Filling the Measure Pipeline: An Examination of Six Utilities' Emerging Technology Measure Development Processes

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ABSTRACT

Energy efficiency program administrators nationwide seek emerging technologies to meet aggressive energy savings goals. This paper presents the results of a study that documented the processes used by six utilities, the four California investor-owned utilities as well as the state's two largest municipal utilities, to find and develop new measures. The study drew on in-depth interviews with 40 utility staff from the six California utilities, including Emerging Technology Programs (ETP) and Research and Development staff, program managers and directors, engineering staff, marketing staff, policy staff and staff specifically dedicated to internal measure development. These interviews were supplemented with reviews of utility documents. This study provides a valuable and unique perspective on the cross-division coordination of efforts within the California utilities needed to identify, assess and deploy new technologies. In particular, this paper illuminates how the ETP activities integrate into overall utility measure development efforts, their role within the process by which promising technologies are assessed and scored, and the other utility divisions that contribute to measure development. In addition, this paper offers a glimpse into the varied sources that California utilities reference to find new measures. We found that measure development is not a linear process, and that there are many routes by which emerging technologies can become measures. The diversity of technology sources and measure development processes across utilities contributes to the robustness of California's collective effort to move energy efficient products through the pipeline.

Introduction

The California Energy Efficiency Strategic Plan (CEESP)[1] explicitly identifies emerging technologies as a tool for achieving aggressive energy savings goals, relying on research, development, demonstration and deployment to move energy-efficient products from the laboratory into the commercial marketplace. To identify, assess and evaluate new technologies, investor owned utilities (IOUs) conduct technology assessments and other activities through the Statewide Emerging Technologies Program (ETP)[2]. However, ETP staffs do not make the final decision to adopt technologies into a utility's energy efficiency portfolio. Each IOU has a utility internal measure development (UIMD) process, which involves ETP staff as well as a broad range of other staff, through which they consider and approve measures for their portfolios. Likewise, beyond the IOUs, publicly-owned utilities (POUs) also have UIMD processes that are essential to the development of successful new measures. These UIMD processes are inherent, critical links related to the introduction of new technologies in the market. Some examples of technologies that have been introduced include tankless water heaters, evaporative pre-coolers for rooftop air conditioners and lighting controls for dimmable fluorescent lighting.

[1] For more information please see the *"California Energy Efficiency Strategic Plan, January 2011 Update"*. http://www.performancealliance.org/Portals/4/Documents/UtilProgs/caenergyefficiencystrategicplan_jan2011.pdf

[2] Energy Efficiency Statistics. 2015

This paper presents a summary of findings from a recent study Evergreen Economics conducted documenting the California utilities' UIMD processes. Evergreen compares the UIMD process used by each of the four California IOUs, and two large municipal utilities, to identify similarities and dissimilarities between them. In particular, this paper discusses how ETP integrates into the broader measure development process, how technologies are scored and assessed, the types of staff that contribute to the process and what information sources utility staff are using to identify and develop new technologies. Evergreen offers a description of each utility's UIMD process, key points of differentiation, and insight into particular lessons learned through comparison of the utility processes.

This is the first study to comprehensively document the details of the California utilities' UIMD processes and is unprecedented in that two publicly owned utilities also agreed to share their measure development processes as part of the study. The result is a comprehensive look at how technology measures are developed for EE programs collectively offered to approximately 35 million of the state of California's 38 million residents. The findings will help program administrators nationwide to refine their own approaches for identifying, assessing and deploying emerging technologies.

It is important to note that each utility has developed unique processes that assist them in identifying innovations to develop a cost effective portfolio and to attract their customer's interest in energy efficiency projects. It was not the intent of this study to identify a single "best process" that all of the utilities should implement, especially since some of the processes or elements therein are relatively new. In particular, we believe there is a benefit to having multiple types of processes, in that all the "eggs" are not in one "basket".

Research Objectives and Methods

The focus of this evaluation was to provide a detailed description of the different UIMD processes among the California utilities, in particular the evaluation aimed to:

- Document the utilities' internal measure development processes (e.g., staffing, steps/sequencing, decision-making);
- Identify information gathered for the processes;
- Identify process steps and information sources that appear to be particularly useful (i.e., lessons learned), so they can potentially be utilized by other utilities; and
- Document the sources that the utilities use to find potential new measures (excluding renewables and behavioral measures).

To achieve these objectives the Evergreen Economics team (Evergreen) conducted in-depth interviews with multiple staff members from the following utilities:

- Pacific Gas & Electric (PG&E)
- Southern California Edison (SCE)
- Southern California Gas Company (SoCalGas)
- San Diego Gas & Electric (SDG&E)
- Los Angeles Department of Water and Power (LADWP)
- Sacramento Municipal Utility District (SMUD)

The interview targets included: ETP staff, program and sector managers (i.e., operations), engineering staff, marketing staff, policy staff and staff specifically dedicated to internal measure development (e.g., Product Developers). The initial interviews were conducted in July and August of 2014; follow up interviews were conducted in December 2014 through February 2015 to clarify specific process elements. In addition to in-depth interviews, Evergreen requested relevant UIMD documentation from the utilities to inform the interviews and give context to interviewees' feedback. Documents provided included process diagrams and flowcharts, scoring charts and measure development policies/guidance documents.

Findings

The six utilities covered in this study have each developed and implemented their own unique UIMD processes. Despite similarities including shared goals in developing cost effective portfolios, geographic location and regulatory frameworks, differing organizational structures, staffing levels and expertise, policy and legal requirements, IT systems, past measure development history, and company culture have resulted in differentiation in UIMD processes across the utilities. The goal of this paper is to provide a summary of each utility's UIMD process as well as noting key areas of differentiation. To meet this goal this paper will first present a summary of each individual utility UIMD process, followed by comparisons across utilities in the following key areas:

- Key staff involved in the measure development process;
- Sources of new measure information;
- Key metrics used to assess new measure potential;
- Feedback loops in place that can lead to measure improvement over time;
- Role of ETP in the measure development process, and;
- The types and extent of cross-utility collaboration.

Lastly, we discuss the key areas of differentiation between the six utilities studied.

Utility UIMD Processes

Individual Utility UIMD Processes

The following is a summary of each utility's UIMD process. While it is not possible to capture all of the details within each process, in this paper we have tried to portray the general processes in each utility. Detailed descriptions of the processes are available in the full evaluation report.[3]

PG&E uses a formal measure development process branded as the Smart Products And Rewarded Customers (SPARC) process to evaluate, develop, and launch new programs and products, or sunset existing programs and products, including services such as audits and education. PG&E has used the SPARC process for approximately six years.

SPARC is a structured "phase-gate" and governance process, which includes up to three distinct product development phases separated by formal decision points or gates.[4] The SPARC process is led by a team of product managers, with the product team receiving ideas for new measures from throughout the organization, including program managers, engineering and the ETP team. As noted, SPARC has up to three gates, with ETP completing an initial screening of new technology before a measure reaches Gate 1. This initial screening takes place through an internal RFP process, in which different internal stakeholders present new ideas for consideration for ETP investigation. During the RFP process, a team comprised of senior staff from core departments quantitatively scores measures on energy savings, market potential and cost-effectiveness and selects the most promising for ETP funding. After the ETP assessment, a measure undergoes Gate 1 review involving a presentation of the business case for the measure to a SPARC committee comprised of Senior Directors and Directors from internal departments with a stake in the measure development process. Once a measure passes Gate 1, a core team either decides additional information is needed, in which case the Product Manager initiates a product trial or pilot program, or that sufficient information is available to move forward with work paper development and program planning. In the former case, the trial or pilot period constitutes the second SPARC phase and the measure undergoes review at Gate 2, where the core team assesses the trial results and

[3] Evergreen Economics, 2015

[4] "Phase-gate" also known as "stage-gate" processes are project management tools commonly used across industries in new product development.

determines if the measure is suitable for progression to the third phase of workpaper development and program planning. In the later case, the measure bypasses Gate 2 and moves directly into the third phase of workpaper development and program planning. After Gate 2 approval, an engineering team develops a product work paper, which is submitted to the Energy Division of the California Public Utilities Commission (CPUC) for approval, and a team of internal stakeholders develops an implementation plan. Finally, the measure undergoes a Gate 3 review. Gate 3 is the final launch go/no-go decision point, where all product development work is put before the product and program managers and other operational groups to assure that all preconditions for measure launch have been met. If a product passes Gate 3, the measure is launched into the PG&E portfolio. Process duration depends on measure complexity and newness, and can range from a few months to two years.

SCE has a highly formalized, well-documented UIMD process, the centerpiece of which is the New Product Development and Launch Gate Process (NPD&L Gate Process). The NPD&L Gate Process is a "phase-gate" process that has been in place for approximately 1.5 years. This process developed out of a reorganization process at SCE in April 2013, prior to which a formal Idea Management process also existed for several years.

SCE's NPD&L Gate Process is comprised of five stages and five key decision gates (Yes/No decision points) where potential measures can proceed, be rejected, or be referred back to previous stages for further development. The five stages of the NPD&L Gate Process are Ideation, Concept Development, Product Development, Launch and Operations. A project manager on a multi-disciplinary NPD&L team manages the overall process, and various internal stakeholders provide important information, primarily ETP and DSM Engineering. Key features of the NPD&L Gate Process include: a single measure (idea) intake mechanism managed by a NPD&L team project manager to provide transparency and screen redundant measures, Go/No-Go decision gates early in the process (during Concept Development) to eliminate measures before extensive technical testing, and process "post-mortem" reviews to assess the effectiveness of the NPD&L Gate Process. A multi-disciplinary NPD&L team administers the Ideation Process. This team manages the intake of new measure ideas via a formal Ideation Form. New ideas can originate from throughout the organization as well as from outside stakeholders. During the Concept Development phase, ETP staff conduct limited lab and filed testing to establish the proof of concept of the technology as well as gather preliminary information to determine the technical viability and savings potential of the measure. If proof of concept is established the measure moves to the Product Development stage where scaled field tests are performed, program infrastructure is developed and a work paper is developed for approval by the Energy Division of the CPUC. Following Product Development, a launch decision is made by a multi-disciplinary Products and Services Steering team. During the Launch stage NPD&L team members support program operations staff in the transition of the measure to the SCE portfolio until the measure is considered stabilized, following which NPD&L staff continue to perform periodic evaluations of product performance against forecasts and are available to assist with resolution of any issues that may arise with the measure. The average process duration is highly variable and can range from 1 month to 5 years depending on measure complexity, market readiness and technical feasibility.

SDG&E has a relatively informal measure development process when compared with the other utilities, due in part to having more limited staffing resources. While SDG&E's process can vary depending on the originating source of the measure, the level to which research on the measure has already been done, and if the measure is on a path to become prescriptive or custom, the general process consists of four phases, Idea Generation and Project Team Creation, ETP Assessment and Presentation, Work Paper Creation, and Program Integration. The overall process is a collaborative effort by staff in Engineering, ETP, EM&V, Programs, and Marketing and Communications. These staff select a project/measure team for each new measure rather than having a dedicated process manager or department. SDG&E receives measures from a variety of internal and external sources, with ETP and other program staff being primary contributors. Once a new idea is received, it passes through initial

screening performed by ETP staff, who present the results of the screening to the project/measure team. Once ETP receive approval from the project team, they conduct a technology assessment to quantify market potential, cost effectiveness and gather other data that may be utilized to create work papers. Once sufficient information is gathered, Engineering staff develops a measure workpaper, which is submitted to the Energy Division of the CPUC for approval. After a work paper is approved and before the product is available to end users, Program Managers work to develop program infrastructure for the measure to facilitate program integration of the measure. Excluding the CPUC decision making process the timeline is estimated to take anywhere from one to six months.

SoCalGas has a formalized UIMD process called Innovation Now!, a "phase-gate" process that was launched in June 2014. Prior to Innovation Now! interviewed staff noted that the process was informal and the new process was introduced to promote better documentation of the process and encourage more collaborative efforts in measure development.

Innovation Now! consists of six stages and four gates (Yes/No decision points) where measures can proceed, be rejected, or be referred back to previous stages for further development. The six stages of Innovation Now! are: Idea Generation, Preliminary Analysis, Business Case, Develop and Test, Launch, and Post Implementation Review. The first four stages are considered developmental stages and the final two stages are categorized as execution stages. A Senior Program Advisor in Customer Programs and Operations oversees the day-to-day measure development effort. A wide range of staff in Engineering, ETP, Programs, Marketing, and Regulatory work in multiple measure-specific teams to pull information together under the direction of a Product Team Leader, that in turn reports to a Project Manager. New measures come from a variety of staff groups (ETP, Program Managers, etc.) and an outside consultant (Navigant). Measures are all brought through the IN! Process and are scored through the first four stages of the process. During the Preliminary Analysis and Business Case phases ETP staff and other departments conduct exploratory research to define the product concept, assess market potential, and determine the feasibility of the measure, following which the decision making "gatekeepers" determine if the measure should pass to the Develop and Test phase. During the Develop and Test phase, staff conduct activities to ready the measure for inclusion in the SoCalGas portfolio, including workpaper development, product testing, and developing program infrastructure. The final decision to launch is primarily based on a Scoring Tool developed at each stage of the process that is reviewed by Gatekeepers. The Scoring Tool considers six factors, which are weighted differently through each gate. Gatekeepers hold and approve staffing and financial resources to move the process forward, and must unanimously pass each measure through each gate. The average process duration is difficult to determine at present due to the relative newness of the process.

LADWP has an informal measure development process when compared with other utilities. New measures are generally fielded through the Custom Performance Program and may become portfolio items if they are installed repeatedly and lend themselves to a deemed savings amount. Measures may also be introduced through the single ETP staff member at LADWP. Compared to the other utilities, LADWP has relatively few approval criteria (energy savings, cost effectiveness, sustainability), and the process requires only one Evaluation Report and Go/No-Go decision. Director level staff decides on the final incentive levels and the process is estimated to take six months to a year depending on the existence of other studies that assess product performance over the span of a year, when performance is dependent on seasonality. The informal process is highly dependent on frequent communications among various staff that is possible largely due to the close physical proximity of staff in the LADWP office.

SMUD has a formal UIMD process that in its current form has been in place since 2011. The process has five steps – Ideation, Opportunity Assessment, Research and Development (R&D) Stage-Gate process, Business Case Development and Implementation. The core measure development component of the process is the R&D Stage-Gate process, which is a four stage "phase-gate" process.

The four stages of the R&D Stage-Gate process are: Technology Assessment, Field Demonstration, Technology Introduction Support and SMUD Customer Incentives. A distinct New Products and Services (NPS) group leads much of the process, and a multi-disciplinary Opportunity Evaluation Team decides when measures advance through the process or not. SMUD has an open ideation process allowing ideas to originate from any source. New ideas are vetted by the NPS team who develop an Opportunity Assessment report that is presented to an Opportunity Evaluation Team comprised of key supervisors and staff from multiple departments including ER&D and Customer Strategy. In some cases, such as incremental changes to existing measures, proven technologies can bypass the R&D Stage-Gate process and pass directly to the Business Case Development and Implementation phases, but most new technologies must pass through the Stage-Gate process. The first step of the Stage-Gate process is the Technology Assessment during which new measures are assessed, to determine their suitability for field-testing. New measures are assessed quantitatively using an emerging technologies scorecard tool as well as being subjected to a qualitative review. If a new measure passes the Technology Assessment it moves into the Field Demonstration phase where the measure is evaluated in real world applications. If the technology successfully passes through the Field Demonstration phase it is either taken directly to the Business Case Development and Implementation phase if it is market ready, or if it is determined to not be market ready it is adopted into the optional Stage 3: Technology Introduction Support phase. This stage is a key feature of SMUD's process and is an incubation/pilots period where higher incentives are permitted and SMUD staff work with manufacturers to iteratively reduce costs, while the technology gains a market foothold. Adopted measures can also revert to this stage if they initially languish in the mainstream rebate programs. Once SMUD has determined that a measure is sufficiently mature to introduce into the mainstream portfolio the NPS team develops a Business Case, which is presented to the Customer Program Director for approval to submit a capital request. If a break-even threshold can be met within 5 years approval, the measure can be obtained at the Program Director level, however, if a measure is not forecast to generate positive returns for SMUD within five years the business case is presented to the SMUD Board of Directors for approval.

Key Staff

The utilities have designated a broad range of staff types to lead the measure development process, including single staff (LADWP), standing multidisciplinary teams (SCE and SoCalGas), temporary project teams (SDG&E) and multiple groups of project managers depending on the stage of measure development (SMUD). Interestingly, some utilities have formed distinct groups to focus on all new products (or services) in systematic fashion, whereas PG&E is organized around specialized product managers (e.g., lighting) with a very technological focus. According to the interviewees, all of these approaches appear to be working for the individual utilities, and our research does not suggest that any type of process leadership is superior or "optimal."

Role of ETP

Among the IOUs, ETP staff perform a similar set of core functions - they bring forth ideas for new measures, complete technical assessments of promising new measures with little existing energy savings data, develop estimates of market size, give technical input to the work paper development process, provide technology introduction support to program staff and sometimes play a role in the overall management of the UIMD process.

ETP staff at all IOUs utilize a variety of sources to investigate potential new technologies including conferences (and papers), the Emerging Technologies Coordinating Council (ETCC) and other

utilities, academia and research laboratories. In addition, ETP staff from all IOUs participate in quarterly meetings, and have a process to share information on all the projects each utility is doing.

A key function of ETP at all IOUs is the development of technical assessments through ETP studies. Data collected for technical assessments varies depending on the measure being assessed, but all technical assessments quantify market potential, look at preliminary cost effectiveness, and provide other data that may be utilized to create work papers. Once technical assessments are completed they are published on the Emerging Technologies Coordinating Council (ETCC) website. For all IOUs, ETP staff cannot begin detailed assessments until receiving approval from the different process leaders. This helps to ensure that only the most promising or strategically important technologies are pursued and that ETP resources are used efficiently. Additionally, ETP staff at all IOUs are involved in the overall management of the UIMD process, either as part of a standing multidisciplinary team as at SCE and SoCalGas, or as part of a project team at SDG&E and PG&E.

LADWP employs one staff member who leads emerging technologies research. This staff person is charged with "identifying and accelerating the introduction of innovative energy and water efficient technologies, applications and analytical tools." As with other Emerging Technology Programs, LADWP's goal is to reduce performance uncertainties and mitigate customer sector barriers that impair the successful introduction of new measures in their service area.

ER&D staff at SMUD perform similar functions to ETP staff, helping to overcome market barriers by working with customers and manufacturers during the Demonstration, Testing and Improving stage, and working with these same stakeholders during the Technology Introduction Support (incubation) stage. During these stages they ensure that the product meets the needs of end users, they measure satisfaction and they work with manufacturers to create or improve their business plans including addressing technical or market barriers. During the incubation stage, ER&D staff also work with program planners and other internal stakeholders to provide training to employees and customers on what ER&D has learned through the demonstration projects.

Sources of New Measure Information

The utilities collectively use a wide range of information sources to learn about potential new measures. Table 1, below summarizes the information sources utilized by the six utilities use to learn about potential new measures, broken out by ETP staff and non-ETP staff. Information sources most commonly mentioned by ETP staff include: conferences (and papers), the ETCC and other utilities, academia and research laboratories. ETP and R&D staff at SCE, SoCalGas and SMUD appear to be using the greatest range of information sources. Importantly, the ETP is highly dependent on the market/manufacturers to conduct original research and development (R&D) and produce new measures. The program can only work with measures that are already in existence, which limits the number of new technologies that can be assessed.

Among non-ETP staff, the most commonly mentioned information sources include: industry publications, conferences (and papers), manufacturers, other utilities, and equipment vendors.

Table 1. Utilities' New Measures Information Sources*

		PG&E (n=8)	SCE (n=20)	SDG&E (n=34)	SoCalGas (n=24)	LADWP (n=5)	SMUD (n=20)	Total (n=111)
ETP Staff	Academic Institutions/ Research Labs	13%	10%	9%	13%	40%	5%	11%
	Conference/Tradeshows	13%	10%	15%	17%	0%	15%	14%
	Customers	0%	5%	3%	0%	0%	5%	3%
	Governmental Organization	0%	5%	6%	9%	0%	10%	6%
	Industry Organization	13%	30%	21%	17%	20%	25%	22%
	Journal or Publication	0%	5%	3%	0%	0%	5%	3%
	Other	0%	5%	12%	4%	0%	5%	7%
	Private Research Company	0%	10%	6%	9%	0%	10%	7%
	Utility Staff, Center or Process	50%	5%	18%	17%	20%	5%	15%
	Vendors/Manufacturers	13%	15%	9%	13%	20%	15%	13%
		PG&E (n=19)	**SCE (n=18)**	**SDG&E (n=13)**	**SoCalGas (n=9)**	**LADWP (n=5)**	**SMUD (n=13)**	**Total (n=77)**
Non-ETP Staff	Academic Institutions/ Research Labs	11%	11%	0%	0%	20%	0%	6%
	Conference/Tradeshows	5%	6%	8%	11%	0%	0%	5%
	Customers	5%	6%	0%	0%	0%	8%	4%
	Governmental Organization	11%	6%	15%	0%	20%	8%	9%
	Industry Organization	5%	22%	8%	0%	20%	15%	12%
	Journal or Publication	11%	17%	8%	0%	0%	15%	10%
	Private Research Company	11%	17%	15%	11%	0%	15%	13%
	Utility Staff, Center or Process	32%	6%	31%	67%	20%	23%	27%
	Vendors/Manufacturers	11%	11%	15%	11%	20%	15%	13%

* The n in this table for each utility refers to the number of distinct information sources that were mentioned, which are aggregated into primary categories for this table. The n's do not refer to the number of utility interviewees.

Many interviewees noted that new measure ideas can emerge and be refined over several years with multiple "touch points," and that attempts to comprehensively track this information is challenging.

New Measure Assessment Factors

The utilities generally consider similar quantitative and qualitative factors when developing and approving new measures. The range of assessment factors mentioned by interviewees across the utilities was extensive. Table 2, below presents a list of commonly mentioned assessment factors. Cost effectiveness, energy savings potential and market potential are always key factors all utilities consider. Other criteria (technical risk, filling a portfolio niche) are also influential. SMUD is unique in that it requires manufacturers to submit detailed business plans to ensure long-term product availability.

Table 2. Key Measure Factors Mentioned By Utilities

Quantitative Factors	Qualitative Factors
Carbon Emissions	Alignment with Regulatory Goals and Mandates
Cost Effectiveness	Barriers to Adoption
Demand Reduction	Fit with Corporate Strategy
Effective Useful Life	Fit with Customer Strategy
Energy Savings Potential	Fit with Existing Programs
Market Size / Potential	Impact on Customer Satisfaction
Non-Energy Benefits	Market Need
Price Point of Product	Market Opportunity
Program Budget	Market Readiness
	Organizational Capacity
	Strength of Manufacturer
	Technical Performance Risk

Measure scoring methods vary between utilities. Four utilities, PG&E, SCE, SoCalGas and SMUD use formal scoring mechanisms to assess new measures at different stages of the UIMD process. The weight placed on the scoring differs across the three utilities, but in all cases the scoring system is only one of many tools that are used to assess a measure. The remaining two utilities, SDG&E, and LADWP have no formal scoring mechanism for assessing new measures, rather assessment is done on a case-by-case basis based on specific information gathered for that measure. Table 3 below presents details on the key information needed to assess measures, as reported by interviewees for each utility.

Table 3. Key Information/Data Needed for Measure Assessment

Utility	
PG&E	Key information required for a viable business case: a market-ready technology that addresses a real customer need, the potential for significant beyond-code savings to support cost-effectiveness criteria, compliance with regulatory constraints, and the ability to reach the market through existing or new distribution channels.
SCE	Key information required includes information on alignment with corporate and regulatory goals, need in the market for measure, market potential, market readiness, technical potential of technology including potential energy savings and demand reduction, cost effectiveness information, non-energy benefits, customer satisfaction, budget source, staff bandwidth, strength of vendor/manufacturer
SoCalGas	Key information can be rolled into the six categories used in the Scoring Tool: Portfolio Strategy, Market Attractiveness, Opportunity Magnitude, Operations, Financial, and Regulatory.
SDG&E	The most important data cited related to energy efficiency, cost effectiveness, and market potential.
LADWP	Key information needed is related to energy savings, cost effectiveness and product sustainability.
SMUD	Key information required includes information on market potential, market readiness, technical potential of technology including potential energy savings and demand reduction, cost effectiveness information, and strength of manufacturer.

Measure Adoption Feedback

Regular feedback can enhance staff commitment to new products, focus future attention on similar measures that may also be successful and point out analytical deficiencies that need improvement (e.g., overestimates of market size or energy savings). Across the six utilities the extent to

which measure adoption is tracked once a measure is launched into the portfolio and the level of feedback received by stakeholders in the measure development process varies. Table 4, below summarizes the feedback loops in place at each utility. PG&E and SCE have the most developed systems for providing measures adoption feedback to measure development staff.

Table 4. Mechanisms for Measures Adoption Feedback

Utility	
PG&E	Feedback is to Product Management through account managers and program management's tracking of performance, reported at portfolio check-in meetings. ETP and others also have access to dashboards to track measures uptake.
SCE	SCE has a well-established process employing several tools to track and communicate measure success and adoption. The primary tracking tool is the Customer Relationship Management (CRM) database. NPD&L produces a quarterly tracking report that details market adoption of emerging technologies. Additionally, the NPD&L team recently created an emerging technologies Key Performance Indicator report that tracks the amount of savings in each program from emerging technology measures, defined as measures that have been launched within the previous 3 years. A key goal of the tracking process is to identify underutilized measures that can potentially be improved.
SoCalGas	SoCalGas has a relatively new measure development process and they have not yet reached the Post Implementation Review stage (as of January 2015). This stage will include multiple analytical parts (analysis of actual vs. planned results, summary of lessons learned, adjustments where necessary, and process improvements) that will go into a Post Implementation Review Report that will be delivered to Gatekeepers.
SDG&E	Customer utilization of measures is tracked through program performance metrics and through mandated evaluations. This information is seen by Program Staff and is not directly distributed to ETP or the Engineering team. Measures with low customer uptake will be promoted by Account Executives or program managers. This strategy will change with the addition of a Measure Development Engineer within the Engineering group who will have responsibilities relating to improving customer acceptance.
LADWP	Engineers have frequent, open communications with the Program Staff but it was not specified if they get feedback on how measures do in the field.
SMUD	Customer Programs tracks adoption and utilization of mainstream program measures. Customer utilization data is readily available and accessible for stakeholders in the IMD process to review. There is no formal process to communicate utilization back to these stakeholders.

Cross-utility collaboration

Staff across the six utilities reported that there is extensive interaction and communication between measure development staff, particularly among the IOUs. Notable forums for communication include:

- ETP staff confer monthly via phone (sometimes bi-monthly) and meet quarterly with the ETCC in-person. ETP staff also attend quarterly meetings organized by the Gas Technology Institute (GTI). In addition to these collaborations, the CPUC requires that the IOUs have public meetings (e.g., TRIOs, ET Forums) where interested parties can bring new measure to the group.
- Program staff works towards statewide consistency through regular communication with program staff at other IOUs. These communications occur through monthly utility meetings (at the program manager level) and bi-monthly statewide calls (at the portfolio level).
- Engineers collaborate with other IOUs on relevant work papers and regularly communicate across IOUs.

- Utility staff regularly collaborate through the West Coast Utility Lighting Team (WCULT) Western Performance HVAC Alliance (WHPA) and the Western Cooling Challenge.

Utility staff noted that collaboration across utilities has led to some notable successes including:

- Demand Control Ventilation measures that were studied in SCE's labs were also included in the PG&E portfolio.
- Food Services cooking equipment studied in PG&E labs were also included in SCE's portfolio.
- Work Paper collaborations were noted by all IOUs as reducing duplication of efforts and more efficient resource allocation across IOU.

Differentiation in UIMD Processes Across Utilities

Each utility's UIMD process has been shaped over time by the utilities differing organizational structures, staffing levels and expertise, policy and legal requirements, IT systems, past measure development history, and company culture. In this section we discuss key areas of differentiation in UIMD processes across the utilities.

- **Utilities with larger staffs and greater resources have UIMD processes that are more formal with well-defined stages and approval/rejection junctures (i.e., gates).** These processes can help to ensure that complete data are assembled and considered by a range of internal stakeholders. While these processes take time to learn and be accepted by utility staff, based on our interviews, they have helped to increase new measure visibility and increase confidence that new measures are coming through the pipeline.
- **Utilities with smaller staffs have less formal UIMD processes that rely on frequent communication between measure development stakeholders.** These utilities appear to work effectively with a more informal process thanks to high levels of communication between staff.
- **LADWP's UIMD process is different than the other utility processes, but is similar to that of utilities across the country without a separate Emerging Technologies function**, with the majority of new measures starting as custom measures with a small-scale rollout to existing customers. Other utilities typically require buy-in from a core program manager before Emerging Technologies or Research and Development staff can start a Technical Assessment on a completely new measure. However, the route of converting custom measures with high interest into deemed measures is a common process for utilities across the nation.
- **SMUD's Technology Introduction Support stage is unique among the utility processes.** This stage allows SMUD to offer higher incentives for emerging technologies in a pilot "incubator" program, with a separate budget, so they gain a foothold in the market, while working with manufacturers to reduce costs, plan capital improvements, improve production capability and develop a marketing strategy.
- **PG&E incorporates a formal internal RFP process to determine technologies that are suitable for ETP assessment.** Twice a year program or product managers pitch new products to ETP through the formal RFP process. This process provides a valuable pre-screening step prior to a technology entering the UIMD process. Other utilities, SCE, SMUD and SDG&E have less formal pre-screening scoring processes.

Conclusions and Lessons Learned

Each of the six utilities has developed UIMD processes to introduce new technologies to meet their aggressive energy savings goals. While these processes share similar goals, and in some cases similar frameworks, each utility has developed unique processes based on their specific organizational traits and needs. Through the course of this study, Evergreen found that:

- Measure development is not a linear process. Depending on factors such as the stage of technology maturity and the availability of external information about a technology, ETP may or may not play a role in measure development. Utilities sometimes conduct initial measure screening before ETP is called upon for detailed assessments, and some potential new measures do not require significant ETP involvement if robust measure performance data is already available from other sources. Overall, these "checks" help to ensure that ETP resources are not used inefficiently
- While the IOUs' ETP programs, and SMUD's ER&D staff key contributors to the cyclical process of developing new measures, many other utility staff are involved in the utilities' measure development processes.
- Within the UIMD process there is a constant need to communicate across divisions; some of the larger utilities choose a more formal process utilizing document sharing software and regular standing meetings; while smaller utilities rely somewhat more on informal day-to-day communications.
- Utilities with greater resources tend to have more formalized UIMD processes, helping them coordinate diverse internal stakeholders and assemble and assess complete data.
- The California IOU Emerging Technology Programs (ETP) play an important role in bringing forth new measure ideas, completing Technical Assessments (TA) of new technologies, giving technical input to the work paper development process, providing technology introduction support to program staff and playing a role in the overall management of the UIMD process
- Utilities assess promising technologies using a wide variety of quantitative and qualitative information. All utilities pay close attention to measure cost-effectiveness, energy savings potential and market potential but a broad range of other metrics are also considered.
- The level of feedback measure development staff receive once measures are launched into a utility portfolio varies, with larger utilities having more formalized feedback loops, while smaller utilities tend to have less formal processes.
- All utilities access a diverse range of information sources to gather information and identify potential new technologies.
- There is significant cross-utility collaboration in new measure development through formal channels such as ETP Forums, monthly ETP phone meetings, quarterly ETCC meetings and participation in technology consortiums, as well as less formal communications between individual staff or departments across utilities.

Even though the processes are different among the utilities, staff at each utility expressed satisfaction with their processes and noted that they continually look for innovations to develop a cost-effective portfolio and to attract their customers' interest in energy efficiency projects.

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