Program Approaches for Fostering Innovative Market Transformation

Rebecca Rothman, VEIC
Laura Capps, Efficiency Vermont / VEIC
Ezra McCarthy, National Grid
Lara Bonn, Efficiency Vermont / VEIC

ABSTRACT

New, massive federal funding for clean-energy measures is fueling the chances for rapid, next-decade market transformation in customer energy use. But instead of thinking in terms of technologies only—whether weatherization, appliances, heat pumps, electric vehicles, or natural refrigeration—what if clean-energy programs were to target their own methods for market transformation? Three program administrators have collaborated on this strategy, using considerations of equity to streamline their research and program development systems to meet increasing energy demands, reduce greenhouse gas emissions, and deliver customer value.

Programs in Vermont, Massachusetts, and California applied principles from other disciplines to see if they could increase program effectiveness and the speed with which an initiative within a program could get to market, resulting in delivering innovation quickly within the U.S. clean-energy infrastructure. This in turn would position programs to optimize federal funding opportunities to rapidly achieve system and State energy goals.

Each program administrator streamlined scanning, screening, and developing next-generation energy efficiency, demand reduction, energy resilience, and carbon reduction solutions—all grounded in equity considerations. The programs differed in organizational dynamics, regulatory and contract requirements, portfolio management, and funding streams. They all, however, emphasized the value of partnerships in delivering comprehensive services.

This paper examines how these programs' resulting frameworks for emerging technologies and services can apply to nearly any program. It offers replicable examples of tested processes for innovation in achieving market transformation with fast fails and scalable successes.

Introduction

Between 2023 and 2038, the American Rescue Plan Act (ARPA), the Infrastructure Investment and Jobs Act (IIJA), and the Inflation Reduction Act (IRA) will collectively inject over $1.6 trillion into advancing the energy transition (Blaeser et al. 2024). Though this is an unprecedented investment in the energy efficiency industry by the United States' (U.S.) federal government and will accelerate the transition to thermal and transportation electrification and renewable energy production, this investment pales in comparison to funding currently needed for energy efficiency programming to meet utility carbon emissions reduction goals (IEA 2021). Refining program administration and design practices is one pathway to achieving greater impact per dollar spent. This paper presents three models for accelerating the identification, testing, and adoption of emerging technologies and services to achieve market transformation.

Energy efficiency programs focus on market transformation—creating and accelerating sustainable adoption of new technologies and services through strategic interventions in markets based on market conditions, values, opportunities, and barriers (ACEEE 2010). Market

transformation delivers lasting ratepayer benefits beyond specific programs, incentives, or energy savings claims. A transformed market is a market where the removal of energy efficiency program resources and interventions will not cause loss of market adoption, enabling those resources to be applied elsewhere.

The traditional approach to energy efficiency programs involves teams piloting individual measures, which can result in isolated savings. While this approach was sufficient to bring the energy efficiency landscape to its current state, innovation is necessary to take full advantage of new resources in order to accelerate progress toward ambitious energy goals. These three models for innovation, adapted from the tech industry, provide pathways for the next phase of energy efficiency program evolution. Modernized, innovative approaches are essential to maximize the impact of the U.S.'s unprecedented energy transition investment.

VEIC

VEIC offers high-impact energy solutions that decarbonize buildings, transportation, and utility grids, crafted through an equity lens. VEIC's programs and pilots optimize energy use, reduce energy burdens for low-income customers, and advance emerging technologies and innovative program models. VEIC administers three large-scale sustainable energy programs, Efficiency Vermont, Efficiency Smart, and the DC Sustainable Energy Utility (DCSEU); and serves on the program administration teams for CalNEXT, Focus on Energy (Wisconsin), Hawai'i Energy, and TECH Clean California (VEIC 2024).

CalNEXT

Program overview. CalNEXT, the State of California's Statewide Emerging Electric Technology Program (SWEETP), uses ratepayer dollars to "identify and evaluate new technologies and program delivery mechanisms" that can deliver energy efficiency program benefits. Under contract with Southern California Edison, a third-party team composed of six organizations administers the program in its newest iteration, serving all sectors. The program's objectives consist of communicating technology opportunities to upstream stakeholders (manufacturers and entrepreneurs), communicating to downstream stakeholders about overcoming barriers to scaling technology deployment, and advancing California's ever-evolving decarbonization, equity and grid priorities—while executing 170 research projects in six years. For CalNEXT, innovation is important because of the regulatory landscape, the program landscape, and breadth of topics covered.

The California regulatory landscape is highly dynamic. Policy from many different sources can influence program technology scaling: legislative action, the California Public Utility Commission (CPUC), the California Energy Commission (CEC), the California Air Resource Board (CARB), the California Department of Housing and Community Development (HCD), the Department of Health Care Access and Information (HCAI), and a vast number of regional, district, and municipal Authorities having Jurisdiction (AHJs). A variety of upstream programs focus on early-stage research and development of technologies; government-led programs like CEC's EPIC program and DOE programs, as well as NGO and private sector technology accelerators, can be the source of program inputs or the destination of program outputs. Contemporary emerging technology programs such as Gas Emerging Technologies Program and Demand Response Emerging Technologies program have the potential for scope overlap. Downstream programs such as Codes and Standards programs; three Investor-Owned

Utility (IOU) energy efficiency programs; California's Market Transformation Program, state run programs like TECH, BUILD, and the Equitable Building Decarbonization program; Community Choice Aggregator (CCA) programs; and regional/municipal incentive programs are the destination of program outputs, but can also be inputs. Finally, because CalNEXT covers all sectors, there is a volume of specialty stakeholders and stakeholder groups with unique insight and impact on the systems they operate in, from affordable housing developers and housing advocates to dairy farmers and grocery store chains. Ultimately ratepayer dollars are used to search for technology solutions that will have ratepayer benefits, and with rate pressures rising, this is a serious responsibility for a program. To rise to the challenge, VEIC has employed the concepts of ideation, storytelling, and continuous improvement.

Ideation. Ideation is a creative process often used in the tech industry, where designers generate ideas in sessions (IDC 2024). As a step in the design thinking framework, it is intended to provide new angles for solving a problem by focusing on quantity of ideas (vs quality) and puts little to no boundaries on the types of ideas that are brought forward. Asking for research ideas from individual subject matter experts (SMEs) produced project concepts that built on their knowledge and could be relevant to the program. To maximize impact VEIC sought ideas that responded to CalNEXT's needs, were relevant to the current California landscape, and could be progressed by a determined SME or group of SMEs. Loosely borrowing steps two through four of the five-stage design thinking process shown in Figure 1, technology area leads defined the ideation prompts with an opportunity analysis in which they reviewed the CalNEXT Technology Priority Maps for the program, selected a few categories they felt were high priority, and answered the following questions:

- How does this technology support, expedite, or make equitable the energy transition in California?
- What is preventing the technology from scaling?
- What research might be done to facilitate technology transfer?
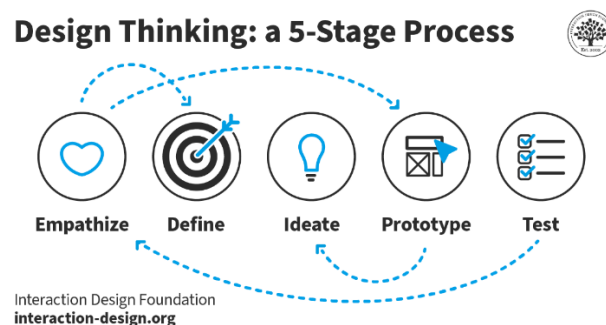- What team members might be able to contribute to ideation on the category?

Figure 1: A five-stage design thinking process. *Source:* Interaction Design Foundation 2024.

Next, VEIC designed and facilitated a remote ideation session using Microsoft Teams and Miro. In this session, technology area leads gave an overview of the problem in the technology categories, and a larger group used digital sticky notes to propose a large number of research ideas. Participants then broke into smaller groups to clarify notes that were unclear and did a digital dot vote to see what ideas were resonating the most. Since people have biases toward their own ideas (Sting et al. 2019), VEIC separated the ideation session from the idea

assessment. In the assessment, the group used a spreadsheet to evaluate ideas against alignment (high, medium, or low) with:

- CalNEXT (required) – alignment with CalNEXT program
- Concept clarity – project scope of work clarity
- Impact – project impact including benefiting Disadvantaged and Hard to reach communities, supporting utility programs, reducing greenhouse gas emissions, etc.
- Strategic focus – project alignment with VEICs strategy for creating impact
- Employee innovation – opportunity for VEIC subject matter experts to grow
- Geographic impact – opportunity for VEIC to reach desired geographic areas
- Future work opportunity – opportunity to generate more impactful work

From this assessment, VEIC was able to cull 100 ideas from the ideation session to a Top 10 that could be "prototyped." For VEIC's purposes, prototyping a research project idea meant identifying relevant subject matter leads, a research question, research type, key partners, and rough level of effort to see if it was realistic for the team to move forward with further development of the project proposal. In some cases (similar to the design thinking framework) VEIC held a secondary ideation/brainstorming meeting to hash out some details for an idea that had been "prototyped." Relative to other ideas that came to the CalNEXT program for review, the ideas surfacing through this process were unique, looking to address technology problems that had been relatively untouched by previous program research. There were a host of secondary benefits: it was a great way to reinvigorate latent innovative spirit in the team, the transparency and strategy made team members feel the selection process was fair and participatory, and the team now has a coffer of ideas that they can go back to and build on as appropriate.

Storytelling. Storytelling has been used for millennia to convey information, inspire people, and connect people. In modern society where individuals can drown in information, storytelling helps organizations (often their leadership and marketing teams) drive change by painting a picture of why change is needed and how a vision can be realized (Frei et al. 2023) and connect with customers by communicating value (Hatter 2022). With CalNEXT, VEIC expects to have 170 projects completed over a 6-year period, across many sectors and technology types that are relevant in different ways to different stakeholders. At a program level, it can be nearly impossible to communicate the value and impact of 170 projects to a diverse stakeholder audience, and it can be almost as hard to focus and inspire subject matter experts from six implementing organizations to create the impact the team wants to realize. CalNEXT tackled this communication conundrum with storytelling.

VEIC began by reviewing the project submissions from the first year and portfolio to see what research themes were coming up (or were notably missing). From that review, VEIC named 10 themes that might be places where the CalNEXT program can have impact. To craft success stories for portfolio themes, first the program leads discussed what the key components might be for telling the story. VEIC decided that it was important to paint a picture of where the team is starting (beginning), where the team is going (end), who they need to get there (characters in the story and audience), risks/concerns (conflict), impacts (the why), and already identified research ideas (plot elements). Program leads worked with their teams to get feedback in these areas and the pieces were aggregated into a series of strategic stories to direct the team, inspire future projects, and form a basis for stakeholder communication. This device is still a work in progress,

but at the end of 2023 a significant group of projects were finalized that will allow the team to practice using these stories for communication.
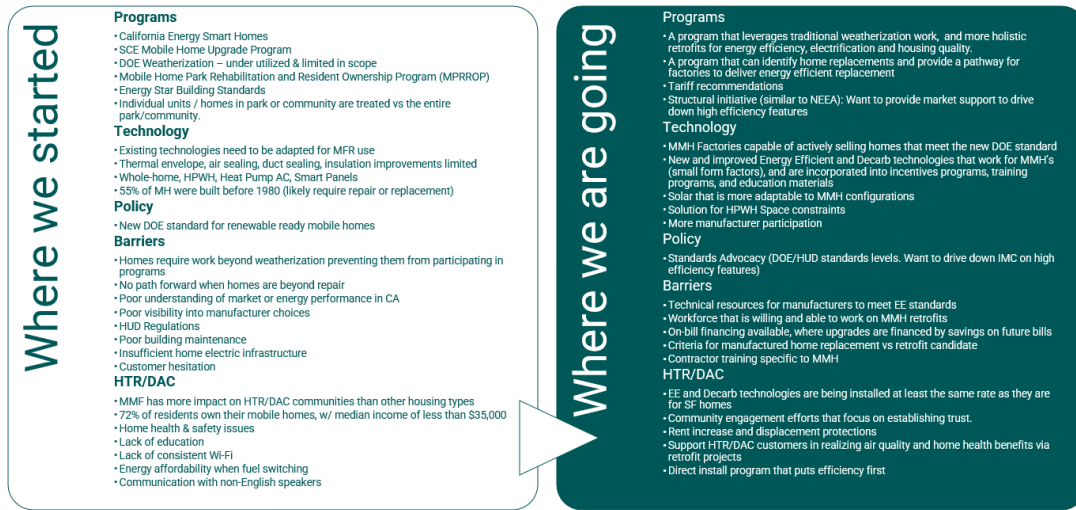
Where we started

Programs
- California Energy Smart Homes
- SCE Mobile Home Upgrade Program
- DOE Weatherization – under utilized & limited in scope
- Mobile Home Park Rehabilitation and Resident Ownership Program (MPRROP)
- Energy Star Building Standards
- Individual units / homes in park or community are treated vs the entire park/community.

Technology
- Existing technologies need to be adapted for MFR use
- Thermal envelope, air sealing, duct sealing, insulation improvements limited
- Whole-home, HPWH, Heat Pump AC, Smart Panels
- 55% of MH were built before 1980 (likely require repair or replacement)

Policy
- New DOE standard for renewable ready mobile homes

Barriers
- Homes require work beyond weatherization preventing them from participating in programs
- No path forward when homes are beyond repair
- Poor understanding of market or energy performance in CA
- Poor visibility into manufacturer choices
- HUD Regulations
- Poor building maintenance
- Insufficient home electric infrastructure
- Customer hesitation

HTR/DAC
- MMF has more impact on HTR/DAC communities than other housing types
- 72% of residents own their mobile homes, w/ median income of less than $35,000
- Home health & safety issues
- Lack of education
- Lack of consistent Wi-Fi
- Energy affordability when fuel switching
- Communication with non-English speakers

Where we are going

Programs
- A program that leverages traditional weatherization work, and more holistic retrofits for energy efficiency, electrification and housing quality.
- A program that can identify home replacements and provide a pathway for factories to deliver energy efficient replacement
- Tariff recommendations
- Structural initiative (similar to NEEA): Want to provide market support to drive down high efficiency features

Technology
- MMH Factories capable of actively selling homes that meet the new DOE standard
- New and improved Energy Efficient and Decarb technologies that work for MMH's (small form factors), and are incorporated into incentives programs, training programs, and education materials
- Solar that is more adaptable to MMH configurations
- Solution for HPWH Space constraints
- More manufacturer participation

Policy
- Standards Advocacy (DOE/HUD standards levels. Want to drive down IMC on high efficiency features)

Barriers
- Technical resources for manufacturers to meet EE standards
- Workforce that is willing and able to work on MMH retrofits
- On-bill financing available, where upgrades are financed by savings on future bills
- Criteria for manufactured home replacement vs retrofit candidate
- Contractor training specific to MMH

HTR/DAC
- EE and Decarb technologies are being installed at least the same rate as they are for SF homes
- Community engagement efforts that focus on establishing trust.
- Rent increase and displacement protections
- Support HTR/DAC customers in realizing air quality and home health benefits via retrofit projects
- Direct install program that puts efficiency first

Figure 2: CalNEXT Strategic Story Arc for Manufactured and Modular Housing. S*ource:* VEIC 2024.

Continuous improvement. "Continuous improvement" goes by different names and has a role in a variety of management frameworks; it is a particular focus of the Japanese style of lean management, where it is referred to as "kaizen" (EPA 2023). VEIC has embedded continuous improvement in the core of the CalNEXT program through the Annual Technology Priority Map and the Scanning and Screening Process (the program's project selection process). Given the dynamic nature of the regulatory and program landscape in which CalNEXT operates, continuous improvement is one of its most important components because it allows the team to iterate and adjust the program to deliver on its objectives despite changing conditions.

Each year, the Program gathers subject matter experts in each of its Technology Areas (HVAC, Water Heating, Whole Building, Process Loads, and Plug Loads). Each group of five to ten Technology Area SMEs considers how research, codes and standards, product availability, regulations, and programs have changed in the past year and update the Technology Priority Maps to reflect current research needs. The Technology Priority Maps act as a communication device for stakeholders, researchers, and the project selection process, and these annual updates prevent the work in CalNEXT from getting out of sync with the landscape it is operating in. Through the Scanning and Screening Process, the team solicits process satisfaction feedback from people who submitted project ideas to the program through a quarterly submitter survey. The team seeks feedback from the project evaluators through scoring calibration, which consists of reviewing program scoring data for anomalies or potential misalignments; these might be outlier scores, large standard deviations, or comments that don't align with either the score or rubric. Lead evaluators provide summarized data and scoring examples, discuss potential misalignments, and offer feedback at a scoring calibration meeting. The team also distributes a quarterly Scanning and Screening Report and requests feedback from program beneficiaries. Feedback from these sources is evaluated, solutions are developed, and solutions are incorporated into the process as appropriate, similar to steps used in kaizen as shown in Figure 3. This approach has allowed the project selection process to mature with the program and provided a forum for stakeholders to stay informed, engaged, and aligned.

Figure 3: Kaizen cycle for continuous improvement. *Source:* Daniel 2021.

Applying the principles of ideation, storytelling, and continuous improvement to the CalNEXT program has allowed the program to be thoughtful about how the progression of 170 project will lead to action. For example the portfolio has roughly 20 projects that support energy efficiency and decarbonization in multi-family residential buildings. In preparation for our 4th year of project selection, we have conducted a gap analysis that compares the current portfolio make up and project learnings to the story for the Multi-Family Residential theme. The analysis identifies the types of projects needed to realize technology transfer for this market segment, and will filter ideas that come out of ideation activities. The continuous improvement efforts we have applied to our portfolio planning and project selection processes, has reduced the time spent working on ideas that will not achieve program goals. Research projects completed through the program have lead to new and updated measure packages, influenced program design, and have supported California's Market Transformation Program.

Efficiency Vermont

Created in 2000 as the nation's first energy efficiency utility, Efficiency Vermont drives Vermont's transition to a more affordable, low carbon energy future through education, incentives, and support for the clean-energy workforce (Efficiency Vermont 2024). Early on, Efficiency Vermont recognized that the "internal barriers and external service gaps created by [program administrator's] programmatic definitions were both impeding the ability to consistently affect the market and creating unnecessary confusion and barriers for customers and strategic partners" (Chiodo and Hamilton 2004). In 2003, Efficiency Vermont moved to a new operating structure and established the following teams, using roles and responsibilities to drive results.

- Market Strategy Teams set long-term vision, develop goals, and facilitate the implementation of market-wide services, working at the strategic and tactical level.
- Market Teams implement programs across broad segments of the market, such as ski resorts or schools.
- Strategic Partner Teams focus on groups of market actors, such as design professionals and trade allies.
- Technical Solutions Groups (TSGs) understand and drive adoption of the new technical solutions or technology evolutions.

The market-based approach to organizing resources worked well for Efficiency Vermont and led to market transformation in efficient lighting technologies (Efficiency Vermont 2023). In recent years, energy efficiency savings are more challenging to achieve, as the market has transitioned from highly inefficient baseline technologies and codes to relatively efficient ones. The great success of energy efficiency market transformation resulted in harder-to-achieve further energy savings (Efficiency Vermont 2023). Additionally, early adopters and easier-to-reach customers have been served, leaving those customers with increased logistical challenges and/or different value propositions, which often require higher incentives (Efficiency Vermont 2023).

Simultaneously, the energy industry is undergoing rapid transformation, and federal funding opportunities such as American Rescue Plan Act, the Infrastructure Investment and Jobs Act, and the Inflation Reduction Act are accelerating the transition (Council of Economic Advisors 2024). Efficiency Vermont supports customers and Vermont's energy system in this evolution through the delivery of energy efficiency and flexible load management programs, long-term resource planning, and emerging technology development. As customers electrify their thermal and transportation loads, their impact on grid stability (or instability) will increase, as will their dependence on the grid for energy resilience. Simultaneously, increased severe weather events and reliance on intermittently available renewable energy for power generation present greater risk to grid reliability (King 2024).

The combination of more difficult-to-earn energy savings with the accelerating energy system transition toward electrified thermal and transportation loads—powered by intermittently renewable energy sources—necessitated a redesign in operating structure, once again, to break down internal barriers and external service gaps. In 2018, Efficiency Vermont disbanded the market strategy teams, which were increasingly focused on short-term implementation efforts and unable to spend the time needed to develop effective long-term plans and identify emerging market opportunities. Efficiency Vermont then increased resources to strategic partnerships, known as Partner and Customer Engagement (PaCE); regulatory efforts; and market teams, known as programs and implementation, with a one-to-three-year planning and implementation horizon. It also established two new teams: the Project Management Office, supporting internal project and change management, and the Emerging Technologies and Services (ETS) team, leading five-to-ten-year strategic development.

ETS developed a robust market scanning, prioritization, assessment, and research and development process for innovative[1] technologies and services, grounded in customer values and market viability. The team deeply engaged the national labs, national and regional industry

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[1] In this context, "innovative" refers to technologies that are new and/or unproven in the local market and which are likely to cause significant market disruption or require significant development to meet market and program requirements.

associations, manufacturers, customers, supply chain actors, and other program administrators to share industry best practices and technology trends and conduct collaborative research and demonstration projects.

Specific examples of these engagement activities include the U.S. Department of Energy Technology Roadmaps, the Consortium for Energy Efficiency's Emerging Technologies Collaborative, the Northwest Energy Efficiency Alliance, National Grid, SMUD, CalFlexHub, and CalNEXT collaboration. ETS also participated in the statewide Utility Working Group, ride-alongs and field site visits with PaCE team members, direct customer engagement, and collaboration with the TSGs on technical gaps that require market transformation solutions. ETS-led market assessments varied in scope, consisting of:

- Market characterization reports
- Systems mapping
- Cross-disciplinary strategy maps
- Human-centered design and customer insights interviews and panels
- Value proposition design
- Business model canvases
- Market transformation planning

The team provided dedicated space for exploring difficult and ambiguous customer challenges and ideas of all sizes for long-term market development, in alignment with Efficiency Vermont's strategic goals. In addition, the team explored ways to evolve the industry to redefine those goals. Figure 4 depicts the ETS process for this work.

Figure 4: Efficiency Vermont's Emerging Technologies and Services assessment process. *Source: Efficiency Vermont 2018.*

In the concept development phase, the ETS team handed off semi-developed products and services to the programs and implementation team. Concept development sometimes involved running a demonstration or pilot project to field-test new technologies and service delivery approaches. For the resulting proposed products and services to be adopted by the programs and implementation team, ETS's idea collection and screening process needed to incorporate pain points recognized by programs and implementation. ETS accomplished this alignment through regular monitoring of Voice of the Customer reports, noting partner-reported challenges from the PaCE team, attending internal engineering meetings that discussed customer project challenges, direct customer and market actor engagement, and participating in annual program and implementation planning. Additionally, ETS team members worked collaboratively with cross-divisional teams on every ETS assessment.

Example projects ETS facilitated for Efficiency Vermont, with deep internal and external collaboration, are:

- Establishing a non-energy greenhouse gas metric to account for the benefits of natural refrigerants and other decarbonization projects
- Creating a weatherization-plus-health non-energy benefit adder in the program screening tool, to recognize the health benefits of weatherization and other energy efficiency measures that improve indoor air quality
- Delivering multiple millions of federal funding to improving school indoor air quality
- Dedicating resource acquisition funding for flexible load management pilots through demonstration and defining impact
- Developing an energy resilience strategy and identifying appropriate roles for Efficiency Vermont to support customers in achieving energy resilience goals
- Managing a robust portfolio of annual research and development technology demonstration pilots, such as cold climate heat pumps integrated with thermal energy storage
- Establishing baselines and unique qualified products lists, convening stakeholder groups, and giving testimony to prepare for a multi-measure controlled environment agricultural offering
- Developing a specific retrofit and incentive approach focused not on profit, but on benefits for those serving low-income customers and investment returns to low-income communities
- Creating value propositions and a multi-year smart home strategy approach to proactively plan for the lighting cliff
- Continuous innovation in heat pump (HP) technical and market application transformation strategies that span whole home ducted solutions, window HPs, rooftop HPs, and industrial HPs

These projects resulted in significant innovation development and implementation towards market transformation.

Expanding beyond Vermont. As VEIC identifies opportunities for innovative growth across its sustainable energy programs and program administration teams, coupled with a rapid influx of federal funding for this work, the organization seeks to take the success of the ETS team and apply it organization-wide, further breaking down internal silos and bridging external market gaps, and bringing more opportunities back to each of its customer markets. To accomplish this, VEIC moved the ETS team (now known as Emerging Opportunities or EO) and the Engineering team to the corporate level and created a new corporate-wide Program Design team. The new Enterprise Services division is composed of Emerging Opportunities & Program Design (EO&PD), Operations Support (previously known as Customer Support), and Engineering.

In their new role, the EO team is facilitating the VEIC-wide emerging opportunities strategy. The team develops the emerging opportunities that match VEICs unique capabilities and equity-centered approach in energy efficiency, building decarbonization, transportation electrification, and clean & flexible grid. Implementing the EO strategy involves:

- Developing a framework for tracking and prioritizing emerging opportunities across VEIC, based on customer needs, contract requirements, market applicability, equity, greenhouse gas and energy system impact, and VEIC expertise
- Creating ten-year market transformation strategies for prioritized emerging opportunity categories and associated three-year implementation plans for specific opportunities
- Establishing standard operating procedures and processes for EOMT (Emerging Opportunities and Market Transformation) work across VEIC, including instituting an internal knowledge base and help desk for specific technologies and services
- Engaging partners in new funding opportunities for cross-program research and development, market experiments, demonstrations, and pilots
- Creating staff development and mentorship programs specific to EOMT skills and technical concentrations
- Sharing lessons broadly with industry stakeholders to accelerate learning and new technology adoption
- Matching customer, market, and divisional gaps and goals to opportunities across the organization and feeding those customer drivers and lessons back into the coordinated central development of priority areas

To support these changes to teams and divisions, EO&PD is leading the creation of a new centralized life cycle development process (LDP). The Program Design team facilitates the LDP, infusing it with external industry insights, such as outputs from the EO Strategy, VEIC strategic direction, and client operating environments. Inclusion of the EO strategy and LDP takes an idea management and process structure to a place where VEIC can value and adaptively prioritize work based on externalities. Overall, the LDP creates the central infrastructure and design approach that will create transparency, efficiency, milestone tracking, templates, resourcing, and grounding in the external operating environment, all while staying flexible, dynamic, and customizable to any region or customer need.

National Grid

For decades, new efficiency measures were either long-standing or dependent on a fog of assumptions, baseline conditions, and hand-waving. Sometimes, measures had sufficient documentation; other times, engineers and evaluation teams lacked such guidance. Program teams developed measures in silos, adopted them directly from vendors, or identified them through first-of-a-kind custom projects. Ideas and concepts floated inside utilities for a time until they could find an appropriate landing spot. The discovery and development process was never linear, making it unclear whether a measure's baseline assumptions were correct, which existing situations or customers a measure might apply to, or whether under- or over-precision was appropriate for the measure definition. Efficiency program teams were not, however, the only ones developing new products and offerings for customers; they knew there must be a better way. By borrowing a new product development approach from the tech industry, National Grid has accelerated getting clean-energy measures to market for customers, helping customers more rapidly adopt energy efficiency, demand reduction, and decarbonization.

The first step was to establish an in-house innovation team whose primary task was to identify, develop, and launch new products and solutions for customers. Traditionally, a program manager, an engineer, or an analyst would need to develop new measures in addition to their day job, which resulted in progress being made in fits and starts rather than in steady advancement.

To take a different approach, National Grid created a Growth and Development team in their Customer Energy Management organization. Customer Energy Management in Massachusetts is the umbrella name for energy efficiency, demand reduction, and decarbonization portfolios planned and implemented in coordination with the other five Massachusetts Program Administrators (PA) through statewide Three-Year Plans and marketed to customers under the banner of Mass Save®. The statewide portfolio of programs is offered to all customers of the Commonwealth, and the PAs strive for consistency across the various service areas. As such, new statewide product offerings need to be coordinated and delivered similarly across the six different companies, which requires monumental collaboration across planning, evaluation, strategy, marketing, and implementation teams. Coordination takes time; the PAs work together daily to make sure that the large, mature portfolios continue to disperse the roughly $1 billion of annual incentives for customer efficiency, demand reduction, and (increasingly) decarbonization.

Through a combination of Technical Specialists and Product Developers, the Growth and Development team provides additional expertise to screen, perform due diligence on, develop, and ultimately launch a new clean-energy product. PAs then adopt this new measure or offering for their customers, continuing to grow their portfolios. With a slightly longer planning horizon than the majority of the portfolio staff, the Growth and Development team can look beyond the current Massachusetts Three-Year Plan term and continue to research and develop new ideas across plan terms for future inclusion.

The Growth and Development team formalized a new product development process. For over a decade, National Grid used a technology-focused deep subject matter expertise approach, wherein a program manager for a certain technology type—e.g. lighting, HVAC, or new construction—developed measures within their area of expertise, in isolation. In hindsight, this led to very niche measures, which often did not have wide applicability, or a high volume of projects. Large swaths of portfolios were not getting development attention, and there was little cross-pollination across sectors, fuels, and programs. In order to broaden the aperture and routinize clean-energy measure development, the Growth and Development team borrowed and adapted a new product development process typically used in the technology and software sectors, and fit it for the semi-physical world that clean-energy measures inhabit.

The Optimal Product Process™, developed by the 280 Group, a product management training and consulting firm, and shown in Figure 5, was the basis for what the National Grid team created. By using a linear process from new idea intake through launch, the Growth and Development team can identify, prioritize, and develop clean-energy products to deliver benefits for customers.
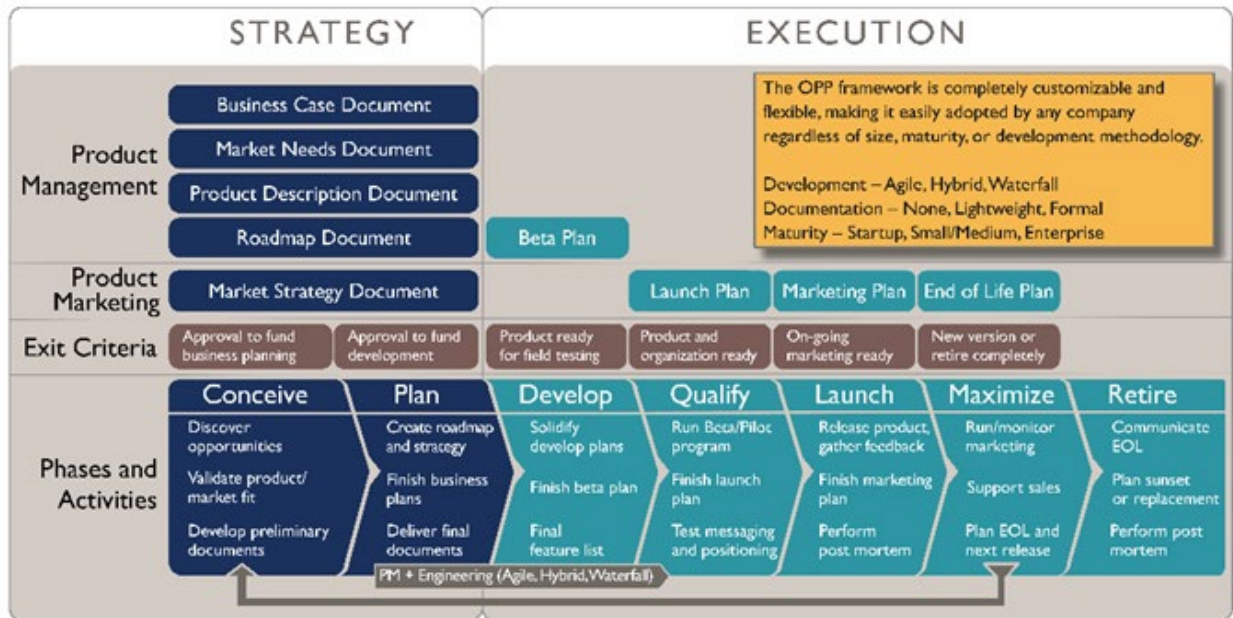
Figure 5: 280 Group Optimal Product Process

Regulatory Values and Saying "No" Matters

National Grid's process starts with the Intake stage. While there are no bad ideas (as the saying goes), not all fit within the bounds of the portfolio,are commercially available, and/or have demonstrable customer value. Ideas that fit within existing programs and offerings will have a quicker path to customers; ideas that expand current boundaries will take longer to establish, often requiring regulatory approvals. Intake, distillation, and judicious review are critical early in the idea screening and prioritization process. National Grid developed a common intake form with categorical classifications, comparative sizing estimates, and weighting methods based on an idea's program fit and viability, feasibility of savings, and initial impressions. When combined with a savings potential estimate, this intake form allows the team to prioritize ideas appropriately.

Not all new ideas or products can fit program portfolios in the same way. Some ideas or products can produce direct savings claimable by the programs, while others might enable indirect savings or have an immeasurable impact. Clarity about an idea or product's likely categorization allows the team to correctly size and set expectations around potential impact to the portfolio. National Grid established four pathways out of the Intake stage:

1. Concept: Commit to performing more research for fit, feasibility, and necessary understanding for a development plan.
2. Retire: If there is no near-term viability for the product within the portfolio, stop allocating resources to its development.

3. Park: The product is not ready for market or is not suitable for the existing program framework, but might be in the near term. Specify conditions that must change for the product to move back to the Intake stage.
4. Referral: Identify the product's place in an existing program or offering.

Many new ideas end up in the Retire,, Park, and Referral stages. Saying "no" or "not yet" is often uncomfortable, but judicious review and prioritization is critical to moving the most impactful new products forward. With limited resources, focusing on things that can contribute to the portfolio and benefit customers is paramount.

Have an Exit Strategy

Using the new product development process creates structure for all new ideas and allows for comparison and prioritization. By forcing all ideas through the same screening and comparative analysis, National Grid can catch well-meaning but half-formed ideas before committing significant resources. Moving to the next stages of Planning and Developing, National Grid requires a clear business case for Customer Energy Management to move the product to the programs, including tests of cost-effectiveness of close approximation. The business case requires a clear path to customer value and portfolio inclusion. If a demonstration is required, it must be for the discovery of a stated characteristic or value; criteria must be clear for either moving the idea or product to the next stage or retiring it. Demonstrations cannot continue indefinitely, like zombies; teams must plan for the exit before they start.

Standardizing Customization

Assuming a supportive business case and viable new clean-energy product, there are still many pieces to its Qualify and Launch stages before it is offered to customers. National Grid's Growth and Development team finds that while the main pieces are the same, the individual considerations for any given new product are bespoke: different combinations and collaborations are required when developing prescriptive savings, incentive levels, marketing, vendor onboarding, information technology (IT) setup, and other elements. At the Launch stage, the new clean-energy product leaves the Growth and Development pipeline. Program Managers manage this new offering to customers through existing program delineations, tracking and reporting against National Grid's spending and savings goals.

The Business Case for a Dedicated Growth and Development Team

Using this development process, National Grid has delivered simple energy efficiency prescriptive measures typical to programs for years. It has also launched expanded fuel-switching decarbonization measures, which focus on displacing existing customer fossil fuel use. Lastly, National Grid has stretched the bounds of what can be included in energy efficiency portfolios by making proposals to regulators for expansion into active demand reduction programs or beyond directly energy-related products to greenhouse gas reduction measures in the refrigeration management or replacement arenas. Using this modified new product development process, National Grid's Growth and Development team has launched dozens of new clean-energy products for customers and added to the portfolio of offerings Massachusetts can claim.

Conclusion

CalNEXT's program-level application of ideation, storytelling, and continuous improvement; Efficiency Vermont's formation of an Emerging Technologies and Services team; and National Grid's establishment of a Growth and Development process all prioritized collaborative innovation in the pursuit of maximum efficiency—both in program benefits and program process. While current energy efficiency practices have functioned well enough to bring the U.S. clean-energy economy to its current promising state, the climate emergency demands further market transformation. Using insights from their own business successes and tactics from other industries, these energy efficiency programs are establishing structural means to encourage the necessary innovation to maximize the benefits of energy investment.

What these programs have in common is a learning philosophy that allows them to leverage past experiences while proactively growing through new explorations. Learning organizations incentivize staff toward professional development and invest in research and demonstration that forms a basis for business development. Deep collaboration across partner organizations accelerates learning and can pool funding resources to maximize research opportunities. The collaborative approach to innovation that CalNEXT, Efficiency Vermont, and National Grid are pioneering can lead the way to next-generation advancement of clean energy in the U.S. The energy transition will require putting billions of dollars to work and has the opportunity to transform our society, but the course is not mapped—organizations and programs need to start with what they know and iterate as they learn. Balancing iteration with collaborative process investment, as these approaches to innovation have shown, can build a road map for continuing market transformation.

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