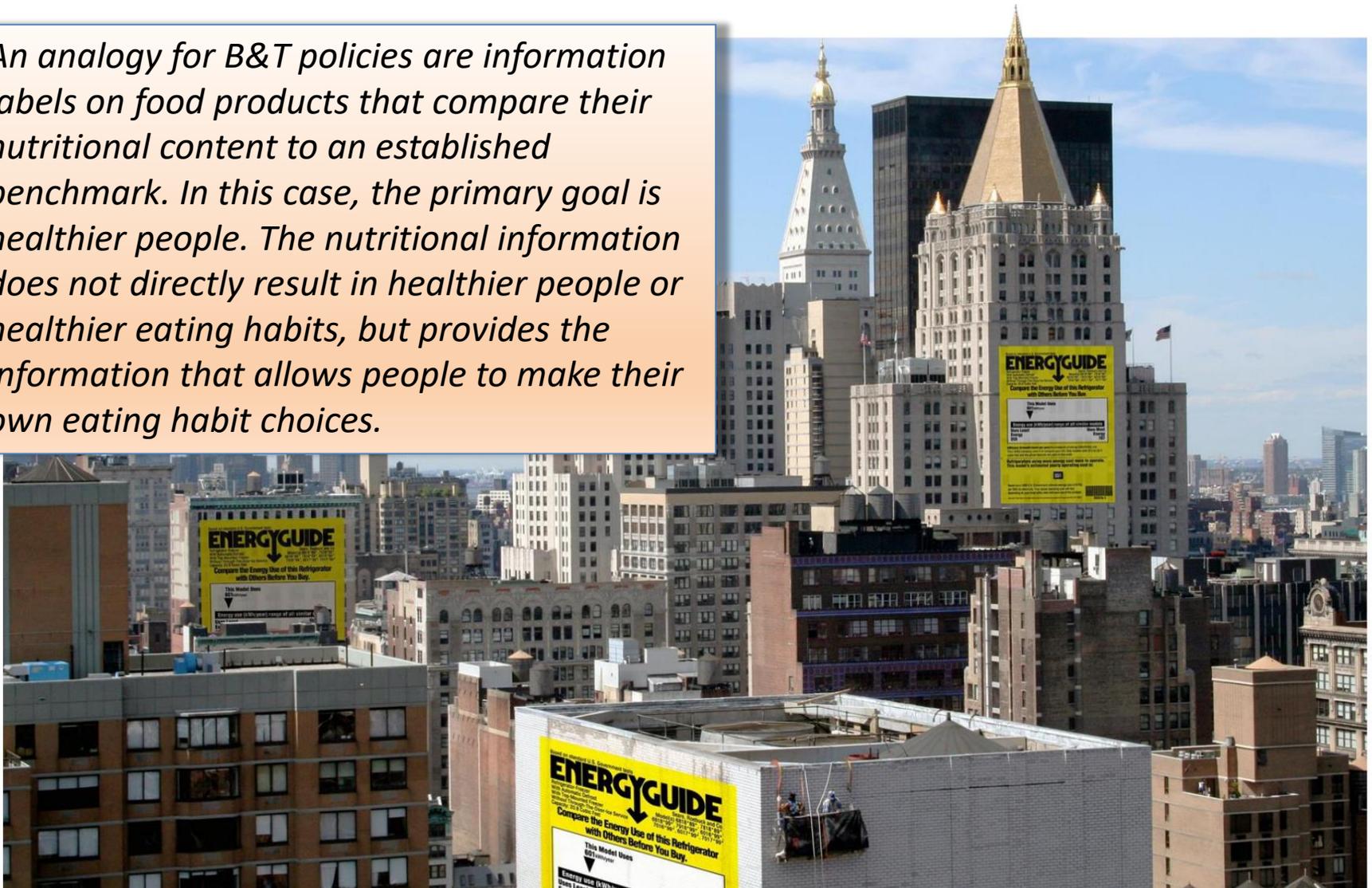
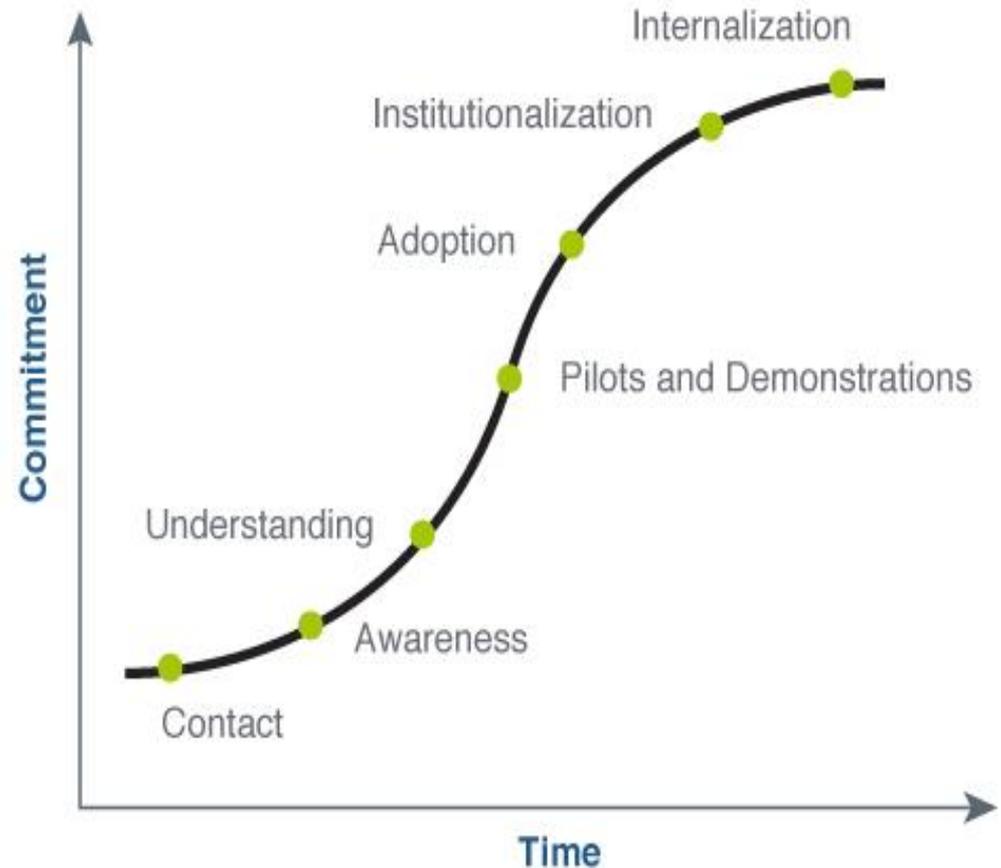


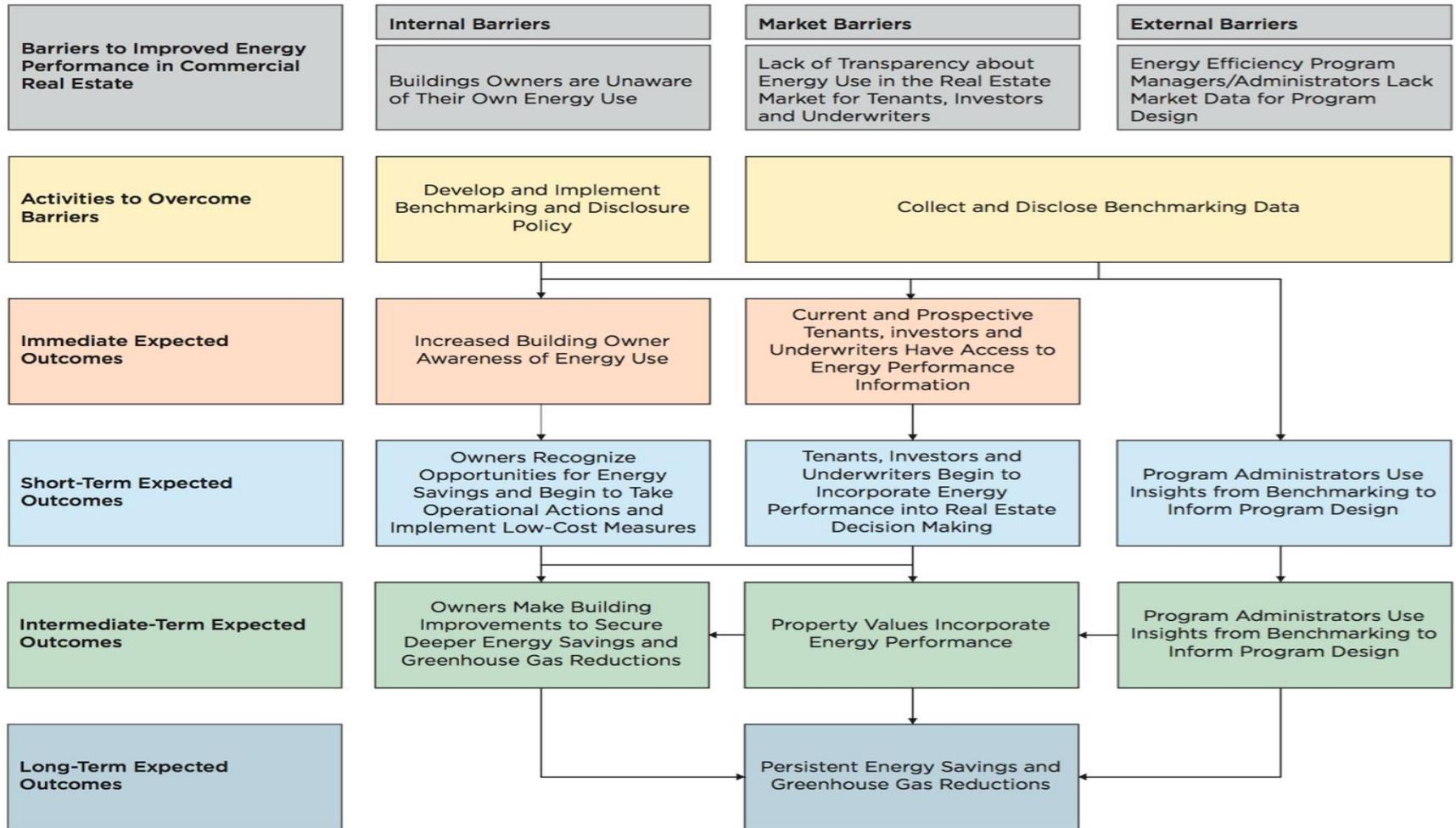
Photo credit: Institute for Market Transformation

Understanding How B&T Policies Support Lower Building Energy Use and Cost

- ◆ B&T policies are enabling strategies that rely on market transformation to support improvements in energy efficiency
- ◆ These policies themselves do not improve energy efficiency or reduce water consumption and pollution
- ◆ B&T policies address barriers (e.g., lack of information on potential opportunities and benefits of reducing energy waste in buildings)



Illustrative Benchmarking and Transparency Policy Logic Model Diagram



Navigant Consulting, Inc. and Steven Winter Associates, Inc. *Benchmarking & Transparency Policy and Program Impact and Evaluation Handbook*. May 2015. [https://energy.gov/sites/prod/files/2015/05/f22/DOE Benchmarking and Transparency Policy and Program Impact Evaluation H....pdf](https://energy.gov/sites/prod/files/2015/05/f22/DOE%20Benchmarking%20and%20Transparency%20Policy%20and%20Program%20Impact%20Evaluation%20H...pdf)

Three Types of B&T Performance Metrics

Metrics are important!

Metrics are defined using an understanding of program objectives and how B&T policies support those objectives (the logic model)

1. Energy Impact Metrics

Directly associated with reductions in energy consumption, demand, or both

2. Non-Energy Impact Metrics

Effects beyond energy savings that are delivered to utilities, participants and society

3. Market Transformation/Adoption Metrics (*Examples*)

Overall Awareness Metrics

- Increased awareness of energy use by building owners
- Increased energy awareness by occupants/users
- Increased use of B&T information by contractors

Metrics Over Time

- Short-term outcomes focus on the initial effects on market participants and on early stage energy savings
- Intermediate outcomes focus on continued changes and enhancement of market structure or market actor behavior in support of the policy goals, such as supply chain growth
- Long-term outcomes are the intended market effects that follow the erosion of market barriers

And....another MT metric increased adoption of B&T policies in other jurisdictions

Berkeley Lab Prepared a Report on B&T Policies

Evaluation of U.S. Building Energy Benchmarking and Transparency Programs: Attributes, Impacts and Best Practices (April 2017)

<https://emp.lbl.gov/publications/evaluation-us-building-energy>

Evaluation of U.S. Building Energy Benchmarking and Transparency Programs: Attributes, Impacts, and Best Practices

Authors:
Natalie Mims, Steven R. Schiller, Elizabeth Stuart, Lisa Schwartz, Chris Kramer,¹ and Richard Faesy¹

¹ Energy Futures Group
Energy Analysis and Environmental Impacts Division
Lawrence Berkeley National Laboratory
Electricity Markets and Policy Group

April 28, 2017



This work was supported by the Building Technologies Office of the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy under Lawrence Berkeley National Laboratory Contract No. DE-AC02-05CH11231.

Report Purposes:

- The Energy Efficiency Improvement Act of 2015 required the U.S. Department of Energy to provide Congress with an overview of policy and implementation attributes of B&T policies
- Focus of report was on the 24 jurisdictions (as of end of 2016) that require privately-owned commercial buildings to participate in B&T policy

B&T impact evaluation findings

- ◆ Most B&T policy impact evaluations found that there are reductions in energy use, energy cost, or energy intensity.
 - 3-8% reductions in gross energy consumption or energy use intensity over the 2-4 year period of B&T implementation studied
 - Two studies (available at the time of the Berkeley Lab study) indicated that there is a causal relationship between B&T policies and energy savings, or at least energy cost savings.
- ◆ However, these indications should be considered preliminary

Recommendations for B&T Policy Design, Implementation and Research

- ◆ Provide annual reports with summary statistics of data, performance metrics, and identified areas for improvements in the jurisdiction's building stock, for example:
 - ❑ Define and track MT metrics
 - ❑ Collect comprehensive data with a focus on consistent definitions and quality control checks/verification
 - ❑ Provide publicly available data, in a user friendly way
- ◆ Support high levels of compliance by, for example:
 - ❑ Measure compliance every year by building type and size category
 - ❑ Collect data on barriers to compliance and develop a range of strategies to address the barriers (e.g., educational efforts)
- ◆ Provide a range of support services and complementary programs at the local level. For example:
 - ❑ Create user-friendly, online resources such as “how-to” guides and online forums
 - ❑ Use webinars, in-person trainings, and online training documents and videos
 - ❑ Establish help centers with jurisdiction staff, contractors, or local trade association volunteers
 - ❑ Provide additional support at designated periods in the B&T policy implementation
 - ❑ Consider creation of national/regional help desks to encourage data consistency across jurisdictions and reduce implementation costs



Energy Technologies Area

Lawrence Berkeley National Laboratory

For more information, please contact:

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Steve Schiller, srschiller@lbl.gov

Berkeley Lab provides technical assistance to state regulatory commissions, state energy offices, tribes and regional entities, and other public entities:

<https://emp.lbl.gov/projects/technical-assistance-states>

Visit our Electricity Markets & Policy Group website at: <http://emp.lbl.gov/>

Join our mailing list and stay up to date on our publications, webinars and other events: <https://emp.lbl.gov/ mailing-list>

Follow us on Twitter **@BerkeleyLabEMP**

CITY PARTNERSHIPS AS MARKET TRANSFORMATION

September 12, 2018



**Amy Jewel
Senior City Advisor,
City Energy Project**

Chicago's building energy benchmarking ordinance calls on the city's largest buildings to track, verify, and report energy use

Chicago Energy Benchmarking Essentials



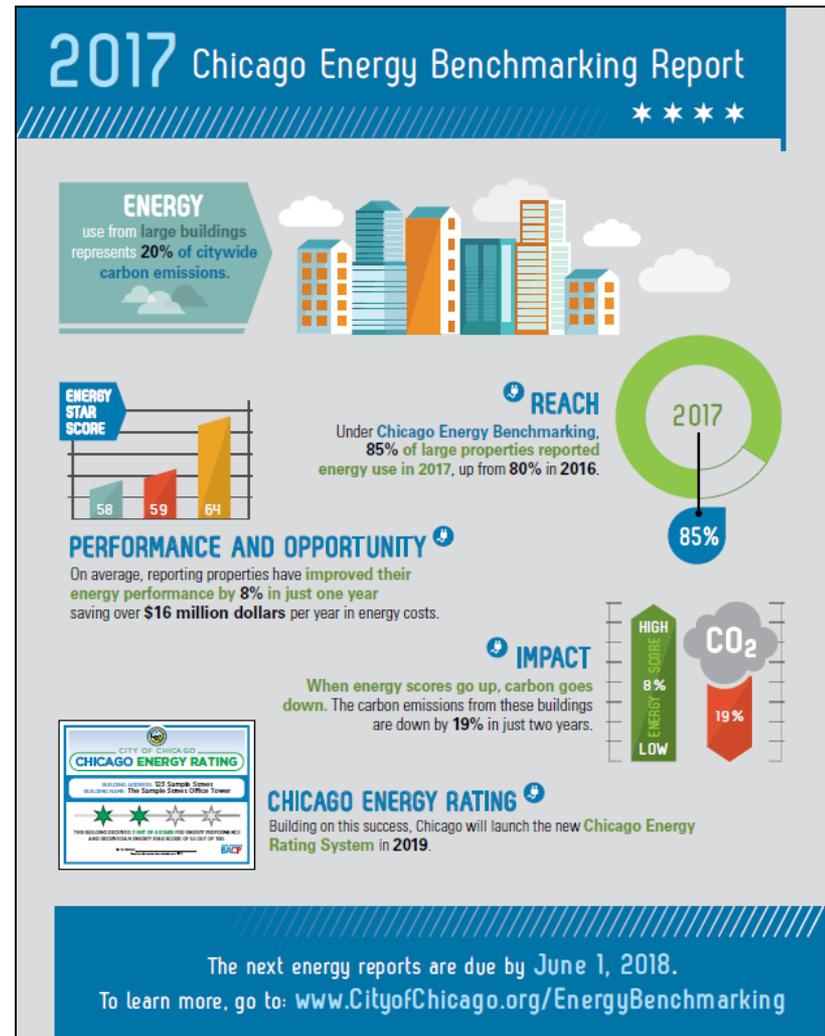
- **The ordinance focuses on data accuracy & transparency:**
 - Buildings larger than 50,000ft² are required to:
 1. Track whole-building energy use (annually)
 2. Verify data accuracy (every three years)
 3. Report to the City (annually)
- **The City is authorized to make building-level energy performance data available to the public** in the second year that a property reports
- Benchmarking includes reporting of **whole-building energy use** in ENERGY STAR Portfolio Manager



Background: The Chicago Energy Benchmarking Ordinance is the foundation of the new Energy Rating System

Overview of 2017 Report Findings:

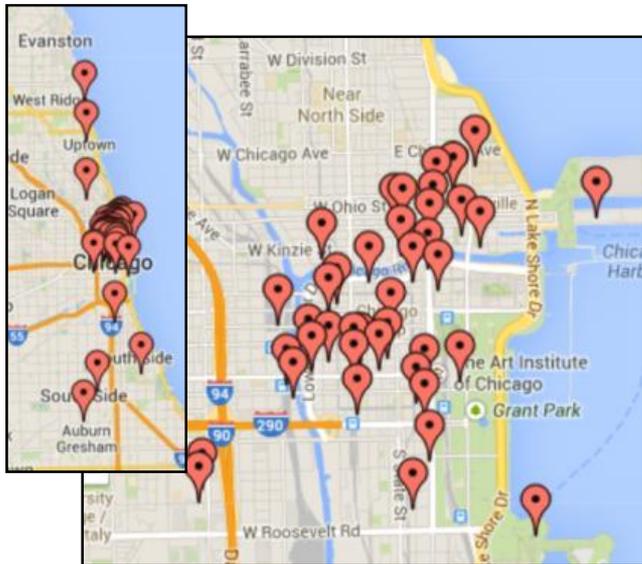
- ~2,800 reporting buildings, representing 20% citywide carbon emissions
- ComEd information suggests that **hundreds more buildings are benchmarking voluntarily**
- 85% reporting rate, up from 80% in 2016
- Cumulative savings of \$39 million supporting an estimated 900 jobs
- Energy performance improvement of 8% in just one year (5 point improvement in ENERGY STAR scores)
- GHG intensity down 19% over past 2 years



The Retrofit Chicago Energy Challenge focuses on major energy performance improvements in existing properties



Rafael Emanuel



- **Objective:** Accelerate energy efficiency in the City's largest buildings to save money, increase asset value, drive economic development, and reduce emissions
- **Commitment:** Participants voluntarily agree to:
 - Reduce energy usage in one or more buildings by 20+% in the next 5 years
 - Begin work within 6 months
 - Track progress and share successes
- **Impact:** Average energy savings of ~15%:
 - 22 properties have reduced energy by 20% or more
 - Energy cost reductions of \$10.6 million/year
 - Currently includes 89 properties spanning over 56 million square feet
- **Website:** www.RetrofitChicago.net

Chicago Energy Rating System: Coming in 2019



CITY OF CHICAGO **CHICAGO ENERGY RATING**

BUILDING ADDRESS: **123 Sample Street**
BUILDING NAME: **The Sample Street Office Tower**



THIS PROPERTY RECEIVED **2 OUT OF 4 STARS** FOR ENERGY PERFORMANCE.

U.S. EPA ENERGY STAR Score: 45 out of 100

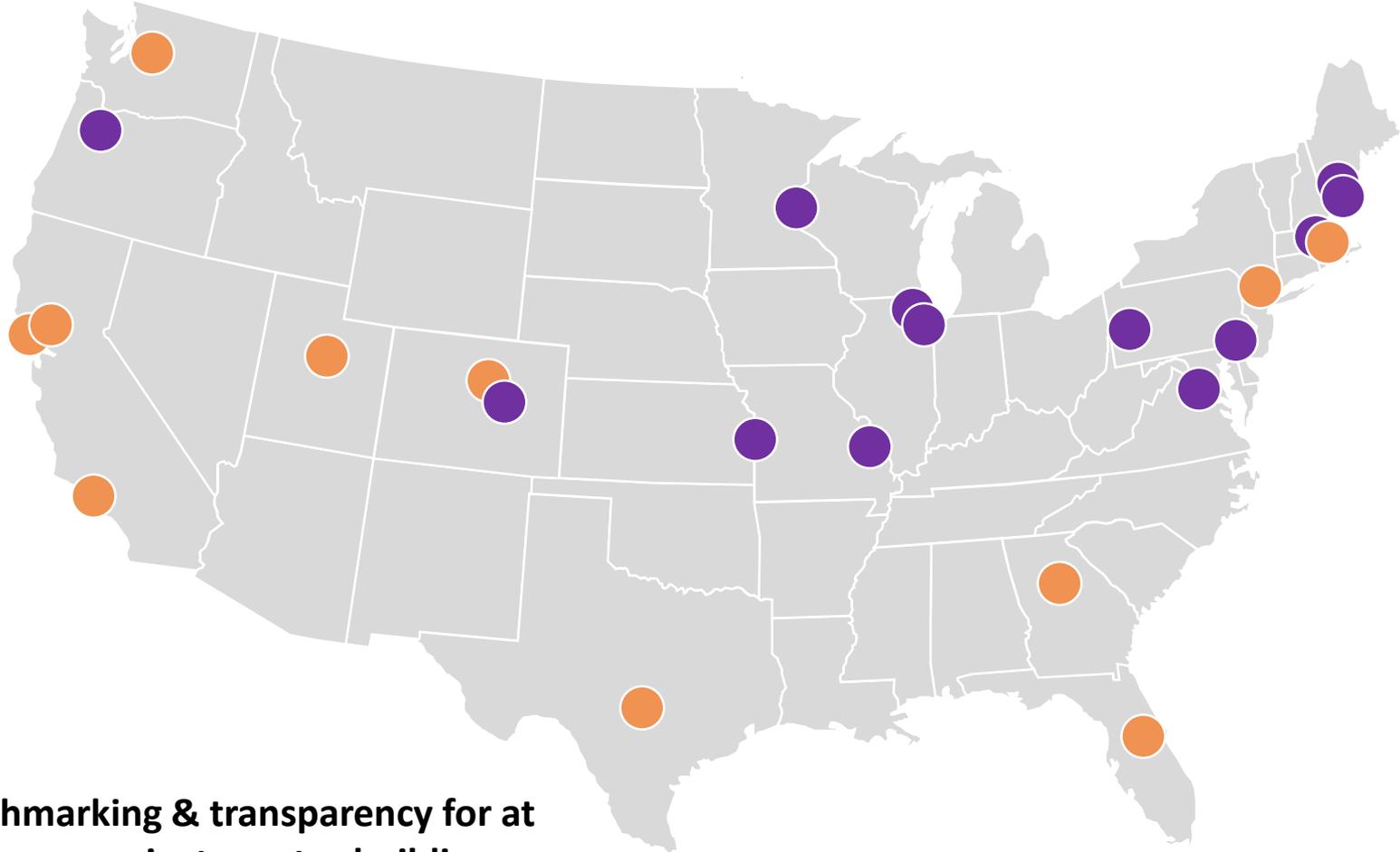
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Based on information from calendar year 20XX.



What's Next and How Can Utilities be More Involved?

11 Cities Require Energy-Saving Steps Beyond Benchmarking



● Benchmarking & transparency for at least some private sector buildings

● Additional beyond-benchmarking policy (e.g., audit, retrocommissioning), or performance standard

A key problem to these types of local requirements is the “free rider” issue in utility program evaluation

Problem:

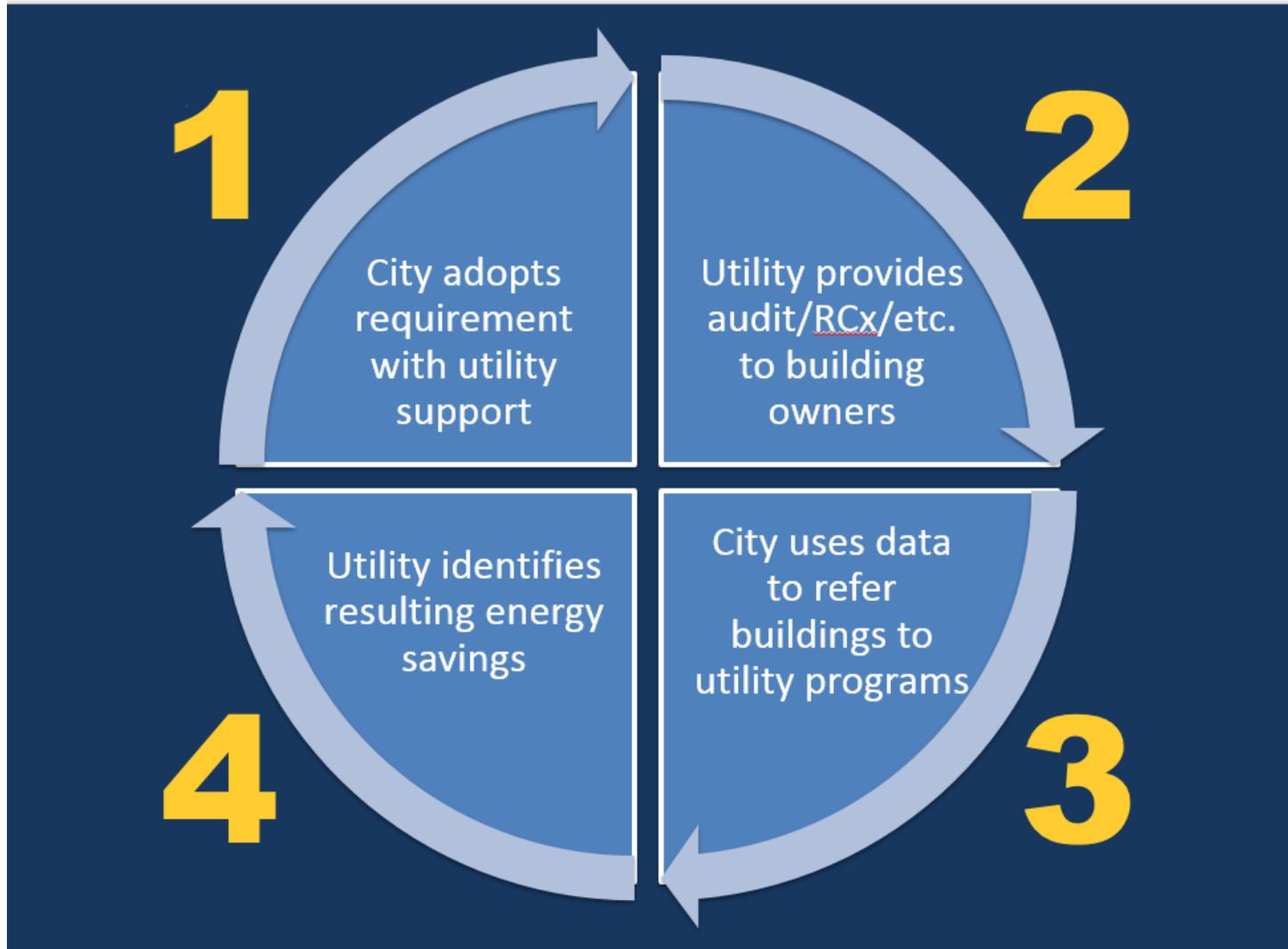
- A city requires property owners to make energy improvements or take certain actions (i.e. an audit)
- The property owner could use utility incentive and rebate programs to fulfill requirements
- Under standard evaluation, the owner would have done it anyway, so utility loses “credit” for savings



Solution:

- Develop new program model in which utilities and cities partner to develop, administer, and share credit for new local mandates

Example Program Model for Shared Energy Requirement, Based in Part on Utility Support for Energy Codes



Reference and Contact Info

REFERENCE

ACEEE Summer Study Paper on This Topic - “It is amazing what you can achieve when you do not care who gets the credit”

<http://aceee.org/files/proceedings/2018/index.html#/paper/event-data/p103>

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ENERGY FUTURES GROUP

energyfuturesgroup.com

Market Transformation vs. Resource Acquisition: A False Dichotomy

COM ED MT SUMMIT

Chris Neme

September 12, 2018

MT – Not by Design

- 1980s WI Low Income Condensing Furnace Installs
 - 90% sustained market share years later (vs. 20-40% in neighboring states)
- 1990s C&I Lighting programs
 - Market Acceptance of T8s
- 1990s – mid-2000s: CFL programs
 - Led to EISA standards
- 2007 New Brunswick Mid-Stream HPT8 program
 - Almost no HPT8 sales to almost 100% market share in less than 1 year
- 2009 Efficiency Vermont Mid-Stream Commercial LED program
 - Almost no LED penetration to 30% EVT C&I lighting savings in 1 year
- Numerous others...

Cold Climate Heat Pump Standards

- 2013 Green Mountain Power (Vermont) Pilot
 - EFG/VEIC developed first “cold climate” definition
 - Three manufacturers
 - Handfuls of eligible products
- 2015 Regionalization of Effort – NEEP
- Today: Huge Expansion of Eligible Products
 - ~35 manufacturers
 - Over 1200 products
- Future Changes?
 - 2019 NEEP spec revisions (out for comment)
 - Canadian government spec
 - AHRI certification changes (HSPF)?

All/mostly
driven by
Efficiency,
Strategic
Electrification
Program Needs

About Energy Futures Group

Vermont-based clean energy consulting firm established in 2010

Areas of Expertise

- Energy Efficiency & Renewable Energy
- Program Design
- Policy Development
- Expert Witness Testimony
- Building Codes
- Evaluation
- Cost-Effectiveness

Range of Clients

- Government Agencies
- Advocates
- Regulators
- Utilities

Clients in 39 states and provinces plus regional, national and international organizations.





Chris Neme

PRINCIPAL

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 (802) 482-5001 ext. 1

 energyfuturesgroup.com

Cold Climate HPs: Initial Standard (2013)

ELIGIBLE COLD-CLIMATE HEAT PUMP PRODUCTS

	DUCTLESS	CENTRAL
Definition	A split-system heat pump unit that heats (or cools) directly into the room without ducts	A split-system heat pump unit connected to whole house distribution systems
Capacity	100% of Nominal Capacity at 5°F	Maximum heating capacity at 5°F >50% rated capacity
Heating Efficiency	COP >1.75 @5°F maximum capacity rating; HSPF > 9	COP >1.75 @5°F maximum capacity rating
Cooling Efficiency	>20 SEER	>SEER 13

Cold Climate HPs: Current & Future (?) Stds

Existing ccASHP Specification Performance Requirements (V2.0)	Proposed Specification Performance Requirements (V3.0) Proposed changes highlighted in RED
Compressor must be variable capacity	Compressor must be variable capacity
Indoor and outdoor units must be part of an AHRI matched system	Indoor and outdoor units must be part of an AHRI matched system
HSPF ≥ 10	HSPF ≥ 9 for all ducted systems, including: <ul style="list-style-type: none"> • Single-zone systems with ducted indoor unit (compact-ducted) • Multi-zone systems that include at least one ducted indoor unit • Centrally ducted systems
HSPF > 10	HSPF ≥ 10 for all non-ducted systems including: <ul style="list-style-type: none"> • Single-zone systems with non-ducted indoor unit • Multi-zone systems that utilize all non-ducted indoor units
ENERGY STAR Certified includes: <ul style="list-style-type: none"> • SEER > 15 • EER > 12.5 	Cooling Rating requirements: <ul style="list-style-type: none"> • SEER ≥ 15 • EER ≥ 10.0 (ENERGY STAR Certification no longer required)
COP 5° F > 1.75 (at maximum capacity operation)	COP 5°F > 1.75 (at maximum capacity operation)

Current ccHP Products

Qualification rates under different possible spec combination levels

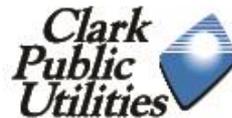
		1.75		2		2.25		2.5	
Ducted (out of 765 total units)		# of systems meeting both conditions	% all of Ducted	# of systems meeting both conditions	% of all Ducted	# of systems meeting both conditions	% of all Ducted	# of systems meeting both conditions	% of all Ducted
	9	765	100%	558	73%	231	30%	12	1.5%
	10	765	100%	558	73%	231	30%	12	1.5%
	11	222	29%	216	28%	163	21%	0	0%
Ductless (out of 498 total units)		# of systems meeting both conditions	% of all Ductless	# of systems meeting both conditions	% of all Ductless	#	% of all Ductless	#	% of all Ductless
	10	498	100%	278	56%	117	23%	59	12%
	11	270	54%	157	32%	60	12%	25	5%
	12	138	28%	82	16%	41	8%	19	4%

Successful MT: Lessons Learned from BOC research

Dulane Moran, NEEA



The Alliance



NW Natural®

PACIFIC POWER



Seattle City Light



Building Operator Certification

Today

- Offered throughout the US, course availability in nearly 40 states
- Aligned with ISO 17024
- Thousands of certifications issued
- Stable energy savings estimates

20 years ago

- Emerging venture with active curriculum development
- Uncertain method for collecting inputs to support energy savings
- Developing value proposition

My Focus

- Importance of early evaluation and market research

Framing evaluative research for MT

- Clear research objectives that reflected the need for valuable information
- Rapid adaptation and absorption
- Short cycle, focused research
- Avoid “fear of failure”
- Experiment to identify most effective measures of progress

From Impact to Progress

- Start with a hypothesis or theory of change
- Build foundation from research
- Identify (but test) indicators
- Take time to gain agreement over baseline measurement approach
- Monitor progress over time



TOGETHER *We Are Transforming the Northwest*



September 12, 2018

Transforming Markets Through Supply Chain Engagement

Emily Levin



New Strategic Alliance: #SourceUpstream



- Non-profit 300+ Employees
- Offices in VT, DC, OH, NY
- 9 years midstream / upstream experience
- Design, deliver, & evaluate programs nationwide:
 - Energy efficiency
 - Transportation
 - Renewable energy
- Founded in 1986



DC
SUSTAINABLE ENERGY
UTILITY



- Employee-owned since 2013
- 110 employees and growing 7% annually
- Offices in CA, OR, MA
- 19 years midstream experience (30 programs)
- 6 national program awards since 2010
- Founded in 1995

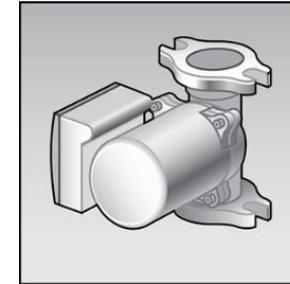


Our team's experience includes:



Goal: Increase Sales of High-Efficiency HVAC Equipment Sold Through Wholesale Distributors

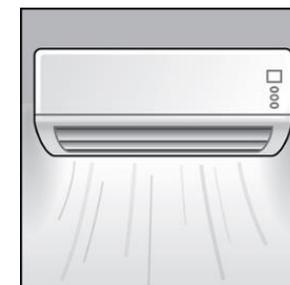
- ✓ Emerging technologies with proven savings
- ✓ Significant market potential
- ✓ Strong supply channel network
- ✓ Products typically sold as emergency replacement, end-of-life measures rather than retrofit or early retirement
- ✓ Predictable rather than customized savings



HPCP



HPWH



ASHP

Description of the Intervention

1. Project planning
2. Establish value proposition
3. Map supply chain
4. Eligibility & performance criteria
5. Data collection
6. Supply chain RFI / planning sessions
7. Establish incentive levels
8. Administration / management fees
9. Execute Sales, Marketing, Inventory, Training (SMIT) plans
10. Supply Chain Account Manager
11. Participating distributor agreement / MOU

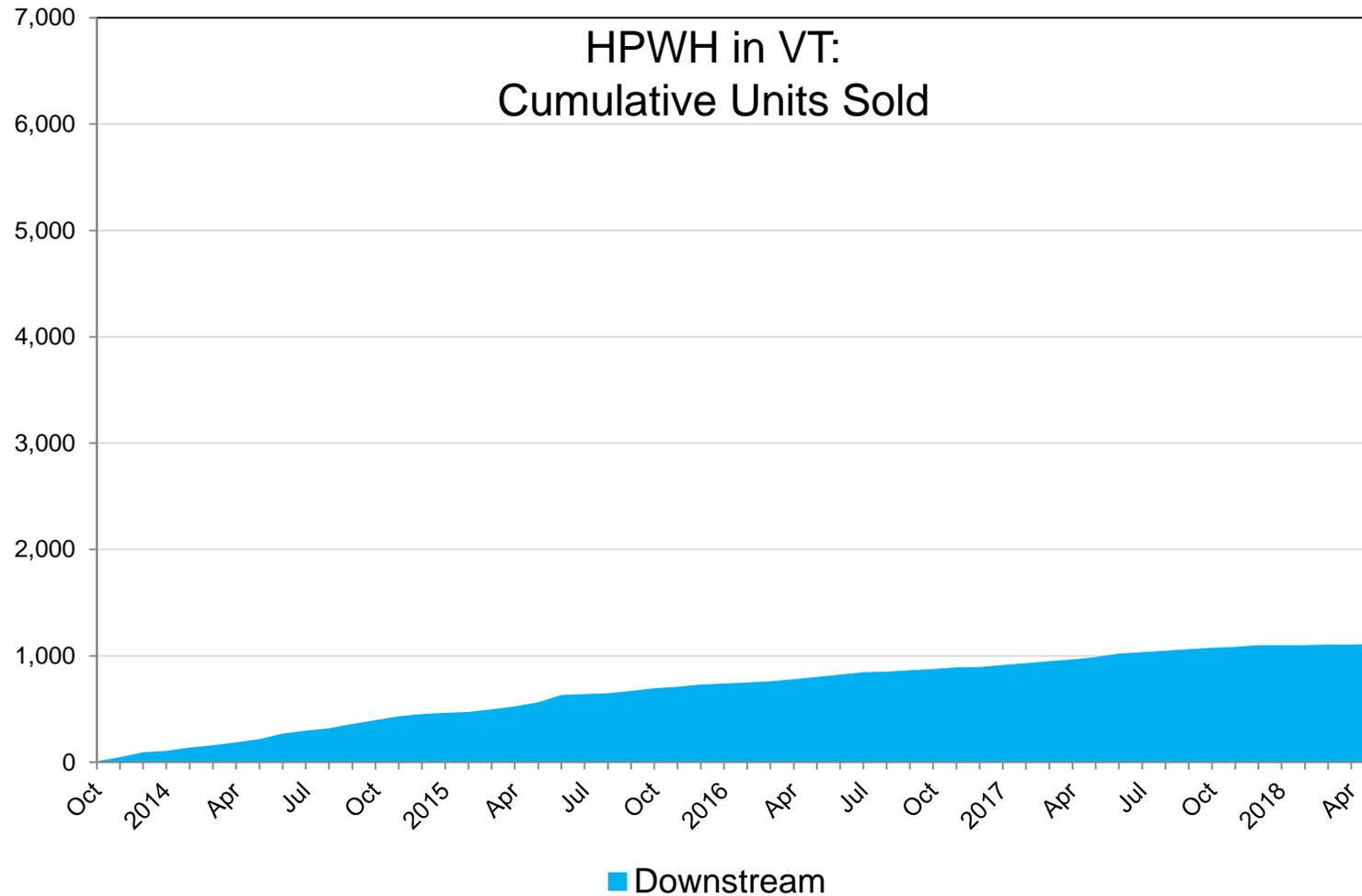
Build a Program for the Supply Chain

Supply Chain Profit Model

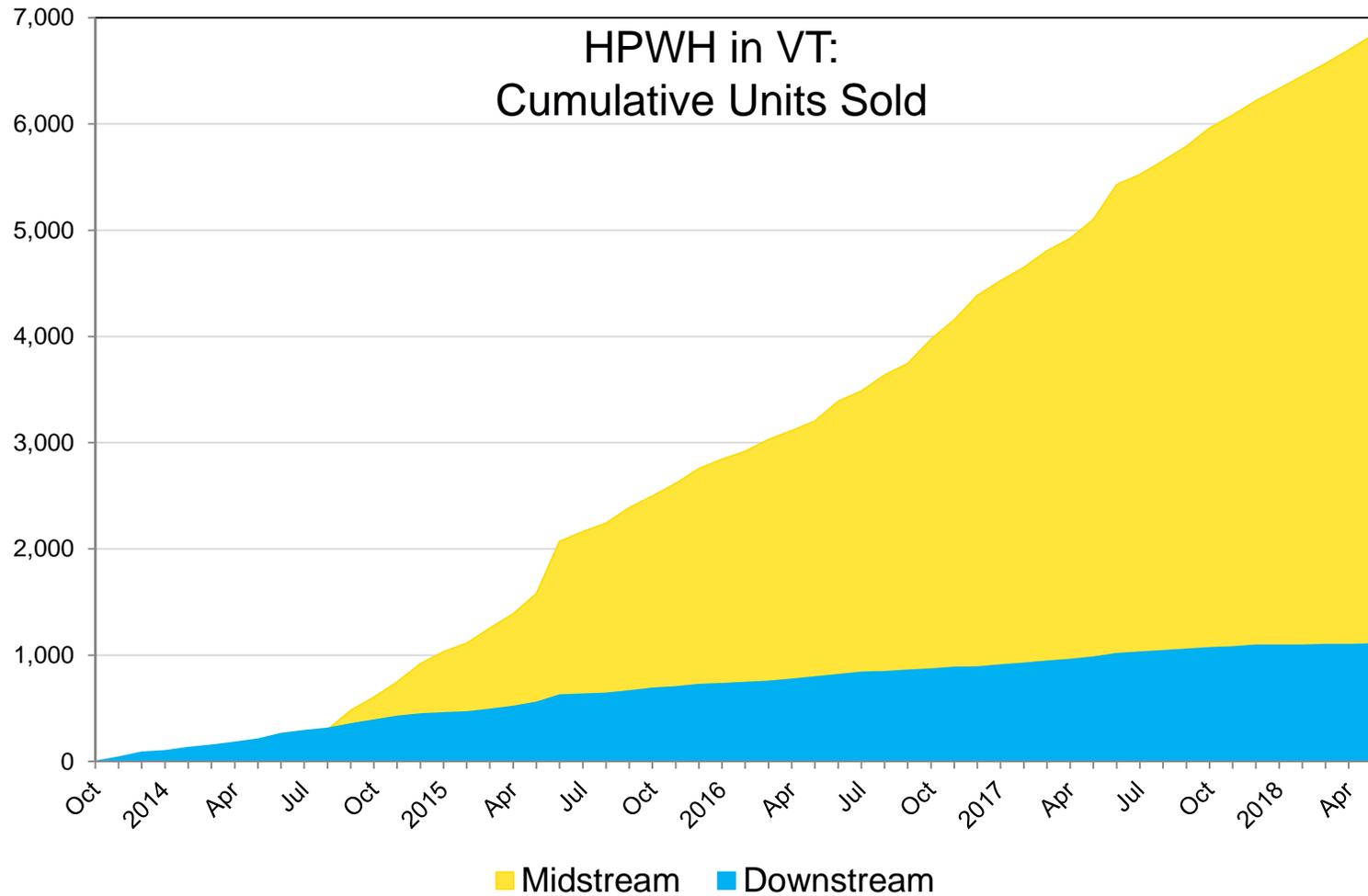
$$\text{Return on Net Assets (RONA)} = \frac{\text{NI}}{\text{Inv} + \text{AR} - \text{AP}}$$

RONA Driver	Consideration
Increase gross margin (GM), gross profit (GP) & net income (NI)	Energy-efficient products affect GM, GP, & NI
Decrease inventory investment & increase turnover	Collaborative sales & marketing Intensive product & program training Incentives increase market demand
Accounts Receivable (AR)	Avg. AR collection 50 - 55 days; Target < 30 days ; Leverage program automation
Accounts Payable (AP)	Avg. AP terms 30 - 35 days; Target: 45 - 240 days

Results Before Upstream in VT



Results After Upstream in VT



Implications for Other Programs

- Not all upstream programs are created equal
- Market transformation requires:
 - ✓ A deep understanding of the supply chain
 - ✓ Relationships with the supply chain to bring them on board
- Program design must meet the supply chain's needs
 - ✓ Predictable incentives to reduce risk to distributors and contractors
 - ✓ Collaborative sales and marketing strategies
 - ✓ Streamlined data collection
 - ✓ Sustained commitment to the market, avoiding boom-bust cycles

Thank you!

Emily Levin

VEIC

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Best Practices Tip for Market Transformation- Match Resources to the Market

SEPTEMBER 12, 2018

Match Resources to the Market

- MT can significantly leverage Utility and Market Actor resources.
- Be cognizant of the targeted market and ensure partners/resources match that market
 - Is the intervention strategy geared toward the Global, National, Regional, State or Local level?
 - Do you have partners who match the size/level of the market?
 - Is your long-term budget sized for the scale needed?
 - Does your time horizon match the market need?

Market Transformation in the Midwest:

Is there a “Coalition of the Willing” in the MW?

- MT can expand technologies, leverage resources and add savings
 - Also mandated for Nicor Gas in legislation and supports regulatory goals
- Nicor Gas engaged Resource Innovations to develop & implement MT.
 - Nicor Gas is currently working with ComEd, but would like to expand further
- Looking for interested utilities and other partners to expand market reach and increase leverage
 - Planning Educational Opportunities:
 - MT Foundations Webinar – 60 minutes either October 1, 9:00
 - MT Overlay Workshop – all-day, in-person, October 11, 9:00-5:00
 - “Learn-by-doing” – will review BOC, IHP and Codes Study in MT framework
 - Pre-Conference Workshop at MEEA Conference – February, 2019
 - Developing tools and approach for MT adoption/implementation
- Seeking input to build “coalition of the willing” for MT in the Midwest

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SUPPORTING MATERIAL

OUTPUT FROM THE SUMMIT SESSIONS

This section contains the tables developed during the Summit in Session 6 and Session 7.

The information in the tables is taken from the raw notes from the Summit. These tables were completed during Session 6 and Session 7. While it has been partially refined, the authors acknowledge there is some redundancy and incompleteness.

SESSION 6

Table 1 - Group 1, Education/Behavior				
What are the best opportunities to get savings through MT initiatives and to transform energy efficiency/demand response (DR)/distributed energy resource (DER) markets?				
1	2	3	4	5
Ideas From brainstorming exercise Ideas grouped into buckets	Strategy Barriers in the market to overcome Approach Include customer and business motivations and how strategy works with these motivations	Savings Potential Scale (1-5), 1 is low potential and 5 high potential Why?	Savings Persistence* Scale (1-5), 1 is low savings persistence and 5 is high savings persistence	Regulator Buy In Scale (1-5), 1 is low probability of regulator buy in and 5 is high probability of regulator buy in Why?
HVAC Quality Install (QI)	<p>This is an existing resource acquisition (RA) program at ComEd and Nicor. Could it be tailored to be an MT program?</p> <p>Barriers:</p> <ul style="list-style-type: none"> Getting the installers to do more work Different than their standard practice Requires proprietary software There is no demand for this in the marketplace Additional field time <p>Strategy to overcome barriers:</p> <ul style="list-style-type: none"> Differentiate themselves in the marketplace Reduce callbacks <p>Higher customer satisfaction</p>	1-2	2	4
Strategic Energy Management (SEM) for Commercial and Industrial (C&I) Training and Support for ISO 50001	<p>Effort required to meet the standard (i.e., not standard practice)</p> <p>Lack of prioritization of energy management</p>	4-5	2	3
C&I Energy Managers	<p>Low persistence</p> <p>Projects take a long time to see results</p>	3	2	3

Residential Benchmarking	Barrier: Lack of transparency of energy performance. Cost of audit Increases availability of HERS raters to offer additional services Lack of visibility of energy use at the time of sale, cost, accuracy	2	4	2
Commercial Benchmarking & Transparency	Proven savings (Schiller report) Barrier that it overcomes: lack of visibility of energy use	3	2	4 Track record in Chicago
Residential Smart Strip Education	Barriers: Complexity, inconvenience Educating end users on how smart strips work	1	1	1
Connected Homes	Barriers: Privacy, lack of verified savings (maybe emerging tech?) Tech adoption	?	?	?
BOC	Big time commitment Value on trained operator	3	2	5
Community-Based Marketing	Community volunteers educate community members on benefits of energy efficiency	N/A	N/A	N/A
Home Energy Reports	(this idea was submitted, but the group did not add it to the table)			
Midstream Incentives	(this idea was submitted, but the group did not add it to the table)			

Table 1 - Group 2 – Products/Standards

What are the best opportunities to get savings through MT initiatives and transform energy efficiency/DR/DER markets?

1	2	3	4	5
Ideas From brainstorming exercise Ideas grouped into buckets	Strategy Barriers in the market to overcome Approach Include customer and business motivations and how strategy works with these motivations	Savings Potential Scale (1-5), 1 is low potential and 5 high potential Why? Total you can put in the market times the savings	Savings (Transformative Persistence)* Scale (1-5), 1 is low savings persistence and 5 is high savings persistence How long does it take to get to potential? 1 is long time, 5 is short time	Regulator Buy In Scale (1-5), 1 is low probability of regulator buy in and 5 is high probability of regulator buy in Why?
Better Heat Pump that Works in Cold Climates *Note: Cold climate is a misnomer because the climate the technology covers goes down to Alabama	Midstream strategy. Encourage manufacturers to develop ducted products, installer certification. Preferred contractor network. Includes ductless. New technology—contractors do not understand it, looks different, customers do not understand it	4 (30% savings) Opportunity would be ducted heat pumps, maybe less potential for ductless mini-split. Study for New York on this—in the context of needing to electrify buildings to achieve decarbonization goals.	3	2
Advanced Rooftop Unit (RTU)/Advanced HVAC	Variable speed, condensing; make sure distributors and contractors have it in stock. Manufacturers need to develop new models (variable speed—three manufacturers, not sure there is a condensing RTU).	5 (If you do that right can get a ton of energy savings and load control). Synergy between the heat pumps and the advanced RTU. 5 because more commercial.	3 (10 years)	4
Advanced Lighting Controls	Likely commercial but could be residential; lighting designer partnerships, network addressable controls. Xcel developing a product that is dimming, occupancy savings. Midstream or downstream.	4 (Depends on the light controlled. In the future, lighting programs will be all about how we control them.)	4 (<10 years)	5
EVs	Work with manufacturers, sales to develop evaluation, charging network, financial considerations. Xcel looking at savings from Level 1 to Level 2, DR opportunities. Pay attention to moderate-income households, focus on employers (Do they have a charging network? Can help with storage if charge during the day.)	5 (For Btu savings and load control) Saves Btu because electric uses less Btu. Within ComEd it is a totally different department that talks about load control.	3 (10 years)	4 (Depends on the state)
Efficient Water Heaters	Heat pump water heaters, condensing, solar, networked electric resistance: increase stocking levels. VT program is a midstream program because distributor-focused.	3 (We do not use as much for water heating as we use for space heating; condensing saves 20% for gas.)	3	4 (Because the economics are borderline/TRC issues)

Clean Water Pumps	DOE just put out a new standard—particular specification for commercial/industrial. PG&E has a program. Could be for HVAC, chillers, high rise, industrial pumps; clean water is key. NEEA has efforts as well. Xcel also building a program on this (not focused on MT but could be). Suggesting midstream. Could also apply to generation and industrial, like paper mills.	3 (Pumps are 15% of industrial electricity use). Pumps are a focus for Efficiency VT but not as high as others.	4	4 (Because of DOE standard)
Amorphous Core Distribution Transformers	Lifecycle costing requirements. Ultimately a minimum standard. These are utility owned. Some of the highest market share is in Washington, DC and Maryland.	2 (All power goes through transformers but cut losses in half and losses are about 1%.) Just the losses in the transformer—enters and leaves transformer.	3	3 (Several commissions have done it, but others have not—benefits ratepayers)
ENERGY STAR Retail Products Platform	Includes refrigeration, clothes washers, etc. Add gas measures—talking to Nicor there is no gas focus. Also add online retailers, initiative to advance retail distributors.	4 and a strong 5+ (So many different products involved in it—talking hundreds of thousands of units; either this or a revision on this; 30% buy in retail).	3.5	3
Refrigeration Emerging Technology	Push/pull and codes/standards.	2 (Refrigeration is 8%-9% of commercial energy use. Small for residential. Not sure what it is for industrial.) Big for grocery market and other markets.	2	3
SEM with Connected Products Included	Small C&I connected interoperable products.	1 (For narrow connected products if just small C&I) Full-fledged SEM would be a 5.	1.5	3
Self-Sealing Duct Systems	Duct with gasket on each section—putting them together gives you an air tight seal. Available for commercial but not residential.	1.5 Start as a new construction measure. Duct leakage is 30% or less. Would need to be very long term so could change building code.	2	N/A
Smart Thermostats	Using them with quality assurance to measure performance of other programs and to target customers for other programs.	3 (Could be higher if used for performance)	5	4 (?)
Labeling	(this idea was submitted, but the group did not add it to the table)			
Corporate Procurement	Infuse energy efficiency into procurement plans for businesses of all sizes.			

Appliance Standards

(this idea was submitted, but the group did not add it to the table)

Table 1 - Group 3 – Emerging Technologies				
What are the best opportunities to get savings through market transformation initiatives/ to transform energy efficiency/DR/DER markets?				
1	2	3	4	5
Ideas From brainstorming exercise Ideas grouped into buckets	Strategy Barriers in the market to overcome Approach Include customer and business motivations and how strategy works with these motivations	Savings Potential Scale (1-5), 1 is low potential and 5 high potential Why?	Savings Persistence* Scale (1-5), 1 is low savings persistence and 5 is high savings persistence	Regulator Buy In Scale (1-5), 1 is low probability of regulator buy in and 5 is high probability of regulator buy in Why?
Cold Climate Heat Pump Promotion	Barriers to overcome: Negative perceived performance, limited delivery infrastructure, installer inexperience, lack of uniform rating system. Approach: Target market electric resistance and propane heat. Need regulatory education regarding fuel switching, (Beneficial electrification)	2-3, 5 years 4, 10 years	4	5, electric efficiency 3, fuel switching
Smart Home Competition	Barrier: Fragmented market with a lot of different brands and platforms. Unclear value proposition for consumers, difficult to define, differing definitions. Better for DR than energy efficiency with smart thermostats.	1, 5 years 2, 10 years	2	5
Network Lighting Controls for C&I	Barriers: Recent non-networkable LEDs, overall incremental economics, lack of installer experience. Non-energy benefits have large potential. With HVAC system integration and DR— load control implications Strategies: Installer training, design potential, and midstream upstream strategies. The first chunk of savings from just LED tube will happen on its own, but the controls will lag.	3-4, 5 years 4-5, 10 years	2-3. Why? If you are talking about scheduling, then there is a lot of opportunity for things to get off schedule and changes to programming. It needs to be recommissioned all of the time.	5. Very good.
Procure Ideas	There is lots of new technology. Maybe the strategy is to do R&D. One of the ideas is a call for ideas. ComEd is doing this for income-eligible (IE). 109 ideas. Down-selected to 20 and now they requested scope of work. No reason you cannot use the same approach for non-IE. We got a lot of diversity of representatives and companies instead of your usual suspects. Everything from research to outreach. In the future, we liked the call for ideas but may ask for something narrower next time.			

Table 1 - Group 4 – Building Design and Construction Practices/Codes

What are the best opportunities to get savings through market transformation initiatives/ to transform energy efficiency/DR/DER markets?

	1	2	3	4	5
Ideas From brainstorming exercise Ideas grouped into buckets		Strategy Barriers in the market to overcome Approach Include customer and business motivations and how strategy works with these motivations	Savings Potential Scale (1-5), 1 is low potential and 5 high potential Why?	Savings Persistence* Scale (1-5), 1 is low savings persistence and 5 is high savings persistence	Regulator Buy In Scale (1-5), 1 is low probability of regulator buy in and 5 is high probability of regulator buy in Why?
Code Adoption		Currently utilities get credit for code adoption separate from code compliance in several states - CA, AZ, MA, (WA, OR, ID). Need to educate regulators in IL to enable claiming savings for stretch codes. Requires third-party verification.	4 Because only getting nexus between model code and stretch. If you have a building standard/code of 5, the new code is 9, towns now adopting these codes (Evanston...) – For people building homes to 9 standard, claiming one unit, adjusted compliance.	4/5	2
Code Compliance		ComEd has a program with the IL codes collaborative already started, residential baseline study starting now, (commercial starts ~Feb). Run a program, then redo baseline study to determine savings. Analysis to be done by PNNL. If compliance improves, utility can claim savings. Coordinate this collaborative savings program with the new construction program to make sure they work together	4	3 If the compliance is there, you get it for the whole life. If you pull the program out, do the figures persist? Not sure... MEEA did a DOE-funded study in Kentucky. Good precedent.	2-3 Already approved it

<p>HVAC Quality Installation Residential</p>	<p>Idea: Utilities fund certification and training program for HVAC installers, do assessment afterwards to see how well systems are working. Was approved in Iowa, where they only allowed incentives for certain certification programs.</p> <p>You need a trained group of trade allies (TAs). They have to value the time commitment—need contractor buy in.</p> <p>Customers need to be educated as to the value as well.</p> <p>There is good potential for support for it here because we have good evaluations from Iowa. This is being piloted in Illinois by Nicor and ComEd (Peoples Gas not involved and being talked to).</p>	<p>3</p> <p>There is a fair amount of savings associated with this, but also barriers</p>	<p>4</p> <p>That should be high, 20 years? If they can create a business model about it... Would the incentive eventually go away? Probably move away from standalone incentive to this incentive. It is probably good for a while.</p>	<p>3.5</p> <p>What will make it appealing—the training component and small business component is valuable in IL. It is new, anything that requires a certification required education.</p>
<p>Smart Commercial Buildings</p>	<p>This is a unique market... Existing buildings, you do a pre- then a post- then decide what level you are.</p> <p>Barriers; building operator training, get controls and systems in the building. Savings potential is not great. Grid services will be large but that is not energy efficiency.</p> <p>Smart buildings use automation to shut off lights and AC when not in use</p>	<p>4</p> <p>There is a lot of savings potential, if you can do the whole thing.</p>	<p>2</p>	<p>2</p> <p>May take a lot of education to commit to something like a smart grid, may be more interested in income-qualified.</p>
<p>Manufactured Homes – Upstream Buyback</p>	<p>Like a cash for clunkers program. The problem with mobile homes is when they get a new one it is great, but they give the old one to a family member.</p> <p>This is three different programs: upstream, cash for clunkers, weatherization, and retrofits on existing mobile homes.</p> <p>We would only want this for primary residences. Good low-income potential, a regulator boost.</p>	<p>3</p> <p>I like there is lots of low-income potential.</p>	<p>5</p> <p>If it is the lifetime of the home vs. the program, that is more of a resource acquisition. If it is mobile home it is high, program support it is low. It is 5 for the actual home.</p>	<p>4</p> <p>They need to be educated and have to define the market.</p>
<p>Manufactured Homes – Weatherization</p>	<p>Often the home is in really bad condition—it is a band-aid. The non energy benefit (NEB) is reverse—it is a liability; when you mess with these homes there is liability. Sometimes it is leaking already when you get there. If it is a public thing, regulatory staff will need to be educated.</p>	<p>3</p>	<p>2</p> <p>As low as anything we have talked about. I do think the program can persist better than upstream program. It is the utility support—the measure stays.</p>	<p>3</p> <p>But requires education, market research. You cannot seal them all the way—there is water leaking into crawlspace. That is why they do the roof and bottom, fill holes.</p>

Financing Home Performance Improvements	<p>Looking for innovative financing strategies to fund energy efficiency home improvements. On-bill finance is one model, but there are a bunch of other kinds of models.</p> <p>Integrate into real estate transactions to improve financing over time.</p> <p>Maybe you need to train real estate people.</p> <p>Is there a need to transform the way the bank or finance industry works?</p> <p>I do not see how financing in itself is a MT program, but I think home performance program is a MT program.</p>				
Zero Energy Buildings/ Zero Net Energy (ZNE) Buildings	<p>I do not see a ZNE code happening, but I can see where you have a stretch code, where people will build them. Then you need to document case studies and publicize.</p> <p>Barriers: education, cost, need for training architects and building engineers and for incentives.</p> <p>Maybe this is a case where you value the benefits other than the energy efficiency improvements to get market demand.</p>	<p>1</p> <p>If it is just case studies buildings and pilots... in CA have been arguing over the definition for years. It is too big of a change. There is no driver right now, super high cost associated with it. There are drivers on the west coast.</p>	<p>1</p> <p>Low because does not even get off the ground.</p>	<p>1</p>	
Building Labeling / Rating and Building Registry	<p>The idea is if one house is rated good, and mine is not good I want to make mine better. You will want a good rating when you sell. But how do you build the market, so purchaser is using the energy efficiency grade to compare and value that more than granite countertops?</p> <p>It sounds like ComEd has a building labeling program (Nicor Gas does not), there's also other levels of ENERGY STAR rating.</p> <p>I do not know what the strategy is: education on the building you are buying. How does it work?</p> <p>There is no uniform labeling/rating core service. How to get people to trust the rating?</p> <p>LEED signs are driving higher sales in NE.</p>	<p>2</p>	<p>2</p>	<p>2</p>	

Table 1 - Group 5 – Other

What are the best opportunities to get savings through market transformation initiatives/ to transform energy efficiency/DR/DER markets?

1	2	3	4	5
<p>Ideas From brainstorming exercise Ideas grouped into buckets</p>	<p>Strategy Barriers in the market to overcome Approach Include customer and business motivations and how strategy works with these motivations</p>	<p>Savings Potential Scale (1-5), 1 is low potential and 5 high potential Why?</p>	<p>Savings Persistence* Scale (1-5), 1 is low savings persistence and 5 is high savings persistence</p>	<p>Regulator Buy In Scale (1-5), 1 is low probability of regulator buy in and 5 is high probability of regulator buy in Why?</p>
<p>Financing</p>	<p>On-bill financing for multifamily landlords and energy savings Accounts (dollars saved = credits for next incentives) Accruing benefits that you can then use for new energy savings projects It is part of something else. With other caveats it is more appealing (i.e., getting savings). For a capital-intensive upgrade, financing becomes a tool the utility can use to help overcome the first cost objection.</p>	<p>3 Big market and important issue.</p>	<p>5 When we are talking about whole home deep retrofits, they are long life measures.</p>	<p>3 Financing for utility is different issue. Usually involves regulatory review.</p>
<p>SEM</p>	<p>Document successful case studies; offer training and incentives. For capital, focus on continuous improvement. Utilities paying niche employees to go to big customers to work with them on a day-to-day basis, be part of their organization. This could lead to high SEM energy savings since these experts are working directly with the customers. However, the savings persistence could be short if the SEM expert only stays with the customer for a short amount of time.</p>	<p>3</p>	<p>1 Depends on how long you hire the people to work in this role for.</p>	<p>5</p>

Residential Benchmarking	<p>National home energy score; time of sale labeling and disclosure.</p> <p>Along a common footprint, everyone who is buying or selling a home has a mandatory energy disclosure benchmarking against neighbors.</p> <p>Makes customer do capital improvements when they sell their house, which they may not like if they have low energy scores.</p> <p>Do you work this energy rating into a home inspection, so it is all part of one package? If so, need to train contractors to be able to handle this increased workload.</p> <p>Real estate industry has a big push back on this.</p> <p>LEED standard helped realtors understand and value this.</p>	4.56	5	3
Policy Framework for Claiming MT Savings	<p>Baseline; savings attribution rules, transition legacy (RA) programs; track MT, share influence.</p> <p>Framework is already there for the utility to do this.</p>	4	4	4.32
Channels and Strategic Points of Intervention	<p>Develop programs that transact and capture savings through channels where the customer already naturally interacts.</p> <p>Intervention point is sometimes more productive than original.</p> <p>Capture people who move, but after they have done their financing. Probably capture 10% of the people they could because of this. If you get out ahead of it, that 10% could dramatically increase.</p> <p>Market potential is the real estate transaction market, which creates such a high potential.</p> <p>High measure life measures, so high persistence.</p>	5	5	4

Low- Income/Disadvantaged Communities	<p>MT support for MF/SF/senior/disabled/ small businesses in low-income communities.</p> <p>Will not see many early adopters of tech for MT in these areas.</p> <p>The concentrated opportunities could work, say for common areas at properties since it lowers operating costs.</p> <p>Bundling measures here could help. Simplicity of selling only one measure compared to bundling more measures.</p> <p>Refrigerator example: utility goes to manufacturer and asks how many units it takes to make a more efficient refrigerator at a lower cost. Utilities can pool together and get more efficient but cheaper products into low-income programs to make up for the manufacturers losses of making a cheaper/more efficient product.</p>	2	2	4
Pay for Performance	Already exists			
Midstream Res Plug Loads and Appliances	<p>Join ENERGY STAR retail products platform</p> <p>Persistence is questionable since regulators have not seen this yet.</p>	3	3	3

SESSION 7

Table 2 - Group 1 – Education/Behavior						
Will the strategy/idea work in the Midwest today? Prioritize ideas.						
		6	7	8	9	10
Ideas From brainstorming exercise Ideas grouped into buckets	Issues and Challenges with Proposed Idea/ Initiative	Ways to Overcome Issues/ Challenges		How to Evaluate these Approaches/Is the Impact Measurable?	Likelihood of Success Scale (1-5), 1 is low likelihood of success and 5 is high likelihood of success Why?	Priority Savings potential + savings persistence + regulator buy in + likelihood of success (3+4+5+9)
BOC	Need for MT hypothesis Baseline/data issues	Ensuring there is the connection to impact Measuring actions, results attributable to the training		Construct a baseline Establish Market Performance Indicators (MPIs)		
SEM/ISO 50001	Lack of demand Complexity Cost Time	Link to corporate sustainability initiatives Facilitate information exchange among participants Work with trade groups Work with socially responsible investment strategies		Number of certifications Develop MPIs Leverage existing data		
Commercial Benchmarking	Not really a utility program Need for an ordinance from the city	Target buildings that have a low score		Data comparison from previous years		

Table 2 - Group 2 – Products/Standards

Will the strategy/idea work? Prioritize ideas.

	6	7	8	9	10
Ideas From brainstorming exercise Ideas grouped into buckets	Issues and Challenges with Proposed Idea/ Initiative	Ways to Overcome Issues/ Challenges	How to Evaluate these Approaches/Is the Impact Measurable?	Likelihood of Success Scale (1-5), 1 is low likelihood of success and 5 is high likelihood of success Why?	Priority Savings potential + savings persistence + regulator buy in + likelihood of success (3+4+5+9)
Advanced Lighting Controls – Commercial-Focused – Networked/ Connected	Limited purchaser awareness, designers also lack experience; iPad app to set all the controls up; company called Enlighted—opportunity is very large but could turn into a lost opportunity Residential: If you have an iPhone, app so lights go on and when leave go off; could be a residential connected opportunity as well Controllable load has DR potential as well	Local demonstrations and case studies Training and incentives for designers, installers, and property managers Important to develop initiative in coordination with C&I lighting upgrades, LED fixture programs	Market progress indicators Set a baseline Measure against market data Non-energy benefits—productivity	5	18
Advanced HVAC – includes cold climate heat pumps, automated fault detection and diagnostics (AFDD), variable speed HVAC, something like quality installation	High cost, limited availability of product, installation issues, integration with existing heating systems and controls Naming and branding is a challenge Fuel switching is a major issue/complexity—politics and regulatory	Local demonstrations and case studies—show people this can work in Chicago climate One for upstream/midstream—maybe more midstream Trade ally training/recognition Include quality install; oversight of installation—ENERGY STAR-verified installation, though this may need to be redesigned; currently for residential only Stakeholder group to do a naming exercise, what to call this Combine thermostats, AFDD (remote verification) to get the bang for the buck	Same as advanced lighting controls Indoor air quality (IAQ) benefits—respiratory	4	16

<p>Clean Water Pumps – CEE has a working group pretty far along, voluntary specification for clean water pumps</p>	<p>Higher cost, newer standard (DOE standard going into effect in 2020, Hydraulic Institute – labeling standard label pump energy index) Stocking availability Contractor in the middle is going for lowest cost Lot of potential is adding a VSD Program baseline will be the minimum standard that is set for 2020</p>	<p>Midstream incentives—want to go through distributors; there is a distributor network Also, large training awareness with distributors – manufacturers are aware because have to meet new standard, but distributors are not as aware NEEA put together a market actor user profile</p>	<p>Same evaluation as others without NEBs Going into commercial buildings, high rise residential, municipal pools (70% industrial/ 30% commercial) Installed by maintenance person in industrial, contractor in commercial Pumps from 1-200 hp Circulating pumps are not under the standard</p>	4	15
<p>Efficient Water Heaters (#4)</p>	(the group did not fill in remaining columns)				
<p>Retail Products Program (RPP) (#5)</p>	(the group did not fill in remaining columns)				
<p>Pretty well defined, doable—something you can get into quickly</p>					

Table 2 - Group 3 – Emerging Technologies
Will the strategy/idea work? Prioritize ideas

		6	7	8	9	10
Ideas From brainstorming exercise Ideas grouped into buckets	Issues and Challenges with Proposed Idea/ Initiative	Ways to Overcome Issues/ Challenges		How to Evaluate these Approaches/Is the Impact Measurable?	Likelihood of Success Scale (1-5), 1 is low likelihood of success and 5 is high likelihood of success Why?	Priority Savings potential + savings persistence + regulator buy in + likelihood of success (3+4+5+9)
Cold Climate Heat Pumps (see advanced HVAC above)	Need to have a value proposition Can build value prop by talking about no duct work Contractor and architect education Split incentive issue	Get the city of Chicago to adopt a rental energy ordinance or an efficiency disclosure ordinance Contractor and architect education Two incentives: one for NC and one as retrofit Need to partner beyond the service territory Comfort and controllability is a selling point Could the utility play a role in aggregating buying power? Offer a pipeline of buyers in exchange for best price Do demonstration projects and publicize Start with multifamily It could be a niche resource acquisition program with some MT elements.		NC has a difficult baseline.	I think this is risky because of the narrow market definition. I think NC is more likely: 4, NC 3, retrofit	14, 15
Networked Lighting Controls	Price is definitely a challenge Cost-effectiveness	Emphasize NEBs Make sure your resource acquisition program is only incenting tubes that are networkable Need to expand outside the service territory Engage the entire supply chain Possibly use an upstream approach Try to get designers onboard Have a showroom highlighting not only energy efficiency and technology, but also NEBs Do demonstration projects in various commercial building types		The evaluation challenge is value of NEBs. You need to sell people on the value and document the NEBs. An evaluation challenge having a feedback loop that you are testing out what is happening to the market and adjusting the program on the fly. This is a market that is changing faster than a lot of industries, so it is important we have regular discussion with key players.	4.5	12.5

Table 2 - Group 4 – Building Design and Construction Practices/Codes
Will the strategy/idea work? Prioritize ideas

		6	7	8	9	10
Ideas From brainstorming exercise Ideas grouped into buckets	Issues and Challenges with Proposed Idea/ Initiative	Ways to Overcome Issues/ Challenges		How to Evaluate these Approaches/Is the Impact Measurable?	Likelihood of Success Scale (1-5), 1 is low likelihood of success and 5 is high likelihood of success Why?	Priority Savings potential + savings persistence + regulator buy in + likelihood of success (3+4+5+9)
Code Compliance	This initiative is already starting. MEEA has begun a residential baseline study and later commercial. Then they will run a compliance support program and redo the baseline study. PNNL will do the analysis.	Started codes collaborative across the state to collect stakeholder input. Logic model, hypothesis is done. The theory is you identify what the code compliance practices are that are not being done, then educate them on shortcomings based on education, support, and training— they will increase compliance.		The key to evaluation of a code compliance program is establishing the counterfactual. Working with regulators now to make sure everything is verifiable. ComEd asked us to make this program complementary to res and commercial pilot ComEd not cannibalize their savings from commercial new construction programs. When we said code collaborative, we mean buildings, appraisers, etc.— that has already happened.	4	16
Code Adoption	Regulatory agreement on allowing it as something utilities can claim savings from. It needs to be a stretch code. It must work with existing RA programs and not cannibalize.	Must develop a strategy for approaching the regulators. For this it is helpful to show them case studies. This is similar to ZNE.		Energy use simulation modeling.	3-4 I think this is a hard sell, but the savings potential is very high.	14

HVAC Quality Install	<p>QC process to ensure it is getting done right. Need to train trade allies and find software that all will use. How do you transform the installer market if you pay for training?</p>	Train and certify TAs.	<p>Track business increase for those certified installers. Track number of certified installers.</p>	<p>3-4 Again, if you mandate it, success is great (which is what we had in Iowa). It is the same as adoption, 3-4 range. Once you do it there is huge potential. It is new here. This market is really hard—these guys do not stay in business very long, high turnover.</p>	12
<hr/>					
<p>Manufactured Homes Think should be on the list; good program for Ameren but not good for ComEd. Should be statewide.</p>					
<hr/>					
Building Labeling and Registry	<p>The City of Chicago is already doing it. Elevate doing a pilot with res disclosure sale, already required by the city. Looking at policy around potential labeling of homes, that research will be helpful. Not a lot of data out there on impact evaluation.</p>				
<hr/>					

Table 2 – Group 5 – Other
Will the strategy/idea work? Prioritize ideas

	6	7	8	9	10
Ideas From brainstorming exercise Ideas grouped into buckets	Issues and Challenges with Proposed Idea/ Initiative	Ways to Overcome Issues/ Challenges	How to Evaluate these Approaches/Is the Impact Measurable?	Likelihood of Success Scale (1-5), 1 is low likelihood of success and 5 is high likelihood of success Why?	Priority Savings potential + savings persistence + regulator buy in + likelihood of success (3+4+5+9)
Define Policy Framework	Political/competing interests Regulatory risk	Understanding of legislative and policy objectives, clarify for actionability	New policy established relative to actionable items	3.52	15.8
Portfolio Approach	Invest in potential—technical, market, delivery options, talk with key distributors/suppliers Map to existing RA programs. New priorities—sonic drying, transformers, variable speed drives	Do a potential study and assessment of supply markets	Anything that raises visibility		

SUPPORTING MATERIAL

MARKET TRANSFORMATION RESOURCE LIST

MARKET TRANSFORMATION RESOURCE LIST

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