PATHWAYS FOR INNOVATION

THE ROLE OF PILOTS AND DEMONSTRATIONS IN REINVENTING THE UTILITY BUSINESS MODEL

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Electricity Innovation Lab
ROCKY MOUNTAIN INSTITUTE

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e-Lab is a joint collaboration, convened by RMI, with participation from stakeholders across the electricity industry. e-Lab is not a consensus organization, and the views expressed in this document are not intended to represent those of any individual e-Lab member or supporting organization.

ABOUT US

ABOUT ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing.

ABOUT e-LAB

e-Lab is a multiyear, multistakeholder forum to address complex electricity system challenges no individual stakeholder can solve alone. e-Lab supports practical innovation across traditional institutional boundaries to overcome barriers to the economic deployment of distributed energy resources in the U.S. electricity sector. e-Lab participants convene and collaborate on solutions and engage in on-the-ground projects that address the biggest challenges facing the sector: new business, pricing, and regulatory models; grid security; customer engagement; and grid integration of low-carbon renewable energy. These changes are critical steps towards a more resilient, affordable, and sustainable electricity system. Please visit www.rmi.org/eLab for more information.

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EX EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

The rapid growth of distributed energy resources (DERs) and large-scale renewable energy is driving utilities to develop and test a wide range of new technologies, business models, and customer programs. These DERs are starting to impact the U.S. electric power system at significant scale—for instance, 2016 saw a record 2.5 GW of residential solar installation and 159,000 electric vehicles sold,[1] up 19 percent and 37 percent, respectively, from 2015. Energy efficiency programs are lowering energy use at homes and businesses to the extent that many areas no longer see growing demand for electricity.

These changes pose new challenges for utilities. As energy efficiency and self-generation erode customer electricity demand, utilities must determine how to fund needed investment in the grid with declining sales volumes. The proliferation of third-party energy devices on the grid creates new uncertainty for utilities in grid operation, as they move away from a traditional model in which the utility controlled all grid assets. In this era, utilities must develop new capabilities to integrate these new devices and manage two-way flows of energy on local distribution grids. Making the transition to a DER-rich future requires piloting new approaches to operating the electricity system, to engaging customers, to working with third-party DER providers, and to the utility business model itself.

We partnered with three leading utilities—Arizona Public Service (APS), Avista Utilities, and Con Edison—to explore best practices for utility innovation and the design, execution, and evaluation of utility pilot and demonstration projects. We interviewed industry stakeholders representing regulatory bodies, utilities, technology providers, and advocates to gather broad input on what works well, what does not, and how to improve.

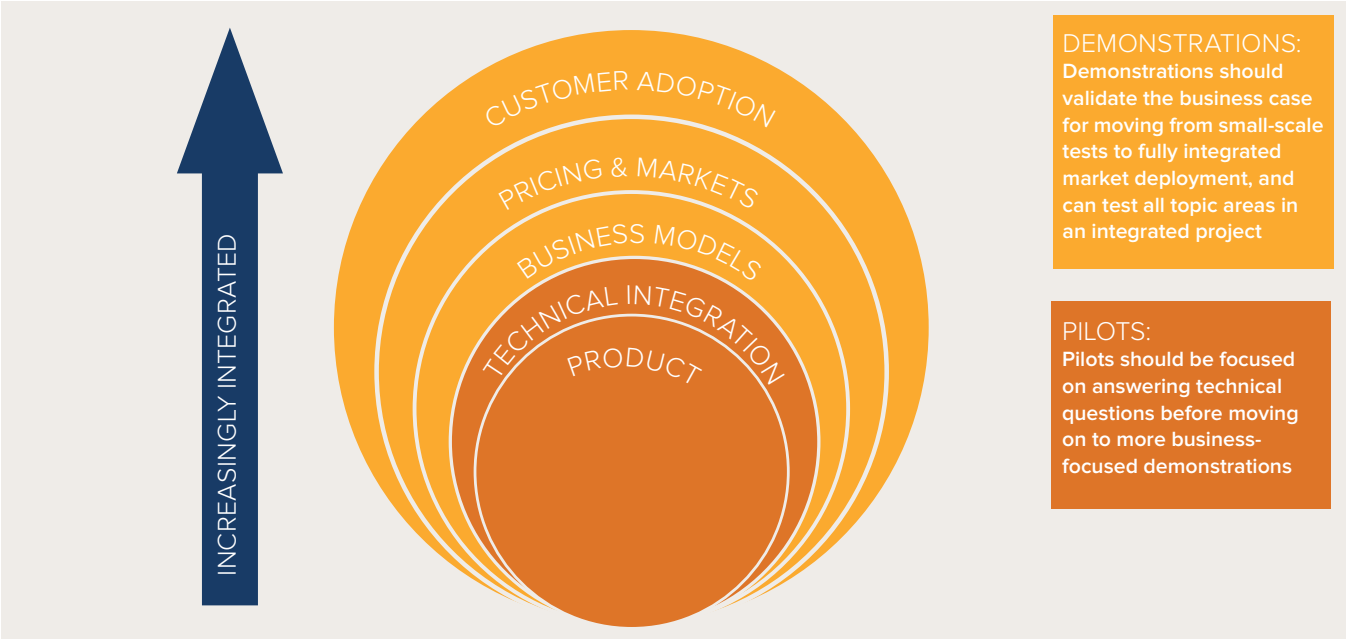
At its best, the U.S. electricity industry can test a range of promising and innovative approaches to integrating new technology for the benefit of customers, utilities, and the environment. This can happen efficiently, with little wasted effort and effective cross-industry learning; and collaboratively, with utilities and technology providers working together with aligned incentives to achieve shared outcomes.

At its worst, innovation can get bogged down by contentious disputes between utilities and technology providers, low-value pilots that produce little in the way of results, ineffective pilots hampered by organizational disconnects and poor design, and redundant programs that fail to learn from results elsewhere in the industry.

PURPOSE OF THIS REPORT

This report explores challenges to effective innovation at U.S. electric utilities, with a focus on pilot and demonstration projects. We offer recommendations for utilities, regulators, and DER technology providers to support more effective and meaningful electricity innovation.
Arizona Public Service, Avista Utilities, and Con Edison hired RMI as a consultant to perform assessments of their innovation programs, which informed many of the conclusions in this report. Additional insight came from members of RMI's Electricity Innovation Lab (e-Lab).

FIGURE 1:
PILOTS AND DEMONSTRATIONS FOCUS ON DIFFERENT TOPIC AREAS



In this report, we provide recommendations for utilities, regulators, and DER providers, centered around five primary themes that emerged when we investigated the state of utility demonstration programs in the U.S.:

1. **Strategic planning: embrace a strategy for energy system transformation and craft a complementary road map for innovation.** Utilities must recognize the imperative for change in their corporate strategies and develop innovation road maps that complement strategic goals. Regulators owe utilities clear and consistent messaging around their own strategic priorities for innovation. Successful DER providers will need to understand the varied utility business models and regulatory environments around the country in order to offer effective solutions.
2. **Designing to scale: design pilots and demonstrations to maximize learning and prepare for full-scale deployment.** Create a distinction between exploratory pilots that only test technical feasibility and scalable demonstrations, and those that also test business models, customer adoption, and other elements necessary for scaling. When possible, utilities should conduct demonstrations that put all these pieces together. Regulators can help by creating the financial incentives for utilities to pursue innovative solutions for customers in a DER-rich energy system, as opposed to the typical incentive to increase capital spending to grow the rate base.
3. **Organization: create leadership support and accountability, dedicated resources, and cross-functional collaboration within the utility for effective innovation.** To overcome silos and competing priorities, utilities should formalize responsibility for innovation within their organizations, with an accountable senior leader and formal role definitions for employees. Innovation teams must also engage business units across the utility in the design, execution, evaluation, and scaling of demonstration projects to design better projects and ensure the impact sticks.

4. **Stakeholder engagement: collaborate effectively across industry stakeholder groups to design and execute meaningful projects.** Utilities, technology providers, regulators, customers, and advocates all must engage collaboratively on new concepts to build common ground and avoid contentious and unproductive disputes in the pursuit of cutting-edge demonstration projects. Regulators should express support for multistakeholder collaboration outside of formal proceedings. Utilities can also seek broad and creative solutions from vendors through solicitations structured around addressing system and customer needs and avoiding overly prescriptive request for proposals that arbitrarily limit the solution space.
5. **Cross-utility collaboration: share best practices and lessons learned among utilities to accelerate effective innovation.** The utility industry can segment itself into groups with similar motivations or challenges, synthesize the important learnings and best practices among the broad array of information and reports, and share publicly their own lessons learned for the benefit of the industry. Regulators can ensure that utility pilots build on lessons from other states, where possible, and that utilities publicly share meaningful evaluations of their own pilots and demonstrations.

01 INTRODUCTION

image © Rocky Mountain Institute

INTRODUCTION

New, inexpensive energy technologies are empowering electricity customers to take greater control of their energy needs, save money, and support a resilient low-carbon grid. Innovative companies have emerged, providing these technologies and starting to change the way we produce and use energy. And regulators in leading states are pursuing grid modernization initiatives and changes to the utility business model to ensure a resilient, affordable, and clean energy system of the future. This transformation is especially acute for local distribution systems, where customer solar, demand-side management, smart grid infrastructure, and other distributed energy resources (DERs) are redefining how energy is produced and delivered.

Across the country, utilities are pursuing new strategies for innovation and conducting pilot and demonstration projects to learn how to make the transition to a new energy system, requiring new and unfamiliar approaches. Unlike past utility R&D programs, which focused primarily on technical integration of new equipment onto the grid, today's offerings—like residential demand response, distributed storage, or electric vehicle (EV) charging programs—require exploring new business models, engaging customers more closely, and relying on third-party vendors to provide new grid resources and capabilities.

Utilities and regulators pursuing innovative programs with distributed technologies must address new challenges. Utilities are sharing some control of generation and grid management, as customers and technology providers manage generation and load on the distribution grid, and yet utilities still bear responsibility for power reliability. And utilities are facing threats to their traditional business model, as successful energy efficiency programs and the growth of behind-the-meter generation erode energy sales. If utilities fail to strategically manage their approach to innovation, they risk new regulatory requirements and customer demands forcing change over which they have little control.

Achieving bold goals for a low-carbon, flexible, resilient energy system will require utilities to accelerate innovation. Effective experimentation through pilot and

FIGURE 2:
PATHWAYS TO INNOVATION CAN IMPROVE ACROSS FIVE THEMES

STRATEGIC PLANNING	**Embrace a strategy for energy system transformation and craft a complementary road map for innovation**
DESIGNING TO SCALE	**Design pilots and demonstrations to maximize learning and prepare for full-scale deployment**
ORGANIZATION	**Create leadership support and accountability, dedicated resources, and cross-functional collaboration within the utility for effective innovation**
STAKEHOLDER ENGAGEMENT	**Collaborate effectively across industry stakeholders to design and execute meaningful projects**
CROSS-UTILITY COLLABORATION	**Share best practices and lessons learned among utilities to accelerate effective innovation**

demonstration projects will be critical to accomplishing these goals. And utilities remain the central players on whom both regulators and technology providers rely for deploying new energy solutions. In order for utility pilots and demonstrations to succeed in driving energy system transformation, utilities, regulators, and technology providers all must embrace new approaches to strategic planning, project design, organizational structure, stakeholder engagement, and cross-utility collaboration. This paper will explore these themes and offer recommendations for each of these parties to build more meaningful pilot and demonstration programs.

ABOUT THIS REPORT

With the support of the e-Lab Network, we collaborated with three leading utilities—Arizona Public Service (APS), Avista, and Con Edison—to assess their approach to testing and implementing new solutions at the distribution-system level. We also interviewed stakeholders from state utility commissions, technology vendors, national labs, and other advocates to gain a broad perspective on how meaningful pilots and demonstrations can support electricity system innovation. This report describes challenges limiting effective innovation through utility pilot and demonstration programs, and provides recommendations for utilities, regulators, and technology providers to accelerate energy system innovation.

02 STRATEGIC PLANNING

STRATEGIC PLANNING

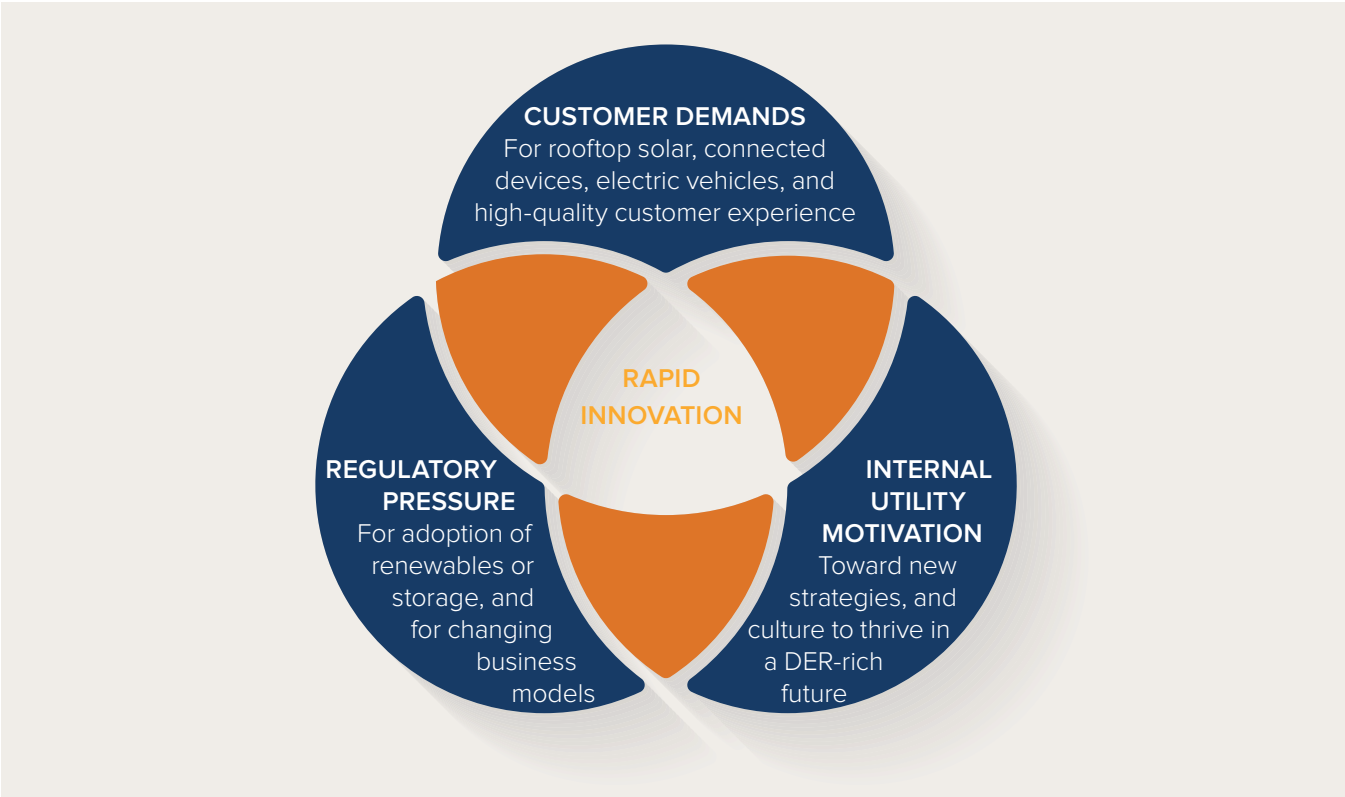
EMBRACE A STRATEGY FOR ENERGY SYSTEM TRANSFORMATION AND CRAFT A COMPLEMENTARY ROAD MAP FOR INNOVATION

Utilities across the country face disruptive change in their operations and business models from the growth of distributed energy resources and variable renewable generation, but few have thoroughly embraced innovative approaches to these disruptions in their company strategies. Without strategic clarity, innovative pilots may be conducted with little connection to a real road map for change, increasing the risk their findings will not result in meaningful large-scale programs. Some utilities are being forced to adopt innovative programs rapidly by customer demands or regulatory pressure, while others lack these immediate forces. Regardless, all utilities can benefit from a clear strategy for energy innovation that informs a road map of pilots and demonstrations. These projects should be complementary to broader strategic goals, amounting to a diverse portfolio that explores an array of key questions and tests a variety of solutions.

DISRUPTIVE FORCES DRIVING CHANGE

Advances in technology—affordable solar, electric vehicles, connected devices, and more—have enabled new energy system designs, but the impact on and opportunity for utilities varies across the country depending on the influence of three main factors: customer demands for new products, regulatory pressure, and internal utility motivations. The most rapid changes are occurring where these forces overlap, and utilities that embrace these disruptions in their strategies are positioning themselves most effectively for the future.

FIGURE 3:
RAPID INNOVATION OCCURS WHERE MULTIPLE DRIVING FORCES ALIGN



CUSTOMER-DRIVEN

Customer interests continue to shift as technologies develop and as customers take more responsibility for managing their electricity usage. Several states are already seeing dramatic customer demand for rooftop solar, forcing utilities and system operators to adopt new approaches to balancing supply and demand on the grid. With the rise of connected devices like smart thermostats, controllable water heaters, and advanced electric vehicle chargers, customers are responding to DER providers' pitches to save money, pressuring utilities to expand demand-response and demand side-management programs. And as internet-enabled customer experiences from leading companies like Amazon, Uber, and Apple have made their way into everyday life, customers are increasingly expecting high-quality interactions with traditional service providers like utilities.

For instance, APS has experienced dramatic growth in distributed solar generation as customers have taken up solar leasing and power purchase agreement (PPA) offers. This has shifted the typical operation of the distribution system, as power now frequently flows from customers back into the grid on certain feeders. APS has started a new division, Customer Technology, working to better meet customer needs while using pilots and demonstrations to test new approaches to managing high penetrations of solar and customer DERs on their system.

Image courtesy of APS

SOLAR INNOVATION IN ARIZONA

A utility's strategy should guide its innovation projects, but pilots and demonstrations can also help identify key considerations that must be incorporated into a company's strategy. APS's Solar Innovation Study (SIS) is helping APS learn how to manage different customer-sited DERs and send price signals to encourage customers to shift their load at certain times. The SIS is a 109-home pilot that is split between APS-owned DER systems (75 homes) and customer-owned DER systems (34 homes). The APS-owned systems are split into three different configurations with varying mixes of solar, batteries, smart inverters, home energy management systems, smart thermostats, variable speed HVAC systems, load controllers, and include access to a customer portal. The customer-owned systems can be designed by a DER provider to include solar or solar plus a battery, and 24 of these systems have direct load control. In all homes, APS is testing demand-based price signals to determine how effectively customers respond and to gauge customer experience. APS is conducting A/B testing to better inform decisions on how to incorporate customer-sited DERs into their system,* and more broadly how to adjust their strategic outlook for DERs.† [2]

*A/B testing is a method of comparing two products or programs to determine which performs better. This method is commonly used in improving webpage designs for conversion rate, for instance, and can be applied to utility pilots to compare performance across program designs.

†For more detail on the APS Solar Innovation Study, see https://www.aps.com/en/globalservices/installers/Pages/solar-innovation-study.aspx and https://www.aps.com/en/globalservices/installers/Pages/solar-innovation-study-125.aspx.

REGULATORY

In the past several years, state regulators have increasingly pursued reform efforts to drive utilities to adopt approaches that better integrate more distributed resources, either in response to legislative direction or proactively, where they see customer or system risk from the status quo. The two most notable proceedings have taken place in New York with Reforming the Energy Vision (REV) and in California with the Distributed Resources Plans (DRPs). Regulators in both states have proposed new incentives encouraging utilities to pursue cost-effective DER solutions.[3] They have also required that utilities enact pilots and demonstrations to test new approaches to distributed resource adoption. Regulatory priorities vary widely by state and often change with the appointment or election of new commissioners. Where these changes occur too abruptly, utilities may be reluctant to pursue strategic innovation, especially as the ability to earn returns on new programs is cast in doubt. Regulators who clearly articulate and maintain their own consistent strategic views can avoid this potentially paralyzing effect on utility innovation.

UTILITY-DRIVEN

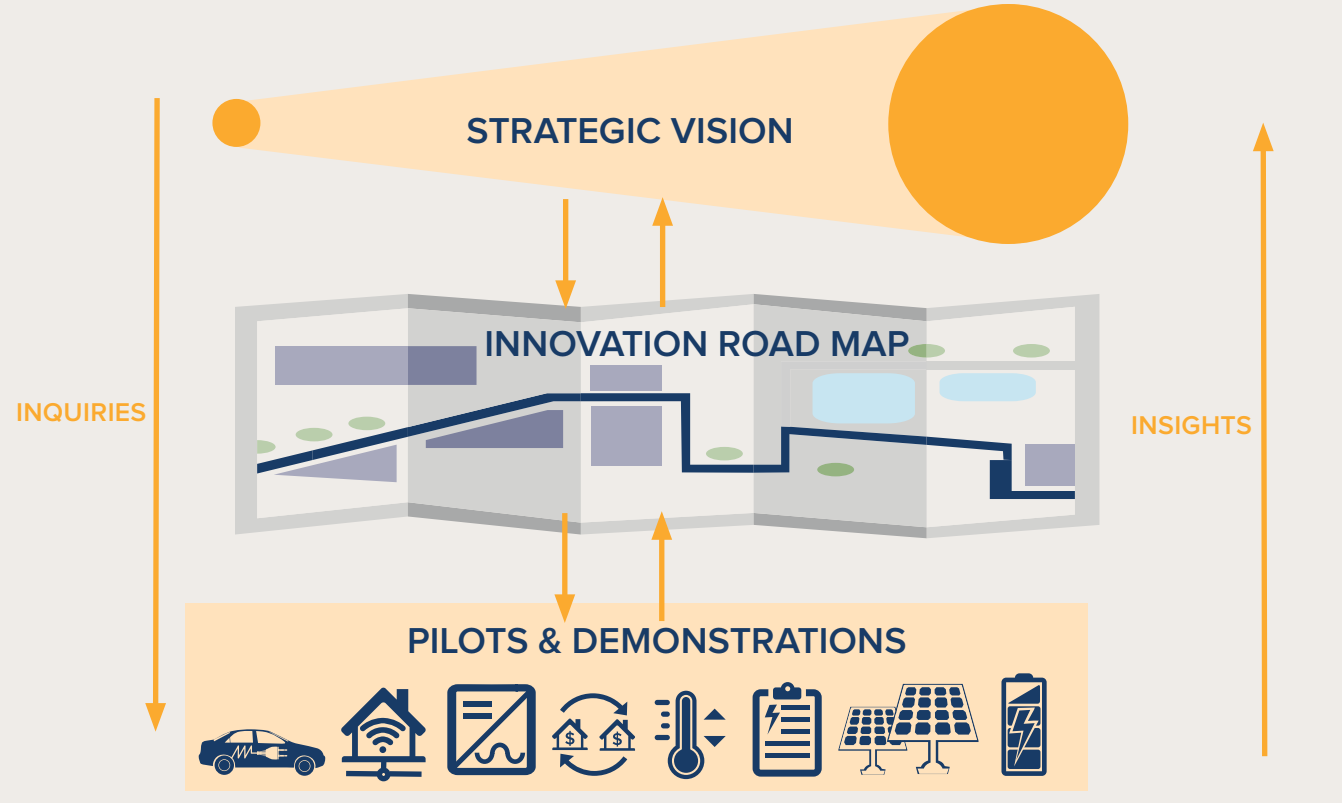
Utilities that embrace the need for change and innovation as part of their business strategy and organizational culture are positioning themselves to shape their role in a DER-rich future and are able to increase the impact of meaningful pilots and demonstrations. While many utilities have individuals or teams pursuing innovative new ideas, fewer have strong engagement and support from senior leaders and a high-level strategy that embraces the need for innovation in the face of disruptive forces. Senior leader support and engagement leads to pilots and demonstrations that complement the company's strategic goals and that are more likely to scale. Many utilities are crafting strategic visions to stay in front of industry trends and position themselves to be successful in a transformed energy system. Utilities with the most meaningful pilots and demonstrations are internally and intrinsically motivated to pursue a strategy of innovation and conduct pilots that complement that strategic vision.

In our research across utilities, we saw several examples of individual pilots that tested interesting technologies but were not well connected to the company's strategic road map and senior-leader priorities. While these projects were often interesting and innovative, from advanced energy storage to sophisticated adjustments to air-conditioning operation, they lacked leadership support and generally led to little meaningful impact.

BUILDING AN INNOVATION ROAD MAP

To ensure pilots and demonstrations align with company motives, utilities can build innovation road maps that include both the company's vision for energy system transformation as well as an understanding of the challenges that need to be solved along the way. The innovation road map should be built from the company's strategic goals and be developed with engagement from senior leaders. Under ideal circumstances, these senior leaders have appropriate opportunities for external experts to inform and critique strategic goals and, by extension, the innovation road map.

FIGURE 4:
UTILITY STRATEGY AND AN INNOVATION ROAD MAP SHOULD INFORM EACH OTHER AND SUPPORT COMPLEMENTARY PILOTS



To garner support for a holistic, integrated energy system, the road map has to articulate the benefits of this system to both customers and shareholders. Customers value an affordable, reliable, clean grid, while shareholders want to ensure an adequate return and sensible investment strategy. Therefore, any innovation road map must both show customer benefits and build the financial case for innovation. By doing so, utilities can enhance the importance of conducting pilots and demonstrations on these topics.

The innovation road map should not be a prescriptive plan for the exact pilots and demonstrations the utility will conduct or the exact technologies the company will pursue. Instead, the road map should highlight the customer or system needs, and how new programs and business models can help solve them. This can serve as a guide to project managers designing pilots and demonstrations to test these models. For instance, a road map may identify the need to add load by encouraging fuel switching from fossil sources to electricity, and to manage customer load profiles to shift from peak to off-peak periods. Then innovation leaders could devise projects to, for example, encourage electric vehicle adoption and off-peak charging, grid-interactive water heating with advanced demand response, or other concepts that satisfy the need.

RECOMMENDATIONS

UTILITIES:

- Build a corporate strategy that recognizes both the opportunities and the disruptions coming from new technology, regulatory changes, and customer demands, as well as the need to adapt and innovate to thrive in a changing industry.
- Craft an innovation road map prioritizing problems to solve for customers and the grid, in support of a clear corporate strategy.
- Focus pilots and demonstrations on potential solutions that will support your innovation road map and inform your corporate strategy.

REGULATORS:

- Clearly and consistently express regulatory strategic vision and priorities; engage cooperatively with utilities to set clear guidance that is based on regulatory priorities and informed by utility input.

DER PROVIDERS:

- Develop solutions that address the confluence of customer, regulatory, and utility pressures for system change. Solutions that address only one factor without regard to the others will have limited potential to scale.

03 DESIGNING TO SCALE

Photo: courtesy of Quest Renewables, Inc—QuadPod™ Solar Canopy

DESIGNING TO SCALE

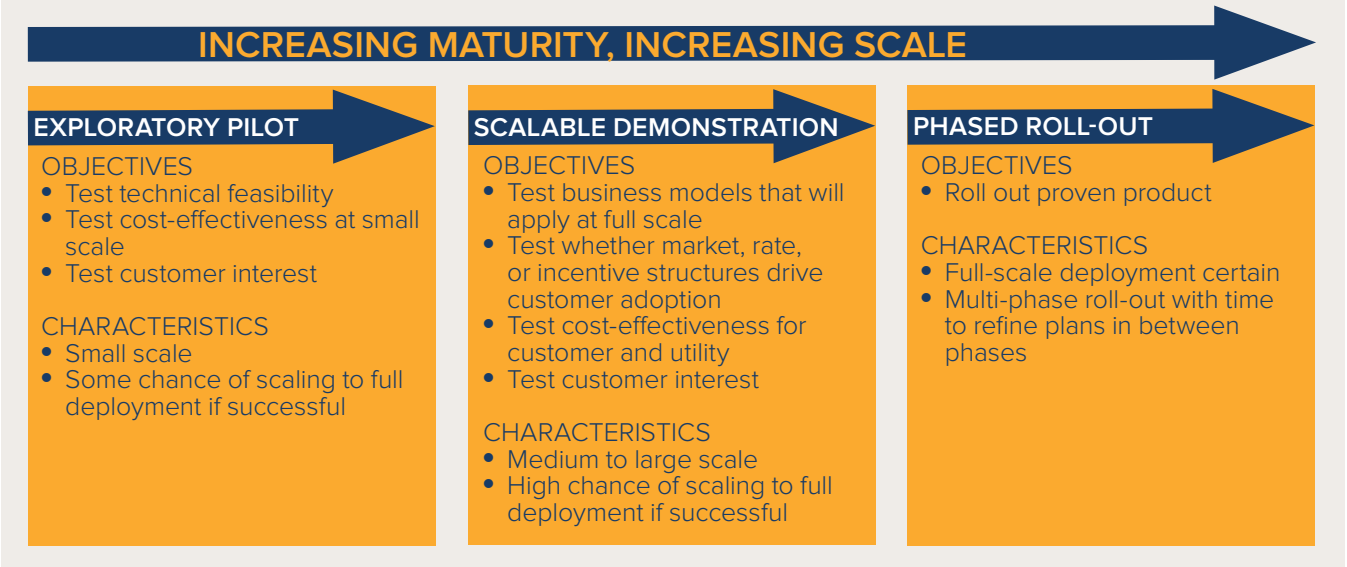
DESIGN PILOTS AND DEMOS TO MAXIMIZE LEARNING AND PREPARE FOR FULL-SCALE DEPLOYMENT

Pilot and demonstration projects are truly meaningful only if they support the utility's strategic vision for innovation at scale. Whether validating potential solutions or weeding out less promising ones, it's important that learning from pilots and demonstrations leads to decisions for products or programs to deploy at full scale. A common refrain from industry stakeholders is that utilities conduct too many pilots without many real programs to show for it. We heard complaints of "pilot after pilot after pilot" without substantial results, or that utilities are "paralyzed by pilot-itis." This perception can be detrimental to utility programs, as some vendors have privately indicated they are choosing not to participate in pilots unless they have a clear path to larger-scale implementation. In this section, we describe how utilities can structure their pipeline of innovative projects and plan for obstacles early, and the importance of regulatory incentives and accountability.

DEFINING A PIPELINE OF INNOVATIVE SOLUTIONS

Utilities are increasingly in the business of providing compelling solutions to customers rather than focusing exclusively on serving load and maintaining reliability. Therefore, they would benefit from creating a pipeline to develop new solutions similar to a product development process, where ideas move from small-scale pilot to larger demonstration to scaled rollout. This ensures that promising projects mature and eventually reach full-scale deployment, and that poor concepts are spotted early with less wasted effort and expense. These utility solutions could include new technology offerings, customer programs, market platforms, or business processes. Figure 5, below, describes a model pipeline for pilot and demonstration projects including three distinct stages. Moving from exploratory pilots to scalable demonstrations to phased rollouts, projects become increasingly mature and larger in scale. Utilities should follow a deliberate process for moving projects

FIGURE 5:
RECOMMENDED PIPELINE FOR INNOVATION PROJECTS



through the pipeline, including decision criteria, timelines for project evaluation and decision-making, and clear protocols defining the handoff of a project from the innovation team testing a demonstration to the team responsible for managing rollout of a full-scale program.

As products move through the pipeline, the probability that they will scale into full market deployment should increase. Products with little chance for scaling should fall out of the pipeline or not be pursued at all. Projects that do not advance in the pipeline are not failures provided the lessons learned are valuable to the utility. Failure consists of running a pilot or demonstration project and coming away with inconclusive results, or failing to identify and capture important lessons.

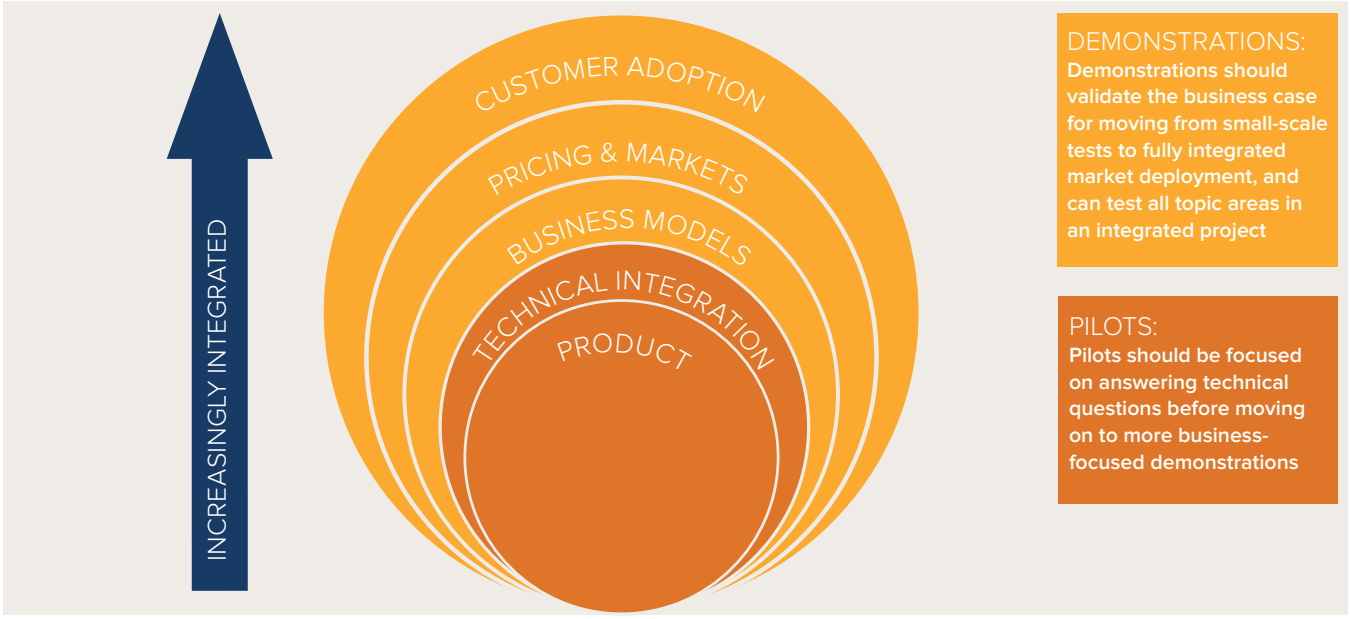
"Failure consists of running a pilot or demonstration project and coming away with inconclusive results, or failing to identify and capture important lessons."

PROVEN SOLUTIONS DON'T NEED PILOTS AND DEMONSTRATIONS

It is not necessary to work through all three stages before full-scale deployment. Oftentimes products with well-tested use cases can be deployed at scale without testing. Sometimes research or projects done by others are sufficient to make the business case for immediate full deployment (i.e., benefits and costs are clear and transferrable). Learning from the experience of other utilities and vendors can accelerate the deployment of new solutions. Pilots and demonstrations need not be prerequisites for full deployment of technologies already demonstrated elsewhere, such as advanced meter infrastructure. For these programs, utilities may choose to conduct a phased rollout to allow refinement in a small customer population before deployment across their service territories.

Commonly, pilots are limited to a focus on a specific product or technology and its integration into the energy system. Demonstrations are more integrated, comprehensive projects that address the business model, pricing, and customer adoption elements of a

FIGURE 6:
PILOTS AND DEMONSTRATIONS FOCUS ON DIFFERENT TOPIC AREAS



new utility program. Demonstrations should seek to answer all the important questions needed to inform decisions for deploying new programs at scale and to design these programs effectively.

In our interviews, we found several utilities assert they almost exclusively conduct demonstration projects (though they may use different terminology). Some focus on technical innovation through pilots, but lack clear pathways to further development. Others run a variety of projects with unclear distinction between types. In almost all cases, utilities lack a clear, structured process for moving a successful project from demonstration phase to scaled rollout, including clear organizational responsibility for implementing these projects on a sustained basis.

IDENTIFYING BARRIERS AND TESTING SOLUTIONS

During pilot and demonstration project design, managers should identify and plan for the strategic, technical, and economic barriers to scaling from the outset of the project. The demonstration should be consistent with the utility's innovation road map, or it will have little chance of growing into a larger program. Technical elements necessary for scaling should be incorporated into the demonstration project—for instance, if an automated dispatch system is required to bring a demonstration to scale, that system should be part of the demonstration itself.

In addition, the business case for deployment at scale should be identified up front, during demonstration design. Although many parameters may be unknown at the outset, managers can build a hypothetical business case and identify those values that must be proven through the course of the demonstration. If even a hypothetical business case does not demonstrate positive value—e.g., customer savings, shareholder returns, or sufficient value added to the energy system—then the demonstration should be redesigned. And finally, demonstration teams can prepare for potential rollout early by involving the parts of the company that would manage the fully mature project beyond the demonstration phase. In most utilities, the groups conducting pilots and demonstrations are not the groups that are responsible for operating mature programs. During project design and execution, those lines of business responsible for full-scale programs should be involved, both to provide valuable input into project design and to become familiar with the project. Utilities should also designate a responsible team for managing the transition of a successful demonstration from the innovation team to its long-term home in the organization.

ALIGNING INCENTIVES

Traditional cost-of-service regulation encourages utilities to focus investment on capital expenditure in physical assets rather than innovation, and new incentives are needed to spur greater utility action and investment in innovative solutions. Even with strong project design, energy system innovation will accelerate significantly with the right incentives for utilities. For example, revenue decoupling from energy sales has given some utilities assurance that they can recover costs even if they help customers use less energy, reducing disincentives for deployment of energy efficiency programs. Regulators seeking innovative solutions for a DER-rich system should consider realigned earnings opportunities for utilities, as with New York's performance incentives for system efficiency and energy efficiency and its market earnings from platform services,[4] and California's proposed earnings opportunity for DER projects that replace traditional grid investments.[5]

Also important is the capacity for utilities to earn returns on demonstration projects themselves. Again, New York provides an illustrative example. In addition to the long-term measures described above—performance incentives and market earnings opportunities—the regulator allowed utilities to earn a return on expenditures for demonstrations, and created limited allowance for utility ownership of DERs within these demonstrations. This has helped

spur utility demonstration activity and investment. Absent this ability to earn a return for innovation activity, many utilities will consistently prioritize traditional grid investments that offer increased earnings potential, limiting innovation activities.

In addition to broader utility incentives, it is also important to consider internal business-unit incentives. Business units within the utility are managing their own budgets, so if implementing a pilot or demonstration will require extra funding, then it's important to highlight the returns from that investment and the business case for pursuing the project. This includes the costs and benefits of deploying a subsequent full-scale product if the project is successful. Costs may be shifted between business units as well, so it is important to have early conversations with all those involved to ensure broad-based support. For instance, innovation in advanced distribution management systems may temporarily increase capital spending while reducing costs for distribution field operations.

Finally, vendors and other partners have their own incentives that must be considered for utilities to create successful pilots and demonstrations. Vendors often receive little or no profit from participation in initial demonstrations, and are more interested in full-scale programs. Therefore, it is important to set criteria and timelines for scaling up a project at the outset so that the pace of potential implementation is clear to partners. Partners should plan beyond the project and communicate their needs for full-scale deployment up front so they can be integrated into project design. In addition, utilities should consider what other benefits vendors receive through pilots or demonstrations, such as a share of financial upside or valuable market intelligence. Aligned incentives will result in more productive and collaborative partnerships.

CREATING ACCOUNTABILITY

Utility pilots and demonstrations commonly receive regulatory approval, and their costs are frequently repaid through customer rates. In many cases, these projects have been completed, with some sharing of findings and perhaps some benefits for participating customers, but no clear connection to large-scale proposals that build on results.

Increasingly, regulators have taken an interest in holding utilities accountable to show meaningful progress resulting from these pilots and demonstrations, even going so far as to communicate their own vision for the direction of innovation at times. In 2014, the Hawaii Public Utilities Commission expressed frustration with utility progress on demand response, writing that the utilities "have operated such programs as separate pilots for many years without an overall strategic plan."[6] The commission went on to order planning for a fully integrated demand-response portfolio, and now is evaluating a broad and integrated demand-response proposal from the utility. While commissions should allow for experimentation and for some projects to drop out of the pipeline due to technical or economic shortcomings, they can create consistent expectations that innovation projects should lead to new solutions for customers and for the energy system.

In support of this objective, regulators can enable a relatively straightforward path for projects to move from pilot to demonstration to rollout. For instance, a commission decision to approve a demonstration could come with a procedural timeline for evaluation of the project results and for the utility to make a follow-up proposal detailing whether and how to scale up the project.

RECOMMENDATIONS

UTILITIES:

- Identify the technical, economic, and strategic barriers to scaling in advance of a demonstration project. Plan how the demonstration will address these barriers to avoid unscalable innovation projects.
- Create a formal pipeline of projects from pilot to demonstration to rollout. Distinguish between exploratory pilots seeking limited technical learning and demonstrations testing scalable models. Where possible, prioritize scalable demonstrations in order to more rapidly reach larger scale.
- Outline a transition plan for a demonstration as part of project design, including designating which group in the organization will be responsible for deploying the potential full-scale program beyond the demonstration and engaging that group early in the design of the demonstration project.

REGULATORS:

- Enable earnings mechanisms to support utility innovation to find new solutions to customer needs. Recognize that traditional cost-of-service regulation encourages utilities to focus investment on capital expenditure in physical assets rather than on innovation, and that new incentives are needed to spur greater utility action and investment in innovative solutions.
- Set the expectation that pilot and demonstration activity should lead to solutions that scale. Support this expectation with a consistent pathway for utilities to advance projects from pilot to demonstration to rollout, with consistent regulatory evaluation along the way.

DER PROVIDERS:

- Design products and services for utilities to test that honor the differing goals of pilot projects at different stages of the pipeline.

04 ORGANIZATION

Image courtesy of Felix Kramer

ORGANIZATION

CREATE LEADERSHIP SUPPORT AND ACCOUNTABILITY, DEDICATED RESOURCES, AND CROSS-FUNCTIONAL COLLABORATION WITHIN THE UTILITY FOR EFFECTIVE INNOVATION

In order to be successful, pilots and demonstrations need to be integrated into the broader organization, driven by teams with clear responsibility for innovation, and supported by accountable leaders. Too often, these projects are conceived and executed by small, isolated teams, which struggle to influence other parts of the company. The size and culture of a utility will dictate the specific organizational structure that best supports pilots and demonstration projects. However, we observed common elements among the successful organizational structures, including establishing leadership support and accountability, dedicating staff to pilot and demonstration projects, engaging the rest of the organization, and fostering innovative thinking.

LEADERSHIP SUPPORT AND ACCOUNTABILITY

Much of the success of utility innovation depends on engaged and supportive senior leaders. Convincing internal stakeholders to support these projects is often a greater barrier than technical or business model issues. It is critical that these projects have a champion who either has the agency to make decisions or is a key influencer within the organization. Without senior support, it is unlikely that the necessary resources (e.g., funding and staffing) will be allocated to the projects or that the innovative concepts will survive. In addition, senior leaders can create linkages between pilots and demonstrations and strategic planning.

To build this into the organization, utilities should create formal accountability for key leaders responsible for innovation efforts. Some utilities benefit from the passion of leaders who champion the need for innovation, but if this is not supported by any formal accountability, innovation efforts are more susceptible to changing priorities as leaders move on to other roles.

Accountable, engaged leaders can maximize their impact by doubling down on innovative culture and encouraging this throughout the organization. For instance, the success of innovation at Vermont's Green Mountain Power is credited in part to the leadership of Mary Powell, whose focus on an innovative culture is summed up in her oft-repeated phrase, "culture eats strategy."[7]

DEDICATED STAFFING

Garnering leadership support should be followed by formally allocating staff to designing, planning, and executing pilots and demonstrations and, where possible, creating a dedicated team for pilots and demonstrations. If innovation projects are considered extra tasks beyond people's day jobs, they are unlikely to get the attention and follow-through needed to drive significant impact within and beyond the utility. Con Edison has dedicated a Distributed Resources Integration (DRI) group focused on innovation strategy and demonstration projects, managed by a VP-level leader. This creates focused responsibility for demonstration projects, which supports the broader goals of the utility. This formal structure allows employees to implement more formal processes for designing, executing, and scaling demonstrations.

In smaller utilities, it may not be sensible to dedicate a large, full-time group to pilots and demonstrations. In that case, it is still important to design role descriptions to formally include responsibility for pilots and demonstrations and carve out staff time to manage these programs. Without securing required time, projects risk floundering as other priorities take precedence.

Another opportunity for driving innovation within the company that we observed from our investigation regards the staffing for the teams that work on pilot and demonstration projects. One strategy is to hire staff from outside the company to incorporate differing viewpoints. Another is to search for people inside the company who are excited about the opportunity to design and implement something new. Bringing together staff from disparate business units brings

diverse perspectives, while still being grounded in the culture and values of the company. Either way, teams will benefit from finding people who are excited about experimenting in a way that benefits the company.

CROSS-ORGANIZATION ENGAGEMENT

Fully deployed programs often touch several business units, while some may even warrant the creation of new business units (e.g., a customer data unit following deployment of advanced metering infrastructure). Therefore, a utility's organizational structure needs to facilitate the involvement of other business units as early and often as practical. Engaging with other business units helps projects be more successful in two main ways.

First, soliciting feedback on project design from those business units will result in more comprehensive learning from the project. Other business units may have greater expertise in subject areas critical to the project and can guide project design. Gathering broad feedback can uncover potentially unseen barriers to large-scale deployment. Objectives for other business units can be incorporated into the objectives for the project, leading to more integrative testing that addresses a larger number of challenges across the company.

Second, involving other business units early helps to generate support for the project. This helps those parts of the company prepare for the potential implications of a successful project and potential scaling down the road. For example, lessons from the project may need to be integrated into day-to-day operations, or new programs may need to be created and staffed. When it comes time to deploy a product at full scale, people will be more receptive to and comfortable with the process if they've had time to consider and prepare for the impacts in advance.

Con Edison has taken several steps to improve cross-organization engagement on demonstration projects. For example, its DRI organization was formed by combining several existing business units, including distribution planning, energy efficiency, and the Utility of the Future group. Housing these groups under a single VP alongside demonstration projects ensures tight integration between related initiatives. For example, the longer-range planning in the Utility of the Future group can more easily influence pilots and demonstrations and vice versa. Or the lessons learned about customer engagement through energy efficiency programs can be incorporated into pilots or demonstrations for other programs. In addition, the company created a steering committee for each demonstration project.

STEERING COMMITTEES IN NEW YORK

Con Edison has implemented both an overall steering committee responsible for the company's efforts to meet the objectives of the Reforming the Energy Vision (REV) proceeding, and individual steering committees overseeing each demonstration project. The REV steering committee includes senior leaders from across the organization to ensure that demonstration projects complement the overall business strategy. The individual steering committees engage cross-functional leaders who are most likely to be affected by the demonstration project or who have meaningful input to offer on project design and implementation. These committees occasionally include participants from outside Con Edison, leveraging diverse expertise and viewpoints to design better projects.

Other utilities have taken similar steps to engage other parts of the organization. APS's Customer Technology Group works closely with the distribution operations, customer experience, rate design, marketing, smart grid, and energy technology groups. Avista has recently created a Customer Products and Services group to bring together personnel to focus exclusively on innovative customer offerings.

FOSTERING INNOVATION

Finally, it is useful to foster a culture of innovation within the utility to generate and support new employee ideas. One key to creating a culture of innovation is ensuring that senior leaders are receptive to new ideas that come from junior staff. This can be either formal or informal.

For example, Avista benefits from a deeply ingrained culture of innovation stemming from its history of entrepreneurial ventures, such as Itron, Ecova, and Relion, that have spun off over the years. Recently, Avista has created a cross-functional group called the Innovation Station, sponsored by a VP, dedicated to encouraging innovation within the company. The group solicits ideas from across the utility and incubates the best ones, socializing the importance of innovation within the company. APS has a similar group that meets regularly to evaluate and rank innovative ideas from around the company, earmarking funding for the most promising ones. Similar concepts for incubating employee ideas have been successful in other industries, and at leading companies such as GE, IBM, and 3M.

RECOMMENDATIONS

UTILITIES:

- Formalize accountability for the execution and strategic impact of pilots and demonstrations. Assign responsibility to a senior leader to ensure meaningful innovation activity supports and informs the utility's strategy.
- If possible, dedicate a team and senior leader to system and business-model innovation full time. At smaller utilities where staffing a full-time innovation team is unrealistic, assign formal responsibility for key staff and leadership roles to support planning and executing innovative projects.
- Engage business units across the utility in innovation project design, execution, and evaluation. Formalize this cross-functional collaboration through cross-functional steering committees or staffing project teams from across the utility. Consider which business units will be involved in or impacted by scaled-up projects and engage with them early.
- Encourage innovative thinking within the company by creating formal and informal avenues for new ideas to reach decision makers.

05 STAKEHOLDER ENGAGEMENT

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STAKEHOLDER ENGAGEMENT

COLLABORATE EFFECTIVELY ACROSS INDUSTRY STAKEHOLDERS TO DESIGN AND EXECUTE MEANINGFUL PROJECTS

As utility demonstrations expand beyond technology evaluations into new business models, pricing structures, and customer adoption, they must satisfy a broader set of stakeholder interests than ever before. Regulators are increasingly considering environmental and grid modernization goals in their expectations of utilities. Customers expect stable rates, more choice, and easy access to innovative products and services. Advocates continue to press for decarbonization of the energy system. And a whole host of new technology providers expect open and fair markets for their products, competing to deploy energy infrastructure that was traditionally the exclusive domain of monopoly utilities. Meanwhile, utilities must maintain reliable, affordable service and ensure they can recover their costs. Finding common ground and satisfying these diverse goals requires collaborative engagement among the utility and other stakeholders, and strategic partnerships between utilities and technology providers to deliver grid and customer solutions. Furthermore, offering the most innovative solutions will continue to require greater partnership between utilities and technology providers, including effective procurement approaches and strategic partnerships.

TABLE 1:
DIVERSE STAKEHOLDER INTERESTS INTERFACE IN UTILITY PILOTS AND DEMONSTRATIONS

	UTILITIES	REGULATORS	CUSTOMERS	TECH PROVIDERS	ENVIRONMENTAL ADVOCATES
AFFORDABILITY					
RENEWABLE ENERGY					
ENVIRONMENTAL PROTECTION					
OTHER PRIORITIES	• Cost recovery • Low risk	• Fairness • Grid modenization	• Solutions for early adopters	• Open market • Technology validation	• Rapid progress

BUILDING COMMON GROUND AMONG STAKEHOLDERS

Engaging stakeholders in collaborative dialogue before bringing pilot and demonstration proposals to regulators is important for advancing innovative solutions with broad support, particularly for hot-button issues like utility ownership of DERs or solar compensation and rate design. In contested regulatory proceedings around the country, proposed pilots have been delayed or derailed by stakeholder disputes, from PG&E's EV-charging pilot in California,[8] to Xcel's solar-plus-storage pilot in Minnesota.[9] As a recent ICF white paper highlighted,[10] engaging stakeholders early allows the utility to narrow differences on these controversial issues and create support for common ground before entering the formal and often adversarial regulatory process. Xcel's recent compromise plan for new rate pilots in Colorado illustrates the ability of a collaborative approach to generate successful pilot programs. Faced with strong opposition to a proposal for fixed grid-access fees on customers' bills, Xcel invited a small group of solar industry advocates to a series of meetings, resulting in a compromise approach. Under this agreement, with support from 26 stakeholder groups, Xcel will pilot time-of-use and demand-charge rates as an alternative to its fixed fees proposal.[11] By forging a plan with such broad support, Xcel avoided the kind of contentious proceedings seen elsewhere, received swift regulatory approval, and can now move forward with implementing its new rate design pilot programs.

PARTNERING FOR INNOVATIVE MARKET DESIGN IN SPOKANE

Avista has enlisted a broad set of partners to demonstrate a "Shared Energy Economy" in Spokane, Washington. Working in concert with UniEnergy Technologies, McKinstry, Schweitzer Engineering, Pacific Northwest National Laboratory, Spirae, the U.S. Department of Energy, Washington State University, and Itron, Avista will create a platform for energy transactions from building to building within Spokane's University District. Several commercial buildings will share energy resources, such as solar panels, battery storage, and flexible demand, through a market to transact for energy and grid services. These distributed assets will be managed for price arbitrage, conservation voltage reduction, frequency response, and other services. This project goes beyond resilience-based microgrid concepts to demonstrate the coordination of DERs on a microgrid through peer-to-peer transactions enabled by a utility market platform. Avista's long-standing partnerships with these technology companies have supported this evolution of transactive technologies to a novel market structure.

BARRIERS TO COLLABORATION

Several risks stand as barriers to achieving these benefits of collaboration. First, utilities may find some stakeholders uninterested in collaborative engagement or not fully informed of the operational and financial factors that must be considered among utility decisions. Stakeholders may bring fundamentally different perspectives on impacts to the grid, the customer's bill, or the utility's business model that prevent more cooperative dialogue. Smaller organizations in particular may feel burdened by the cost of attending frequent collaboration events or feel they lack the personnel or technical resources to fully engage on a level playing field with utilities.

Utilities may worry about being forced into pursuing a program that doesn't fit with their strategic objectives or support the evolution of their business model, or about an untested technology partner that may fail to reliably deploy and operate grid assets, placing cost recovery or even grid reliability at risk. And in most locations, formal regulatory hearings and testimony have typically offered the only channel for dialogue between the utility, regulators, and other parties.

In addressing these concerns, the utility and regulator may need to support engagement with a subset of willing stakeholders, encourage more informal discussion of strategic priorities outside of formal hearings and testimony, and consider flexibility in funding mechanisms for innovation that accept some risk that an effective pilot may show a concept to be unviable.

EFFECTIVE VENDOR PARTNERSHIP AND PROCUREMENT

The second important facet of stakeholder collaboration is building the right solutions together with vendors. This requires crafting effective solicitations, communicating clearly with vendors, and in many cases integrating offerings from multiple providers. A common pitfall is defining a solicitation in such narrow terms—around a technology specification, for instance—that many innovative and relevant solutions are excluded without consideration. Many of the best utility solicitations are clear and specific about the objectives for the solution the utility is seeking but agnostic to the specific technology or customer program offered to meet those objectives. DER vendors have shared frustration with solicitations that are too prescriptive, or are too vague about what goals they seek to meet.

Technology providers, especially startups backed by venture capital investment, may also feel urgency to achieve revenues at scale quickly. Progress in scaling up new products is constrained by the reality of utility needs to validate technical feasibility of new products on the grid, and often to receive regulatory approval for large-scale deployment. Still, utilities can support effective partnerships with technology startups when they plan for a reasonable timeline to move from demonstration-scale to wider deployment and clearly identify the criteria that will inform scaling decisions.

When utilities cultivate strategic partnerships with vendors, supported by frequent and open communication, grid innovation can be even more robust. APS regularly convenes partners in smart-grid vendor workshops, proposing options for integrating new products into the grid, and holds an open discussion on implementation options. This approach has created long-term collaboration with industry partners and helps align vendors with APS's strategic priorities.

Vendors can also support effective partnerships with utilities. Recognizing the new array of challenges facing utilities, vendors can seek to offer holistic solutions that can support an integrated demonstration. Holistic solutions—as opposed to an individual hardware or software product—combine the hardware, software, and business functions needed to deliver a turnkey product to a utility that may lack the capability to act as a software or hardware integrator, or may lack the marketing and sales resources needed to deploy a product well. Individual vendors may need to partner with other technology providers to create these integrated offerings.

SOLICITING INNOVATIVE SOLUTIONS AT CON EDISON

Con Edison has pursued an especially broad and inclusive solicitation approach to ensure a variety of solutions are considered. For its energy storage demonstrations, Con Edison released a request for information (RFI) seeking proposals to illustrate how Con Edison can earn significant market-based earnings from energy storage. The RFI simply listed hypotheses Con Edison sought to test and encouraged respondents to provide creative solutions involving storage. Con Edison received a wide range of demonstration proposals, allowing them to consider many more options than the utility team would have developed on their own. Now, specific demonstration projects are launching, testing new models for both mobile and customer-sited stationary storage.

While the RFI process has provided a broad range of innovative solutions, it does come with pitfalls. The internal review of so many diverse proposals is time-intensive for a wide cross section of utility staff. And at least some DER providers have expressed concern that it requires significant effort on their part with too much uncertainty over how to craft a winning proposal. Con Edison intends to provide more detailed criteria for proposal evaluation and selection going forward, and will continue to use the RFI in situations where solutions are broad and unknown, and when the utility is seeking groundbreaking new approaches not well established elsewhere.

Image courtesy of Con Edison

RECOMMENDATIONS

UTILITIES:

- Engage early with key stakeholders to build common ground and mitigate acrimonious debate. This is particularly important for hot-button issues such as utility ownership of DER infrastructure and rate design, where many utility proposals have been substantially revised or rejected outright by regulators, while multistakeholder compromise proposals have earned approval.
- Craft vendor solicitations that emphasize customer and system needs rather than specific technologies and use cases. Avoid overly prescriptive requests for proposals that exclude creative solutions from vendors and are thus less likely to advance meaningful innovation. Provide clarity on the size of available revenues and trajectory for scaling up, where possible.
- Build strategic partnerships with select technology providers to align vendor solutions with long-term utility needs.
- Participate fully in relevant stakeholder collaboration forums, such as New York's REV Connect or More Than Smart forums in California.

REGULATORS:

- Encourage collaborative engagement between the utility and other stakeholders to develop solutions with broad support before formal proceedings begin.
- Clearly state regulatory preferences and objectives for demonstrations to provide guidance for successful project development.
- Support utilities moving quickly in order to avoid alienating small, innovative technology providers.

TECHNOLOGY PROVIDERS:

- Communicate the value proposition that allows the utility to conduct an integrated demonstration project addressing business models, pricing, and customer adoption rather than focusing on an isolated technology offering.
- Form partnerships with other providers, when needed, to craft holistic solutions for utilities.
- Productively engage in creative and iterative discussions with utilities and other stakeholders to develop innovative solutions. Recognize that these may not always directly yield a project opportunity, but they are critical to support broader innovation for the electricity industry, which will ultimately create more opportunities for new solutions.
- Demonstrate to utilities a willingness to share in the risks and rewards of innovative projects, with new business model proposals outside of traditional rate-base investment.

06 CROSS-UTILITY COLLABORATION

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CROSS-UTILITY COLLABORATION

SHARE BEST PRACTICES AND LESSONS LEARNED AMONG UTILITIES TO ACCELERATE EFFECTIVE INNOVATION

Many utilities around the country are facing similar challenges in integrating new distributed technologies and evolving new business models, and they stand to benefit from each other's learning and best practices, especially as they pursue pilots and demonstrations that evaluate similar concepts and technologies. The electric power industry is unique in that competitive pressures across utilities are slight, given each company's regulated monopoly in its service territory. This enables collaborative sharing of lessons learned and best practices not common to most industries. And yet, despite frequent cross-utility communication that occurs through personal connections or industry groups, the wide range of lessons learned through grid and customer innovation programs is not well understood across the industry. Furthermore, regulators do not consistently require utilities seeking approval of innovation projects to present lessons learned and precedents from other jurisdictions that inform the new project design. Improving the exchange of learning could improve innovation best practices, allow utilities to build on the results of each other's pilots, and inform public discourse around regulatory decisions and energy planning.

Effective cross-utility learning is hard. Ironically, the wide range of industry conferences and technical reports makes it hard to know where to look for the important takeaways relevant to a given utility. Some utilities are quite sophisticated in deploying innovative demonstrations, while others have been less effective, creating an imbalance in capabilities that leaves some utilities reluctant to expend effort engaging with their peers and neighbors. And while some utilities have effectively collaborated with in-state peers, they often lose sight of what others are learning around the country. Large industry groups aid in broad coordination of research but often lack the focus needed to address specific utilities' needs.

ARRA SMART GRID LEARNING

The 2009 American Recovery and Reinvestment Act (ARRA) was a massive driver of investment in a modernizing grid, funding over $3 billion in smart grid assets and $600 million in novel demonstrations. The broad learning of projects supported by ARRA illustrates the challenge of effective cross-industry collaboration. On the one hand, the Consumer Behavior Studies conducted across 10 utilities not only resulted in detailed public reporting of results from each utility, but also resulted in concise synthesis reports from the Department of Energy highlighting major lessons learned. On the other hand, the 32 smart grid demonstrations left participating utilities with valuable learning, but nonparticipating utilities report a lack of awareness of the lessons learned from around the country. Individual utilities have little incentive for distilling and sharing their lessons learned, and the large number of disparate projects makes it difficult for any one party to have a clear view of the full array of learning.[12]

For instance, utilities historically collaborated on technology R&D, but the newer topic of business-model innovation so far lacks the same level of engagement. As a smaller subset of utilities avidly pursue innovative business models, they gain less from industry-wide forums that are focused on more broadly applicable learning.

To enhance collaboration and information sharing, utilities, regulators, and industry stakeholders can segment, synthesize, and share.

INCENTIVES FOR COLLABORATION

While the electric power industry at large would benefit from increased sharing and synthesis of information and learning, no individual entity is sufficiently incented to catalog, curate, and synthesize demonstration results across many utilities. Individual utilities would find the effort needed for a comprehensive approach too costly to justify by means of the benefits accruing to them alone. Industry advocates and nonprofits typically find such efforts to be lower priority than other projects competing for limited funding. Industry research groups like Electric Power Research Institute have traditionally played a related role in advancing research and development for member organizations through independent experimentation, but efforts to curate learning from across utility pilots have been limited. Such groups are likely best positioned to play this role in the future, but can evolve to meet different needs only if member utilities clearly communicate the gaps in current resources.

SEGMENT

All utilities do not share the same concerns, goals, and context. In addition to industry-wide groups, utilities can form coalitions of like-minded utilities facing similar challenges to collaborate on effective solutions. For instance, New York utilities are seeking innovative new business models in response to the REV proceeding. While they already collaborate on shared learning in building distribution platform business models, they could benefit from greater collaboration with utilities like Avista, which is testing its own platform models, but does not typically exchange learning directly with New York utilities.

SYNTHESIZE

There is an overwhelming array of information on results from pilot projects, available through individual project reports and a scattered array of databases that catalog results. These databases generally lack effective curation and synthesis of the most meaningful results, or easy means to find and compare projects across key metrics (e.g., customers served, cost, energy impacts). Recognizing this gap, research groups, government agencies, and thought leaders could curate the most important learning tailored to specific needs into brief and easily accessible reports, organized and searchable for easy access by topic or relevant metrics.

SHARE

When utilities publicly share their lessons learned from pilots and demonstrations, other utilities, regulators, and technology providers benefit from learnings that inform projects elsewhere. However, sharing these insights requires time and resources from the utilities, without promise of reciprocal benefit. Recognizing this, utilities forming small coalitions can set expectations for their peers of reciprocal sharing, and regulators can set the expectation that utilities should publish lessons learned at a regular frequency.

RECOMMENDATIONS

UTILITIES:

- Segment the utility industry to identify others facing similar challenges and context. Seek out these utilities for collaboration and shared learning, and build coalitions for sharing best practices.
- Seek out relevant learning from other utility programs at the outset of designing a pilot or demonstration. Incorporate lessons learned in your own project design or, where possible, build on others' results to skip the pilot or demonstration phase and move more quickly to rolling out a larger program.
- Develop plans for evaluation, measurement, and verification and for disseminating pilot results from the outset of project design.

REGULATORS:

- Direct utilities to publicly share lessons learned from pilots and demonstrations, including recommendations for other utilities and opportunities for improvement, with allowances for

intellectual property protection where needed.
- Create the expectation that utilities should incorporate lessons from across the industry into a project coming before regulators for approval, in order to minimize redundancy in pilots and demonstrations.
- Encourage utilities to promote and share their work with other utilities around the country in industry forums.

EXTERNAL RESEARCH GROUPS, THOUGHT LEADERS, AND GOVERNMENT AGENCIES:

- Synthesize the most important learning tailored to specific questions, in brief and accessible reports, to help utilities navigate the wide array of information available to them. Curate the information provided to highlight major takeaways and key metrics, and segment these reports to target specific concepts and business models of interest.

DER PROVIDERS:

- Take advantage of similar situations across utilities to intentionally make connections between utility project champions, leverage individual utilities' successes with your technologies, and reach scale faster.

07 CONCLUSION

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CONCLUSION

The need for utilities to innovate will only continue to grow as low-cost distributed technologies evolve, customer demands for new solutions grow, and regulators launch more market transformation efforts. Utilities that fail to innovate meaningfully risk disruption at the hands of new market entrants. And all stakeholders rely on utilities to test the most innovative, comprehensive, and integrated solutions. Today's wave of pilots and demonstrations, covering ground from virtual power plants and DER dispatch optimization to new utility business models and transactive energy, will test utilities' ability to meaningfully advance a new set of solutions. If early innovators are successful in designing effective projects in support of their strategic road maps, they can set the course for industry transformation. If they fall into pitfalls with incomplete demonstrations, lack of strategic clarity, and unproductive stakeholder disputes, the pace of energy system transformation will suffer.

Utilities, regulators, and technology providers around the country aspiring to innovate for an affordable, reliable, low-carbon energy system should deliberately plan their approach to innovation, adhering to best practices across the five themes highlighted throughout this report:

1. **Strategic planning:** Embrace a strategy for energy system transformation and craft a complementary road map for innovation.
2. **Designing to scale:** Design pilots and demonstrations to maximize learning and prepare for full-scale deployment.
3. **Organization:** Create leadership support and accountability, dedicated resources, and cross-functional collaboration within the utility for effective innovation.
4. **Stakeholder engagement:** Collaborate effectively across industry stakeholders to design and execute meaningful projects.
5. **Cross-utility collaboration:** Share best practices and lessons learned among utilities to accelerate effective innovation.

RMI's vision is for a clean, prosperous, and secure low-carbon future. Achieving this vision will require increased adoption of leading technologies, new approaches to operating the energy system, and a significant shift in the nature of energy infrastructure investments. These all require transformative change and innovation in the utility industry and evolution of the utility business model. Leading utilities are now embracing this transformation, and today's meaningful pilots and demonstrations will bear new models for our future energy system.

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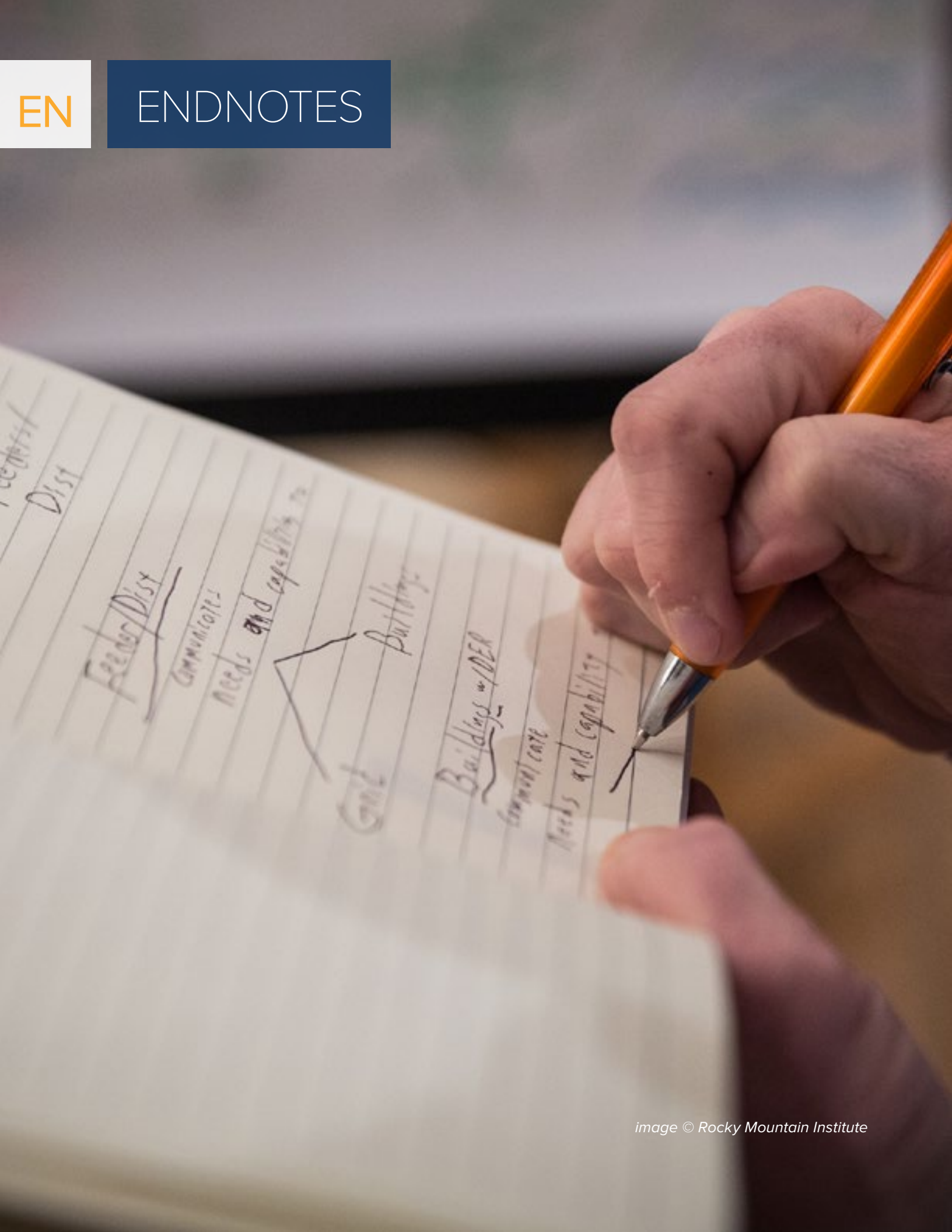
ENDNOTES



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