Get Smart!

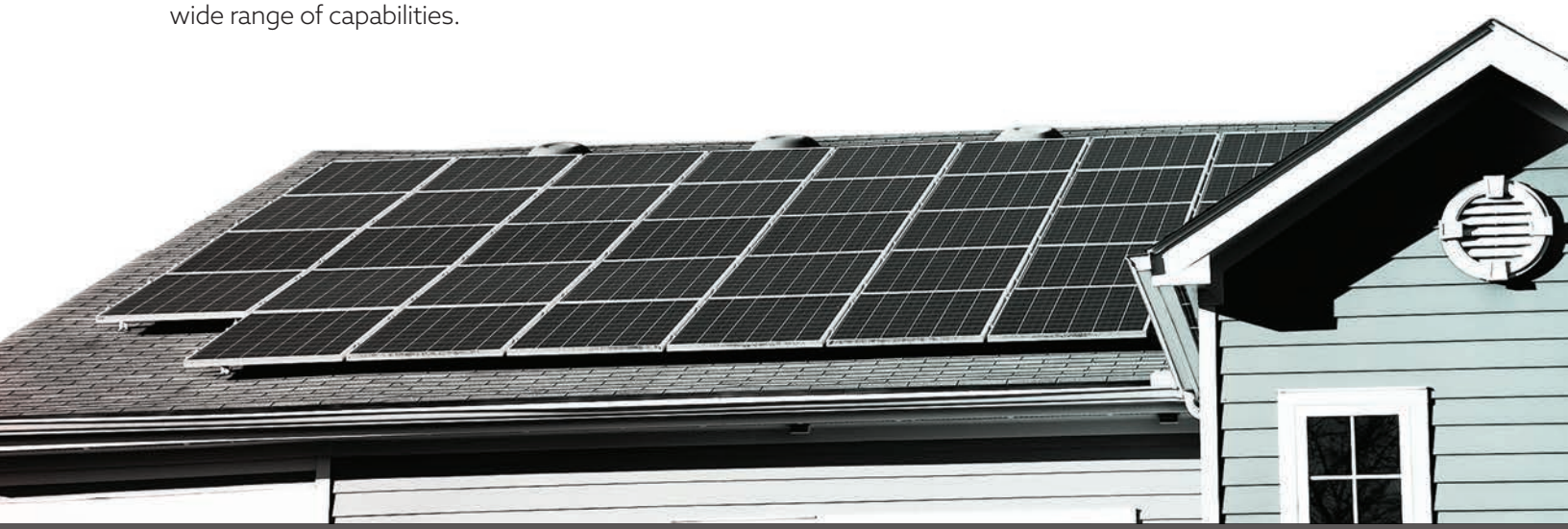
Applying Smart Thermostat Lessons to DERs

The transition to a clean energy grid is underway.[1] Distributed energy resources (DERs) are roughly doubling every five years and will continue to proliferate.[2,3] As utilities and program administrators aim to integrate and capitalize on DERs as part of their energy and offerings mix, we would do well to examine the ways in which DERs are fundamentally different, and require different strategies, than typical energy efficiency programs. What go-to-market models are necessary to both drive adoption of DERs and maximize their grid benefits? Fortunately, the path of smart thermostats provides valuable lessons that can inform how we leverage DERs in the industry.

Smart thermostats, which bridge both energy efficiency and demand response programs, offer a wide range of capabilities.

Most notably for DERs, smart thermostats have been successfully deployed to deliver load management and demand response. Millions of smart thermostats are already installed, arguably the industry's earliest and most widely adopted DER, and smart thermostats are supported by utilities using a scalable incentive structure.[4]

As a model, smart thermostats provide important instruction on how to (1) scale DER technology adoption, (2) drive participation in demand response programs, and (3) ensure continued engagement to provide reliable, dispatchable resources. Our lessons learned can be directly applied to batteries and connected fuel generators and other forms of demand response, such as electric vehicles and water heaters.



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Path to DERs at Scale, from Adoption to Participation to Engagement

Bringing dispatchable DERs to scale involves far more steps than for traditional efficiency products or other utility offerings. For energy efficiency programs, participation and product adoption are relatively synonymous and continued engagement is limited. For DERs, for example, customers can't participate in a bring-your-own-thermostat (BYOT) demand response program until they own a qualifying smart thermostat. Furthermore, many BYOT participants purchased their thermostat well before they ever heard of a BYOT program. In other words, product adoption and DER program participation may be disparate and unrelated actions for customers in a DER program. In terms of customer engagement, the interactions for DERs far exceed any other utility-to-customer communication. Customers pay their bills monthly, but they're not expecting unscheduled messages regarding their appliances.

Adoption

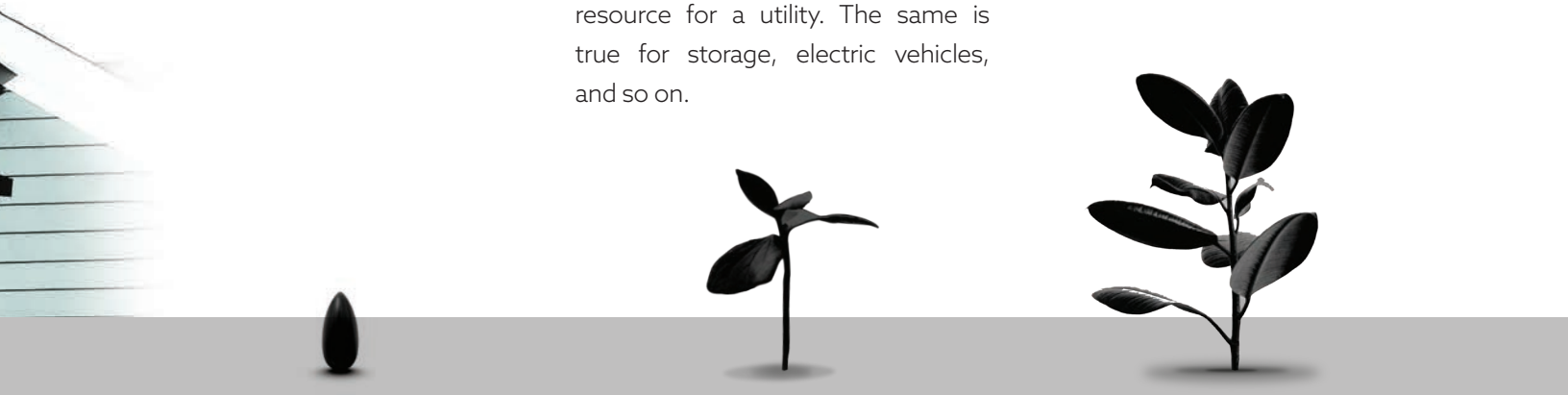
Customers must purchase and install their DER technologies. For smart thermostats, most customers purchased their device unaware that it was DER-ready and unaware of DER programs. Product adoption was driven by headlines, product design, multiple value streams, and energy efficiency incentives, not DER program incentives.

Participation

Utilities can't use customers' dispatchable DER products until customers agree to participate—without participation, a DER product is just another device. For example, smart thermostat owners may refuse to allow their utility to notify them of demand response events, essentially reducing smart thermostats to a nice-to-have upgrade on a standard programmable device. While this may net energy savings, it is not a dispatchable resource for a utility. The same is true for storage, electric vehicles, and so on.

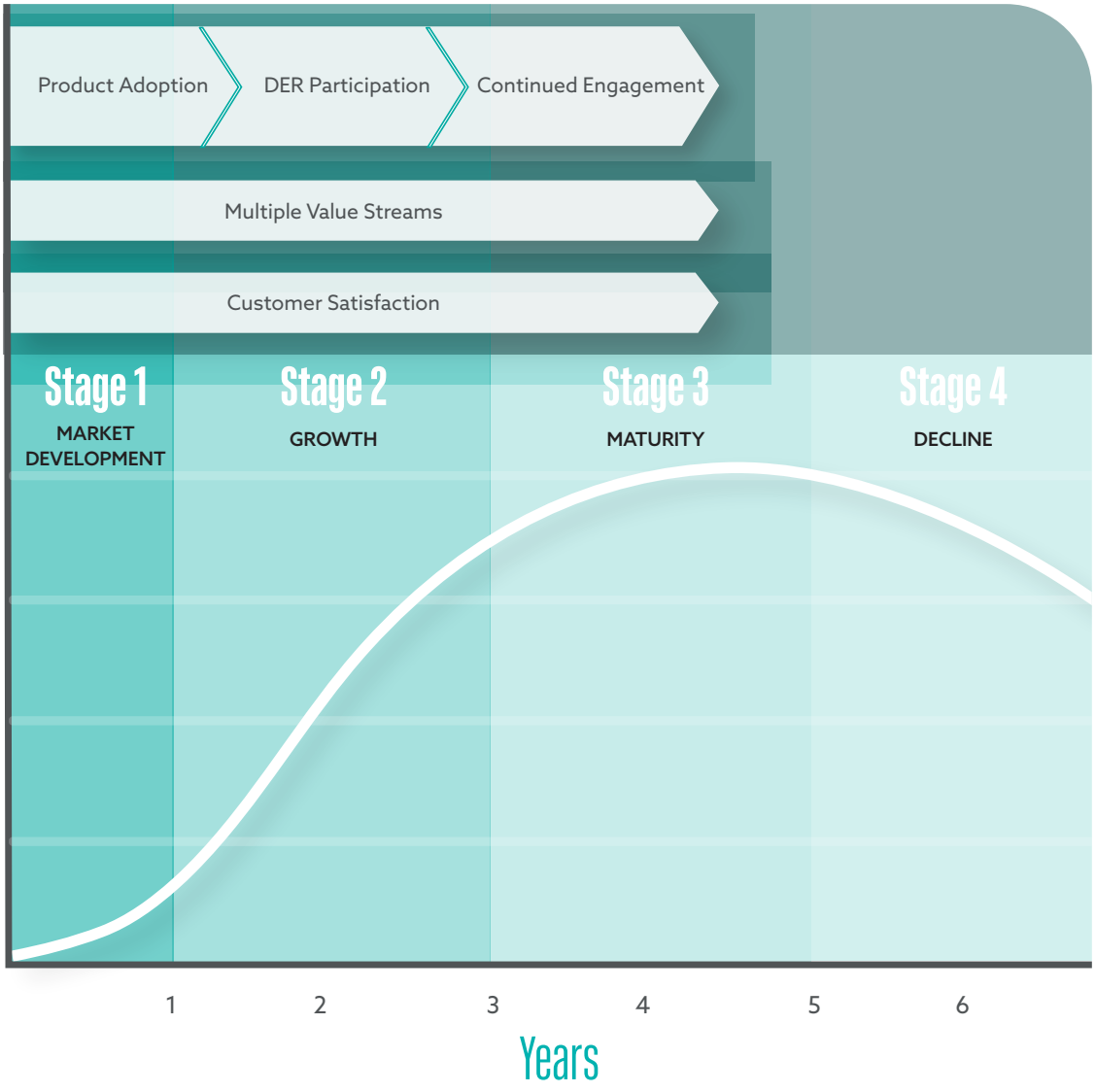
Engagement

Continued engagement matters. It's essential for utilities to foster an environment where customers are happy and willing to allow their DER to remain in utility programs. This takes adequate payment, good communication, consideration of comfort and convenience, and customer choice—all components of current smart thermostat DER programs.



DER Life Cycle Product Life Cycle - Entire Industry

DER Path to Scale



The traditional product life cycle is four stages: market development, growth, maturity and decline.[5] DERs are firmly in the market development phase, but there are some signs that certain DER products and services may reach the growth phase within the next five to ten years.[6]

Driving DERs to Scale

Bringing DERs to scale is challenging. In some ways, it's a new concept for customers and it involves changing customers' existing relationships with utilities. Based on the history of smart thermostats to date, utilities can drive DER through collaboration, leveraging multiple value streams, focusing on customer satisfaction, and using key vendors.

Collaborate and leverage multiple value streams—it will introduce conflicts, which is a good thing.

Smart thermostat providers found support from utilities, regulators, advocacy groups, and ENERGY STAR®. Smart thermostats presented opportunities for each of these groups, and smart thermostat companies did an excellent job of engaging across value streams. Utilities promoted the measure to help them hit savings targets, and regulators were supportive, demonstrating commitment to economic progress in an Internet of Things (IOT) world. Environmental advocacy groups supported smart thermostats because they saw opportunity for not only energy savings but also greater load flexibility to support higher penetrations of renewable energy. Meanwhile, ENERGY STAR® reinstated their thermostat designation and implemented product testing in an innovative way using product-collected data.

Engaging across these value streams involves collaboration, which has had challenges, but maybe that's a good thing. One of the clearest examples of conflict is with smart thermostat evaluation. Energy efficiency measures typically need to demonstrate that their societal benefits (e.g., avoided utility infrastructure and generation costs) outweigh the incremental cost of the product. Some of the most prominent smart thermostats are about 20 times as expensive as the baseline product, which sets a high minimum threshold for energy savings. Traditionally, cost tests do not allow for evaluators to incorporate other benefits (e.g., from demand response or even non-energy benefits), but this framework is changing, and some utilities are merging demand response and energy efficiency departments. While we can expect debate over using energy efficiency funds to support DER adoption, given the battles over net-metering, this approach might be the best tool we have during these early days of the clean energy transition.[7]

What are the additional value streams for other DERs? Utilities are already looking to support customer-side battery adoption by leveraging demand response, arbitrage (shifting energy use to lower cost times), and enabling the battery to operate as a back-up generator for the customer. The path for getting DERs to scale will involve multiple value streams.

Keeping Customers Happy Is Worth Compromise

DERs won't scale up without customer satisfaction, which involves convenience, customer choice, data privacy, and careful messaging.

- Make it easy to buy and receive the rebate instantly. Smart thermostats leveraged new streams for product adoption (e.g., ComEd's Marketplace)[8] where rebates are instantaneous, and the customer doesn't have to follow up later and take time to dig up their account number.

- Make it easy to install (or ensure a professional can easily install it). Smart thermostats developed an easy-to-use self-install guide, where previous thermostats recommended professional installs. Nest even has a service to help customers find knowledgeable contractors familiar with installing their product,[9] which demonstrates a framework for easy installation that can apply to batteries, water heaters, and other DER-ready products.

- Promise and deliver ongoing convenience. Smart thermostats promised thermal comfort without being wasteful and with minimum involvement from the customer.

- Make DER participation easy. Customers can sign up for DER programs through their smart thermostats with one click and participate in automated DER management.

- Give customers choice and make it easy to opt-out. Customer choice is important for satisfaction, and smart thermostat companies made it easy for customers to opt out at any time, sometimes by simply hitting the up or down arrow on the thermostat.

- Don't ask too much. Keeping customers happy involves compromise, which might mean prioritizing comfort over savings and/or thoughtfully minimizing asks on the customer. Smart thermostats, for example, typically max-out their demand response events between a 2-4°F shift in setpoint.

- Implement messaging carefully. Customers will participate in DER programs for different reasons and will have a variety of values. Programs can motivate customers by articulating the environmental benefits, financial benefits, the simplicity of participation, or through other messaging styles informed by social marketing.

- Minimize sharing customers' data. Data from smart thermostats are debatably owned by customers, and customers will be more likely to participate if they know their data is secure. If we want people to be a part of our DER future, we're going to have to think creatively about what data is critical and where there's room for compromise.

There are great opportunities to use vendors to implement scalable DER programs.

Implementing DER programs is complicated, but vendors can help. Customer acquisition and customer satisfaction are challenging, and perhaps most importantly, managing data and communication across multiple manufacturers and technologies can be a breaking point. Energy Hub, Uplight, and other providers have successfully implemented DER programs with multiple smart thermostat vendors across the U.S. These same companies are planning ahead and already offer similar programs for customer-side batteries and for at-home electric vehicle charging.

DER Programs Are Evaluable

Smart thermostat DER programs are not only evaluable, but prime candidates for experimentally designed research studies. In evaluation we often try to answer the question: What would have happened without the program? Fortunately, with tens of thousands of connected devices, it's relatively easy to withhold a random control group, which simplifies the interpretation of results. This concept not only applies to evaluation but more detailed research as well. Program administrators could develop experimental studies to test the effect of different messaging campaigns on opt-out rates; to test the difference in savings between mild, standard, or aggressive pre-event cooling; or even to test the prominence of customer fatigue for demand response events on sequential days.

What's Next?

ILLUME is currently conducting research around smart thermostat demand response that will set precedents for future demand response operations, answering research questions like:[10]

- How many events can you call before fatiguing customers?
- How long can the events run before customers opt out?
- How can you better message and communicate for your demand response programs?
- How can you maximize participation and reach a variety of customers?

While smart thermostats continue along their adoption curve and as utilities take their current DER initiatives to scale, we'll be watching for what technologies come next and what path they follow:

- Will electric vehicles be successful following in the path of smart thermostats, or will they break new ground?
- What is the next stage for smart thermostats, and are we on the front or back of their growth curve?
- What other DER technology will follow behind electric vehicles?

While there are many yet-to-be-answered questions, we are eager to see which go-to-market models are the most successful in driving DER adoption while maximizing their benefits to the grid.

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