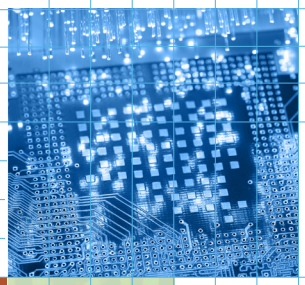


Smart Grid Maturity Model

Update | October 2010

Software Engineering Institute | Carnegie Mellon

About the Smart Grid Maturity Model

The Smart Grid Maturity Model (SGMM) is a management tool that utilities can leverage to plan their smart grid journeys, prioritize their options, and measure their progress as they move toward the realization of a smart grid. The SGMM was founded by utilities for utilities when the Global Intelligent Utility Network Coalition, a smart grid collaboration of 11 utilities, saw the need in the industry for this tool. The model describes eight domains, which contain logical groupings of incremental smart grid characteristics and capabilities that represent key elements of smart grid strategy, organization, implementation, and operation. Utilities use the SGMM to assess their current state of smart grid implementation, define their goals for a future state, and generate inputs into their roadmapping, planning, and implementation processes. As more and more utilities around the globe participate and the SGMM experience base grows, the SGMM becomes an increasingly valuable resource for helping to inform the industry's smart grid transformation.

"SDG&E is working hard to realize the benefits of smart grid. Going through the SGMM Navigation process with our cross-cutting smart grid team gave us an opportunity to take a step back to share diverse perspectives and take stock of our progress and strategic direction. We look forward to benefiting not just from our own use of the model but to sharing experiences and lessons learned with other utilities in the SGMM community."

Lee Krevat, Director
Smart Grid, San Diego Gas & Electric

SGMM Navigation Process

The SGMM Navigation is a structured approach to applying the SGMM through a facilitated workshop process. SEI-certified SGMM Navigators work with the utility's smart grid team to complete the SGMM Compass survey on a consensus basis – promoting internal information sharing and discussion. After scoring and analyzing the survey, the Navigator leads a second workshop to review the findings and use them to set organizational aspirations for an agreed time horizon – and to discuss related motivations, obstacles, and required actions. These outputs are valuable inputs into the utility's ongoing planning and implementation process, and they set a baseline for measuring progress.

The Navigation process provides benefits to the utilities using the SGMM, the Navigator supporting the utility, and the SGMM community as a whole. Utilities report significant value from the detailed reports with data that feeds into the strategic planning process—including comparisons to the model and the community as well as individual aspirations and associated actions. Utilities also benefit from the improved communication and consensus building promoted by the workshop discussion of current and desired smart grid status.

The Navigator adds industry expertise to the process and has an opportunity to better understand the goals and rationale of the utility's smart grid improvement efforts.

The community benefits by having the SGMM applied and used in comprehensive and consistent fashion, improving the completeness and fidelity of the data. In addition to maturity profile data, the data collected in the Aspirations Workshops can contribute to a deeper understanding of smart grid trends. On an aggregated basis, this data can help inform utilities in their planning and other stakeholders as they provide products and services to support these plans.

Figure 1: Steps in the Navigation process

The SEI Announces the SGMM V1.1 Product Suite

In September 2010, Carnegie Mellon University's Software Engineering Institute (SEI) published V1.1 of the Smart Grid Maturity Model (SGMM). This version of the model was pilot tested with more than 30 utilities to ensure the quality and usability of the update. With V1.1, users will benefit from a significantly improved model and supporting product suite that is built upon the familiar architecture created in previous versions of the model. Because the architecture was retained, organizations can compare their current V1.1 results against those obtained using earlier versions of the model.

SGMM | **Smart Grid Maturity Model**

V 1.1 PRODUCT SUITE

Model	• Definition document • Matrix
Compass Survey	• Compass Survey yields maturity ratings and performance comparisons
Navigation Process	• Expert-led workshops to complete Compass and use results to inform objectives
Training	• Overview seminar • SGMM Navigator course
Licensing	• License organizations and certify individuals to deliver Navigation process

Figure 2: Overview of the product suite

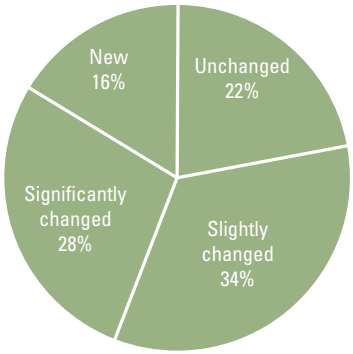


Figure 3: Changes in model characteristics from V1.0 to V1.1

Specific V1.1 Improvements

An Expanded SGMM Model Definition Document

The model architecture has been codified and refined to ensure more consistent maturity progression within each domain.

Organizations still receive a maturity profile of their rating in each domain, but they no longer receive a single overall maturity rating.

A consistent labeling scheme ensures easy mapping among model artifacts.

New content better describes the SGMM levels and domains.

New security and critical infrastructure characteristics have been incorporated.

The characteristics now include more explanatory and educational text as well as more examples for clarification to enable consistent understanding and application of the model.

An Updated and Refined SGMM Survey, Now Called Compass

The new Compass includes demographic, scope, and performance questions in addition to questions about the achievement of model characteristics.

Users can move easily between the Compass survey and the Model Definition with a one-to-one mapping between Model Definition characteristics and Compass questions.

Sixty-two percent of Compass questions or answer options have been updated to elicit more accurate and consistent responses.

Twenty-nine new questions were added to support the new characteristics that were added to the model. Eight questions were removed.

A New SGMM Navigation Process

The SGMM Navigation process defines a five-step process for how an organization can use the model to help chart a technical, organizational, and operational path through its grid modernization effort.

SGMM Navigators are industry experts trained and certified by the SEI to guide utilities through the process and to help them to use the outputs in their ongoing planning and implementation.

Users of the SGMM Navigation process report finding substantial value in the information sharing and consensus building that occurs through the facilitated workshops.

This repeatable process also allows for consistent application of the model across markets, organizations, and time and increases the quality of SGMM community data.

The latest release of the SGMM is available at: http://www.sei.cmu.edu/goto/SGMM.

Early Trends in Repeat Use of the SGMM to Track Progress

A small but growing number of utilities have now taken the SGMM survey more than once. The figure below summarizes the before and after maturity profiles of these organizations.

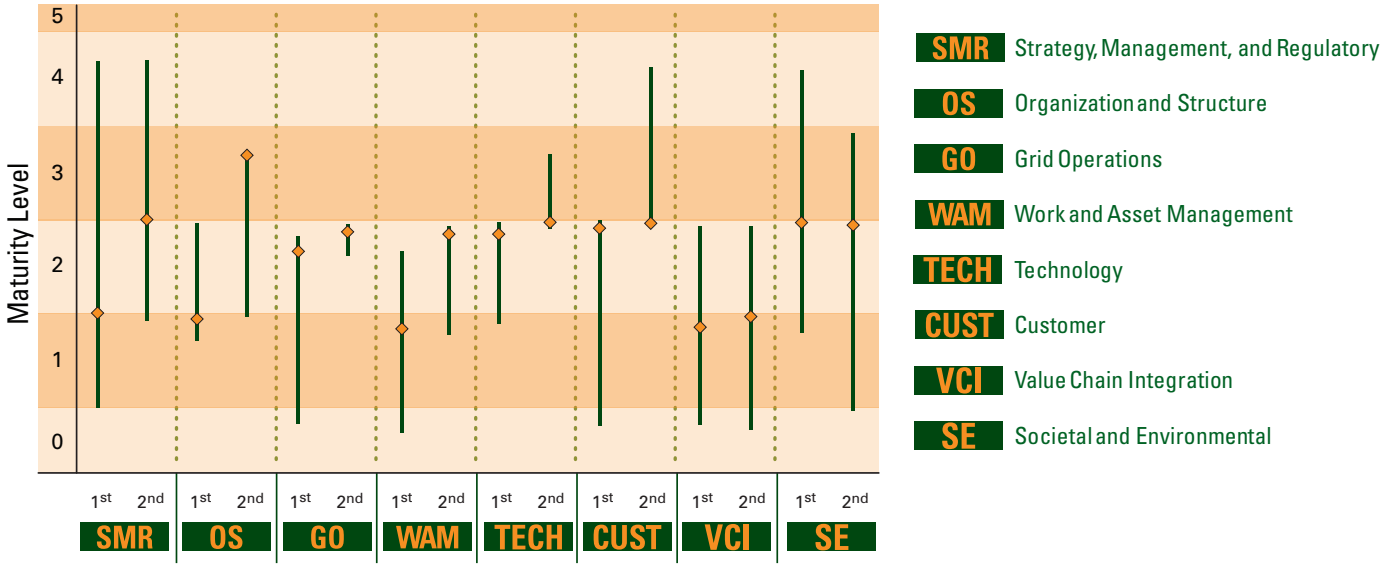


Figure 4: Average and range of maturity scores for utilities that have completed the SGMM survey twice

As the SGMM community expands, more and more utilities will use the SGMM as part of their ongoing planning, implementation, and progress measurement cycles. This will provide useful feedback for the utilities themselves and potentially valuable insights for the community as a whole. For example, looking at the SMR and OS domains in Figure 3, users may infer that these utilities have shown the most progress in these two domains as they are foundational in terms of establishing the vision, strategy, regulatory pathway, funding, organizational structure, workforce preparedness, and other fundamental building blocks for a smart grid transformation. This analysis also provides useful feedback into the ongoing improvement and evolution of the model itself. For example, V1.1 tightened the characteristics of the SE domain in response to user and reviewer input. This may be a factor in the slight decline in SE ratings.

This repeat-use analysis is an example of the type of analysis the SEI will be able to perform as the SGMM database grows. Other examples may include

- segmented analysis and comparison by utility size, type, geography, or other variables
- pattern identification from community lessons learned
- correlations of maturity and performance over time

These more granular analyses will generate additional insights for use in industry planning and implementation, business case development, progress measurement, and performance feedback.

"Pepco Holdings has been involved with the SGMM since its inception. We recently completed the survey again, using the SGMM Navigation process. This was helpful in fostering candid, fact-based discussion of where we have been, where we are today, and where we expect to be in the future. We look forward to using the tool as an integral part of our ongoing planning and transformation process, and in measuring our progress over time."

George Potts
Vice President, Business Transformation
Pepco Holdings, Inc.

Community Data

The SGMM community continues to grow, with nearly 100 utilities having participated to date. The figures below show the aggregate maturity profile, geographic distribution, and type of operation for this expanding community.

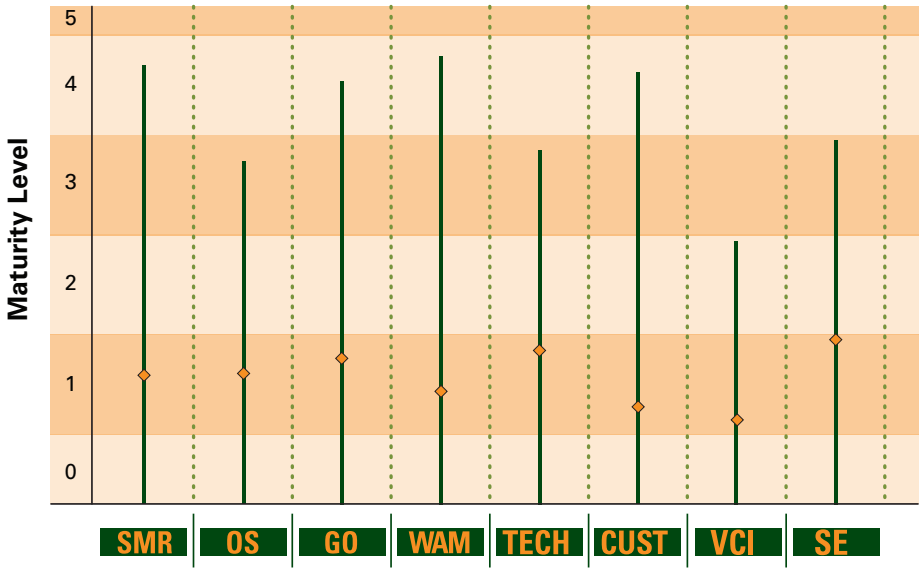


Figure 5: Average and range of maturity scores for all SGMM Compass survey responses

The SGMM helped to define and clarify a roadmap for smart grid implementation. We were able to assess our existing plan and make changes to it; the tool shows that there is more than one way to construct a smart grid plan. We feel that the SGMM tool really shows the breadth of the smart grid.

The final report offers an objective analysis of our utility; it provides more weight to the results and has created a communication tool that we can share with the community to help us leverage support as we set a future vision.

AMP members on their participation in the pilot study

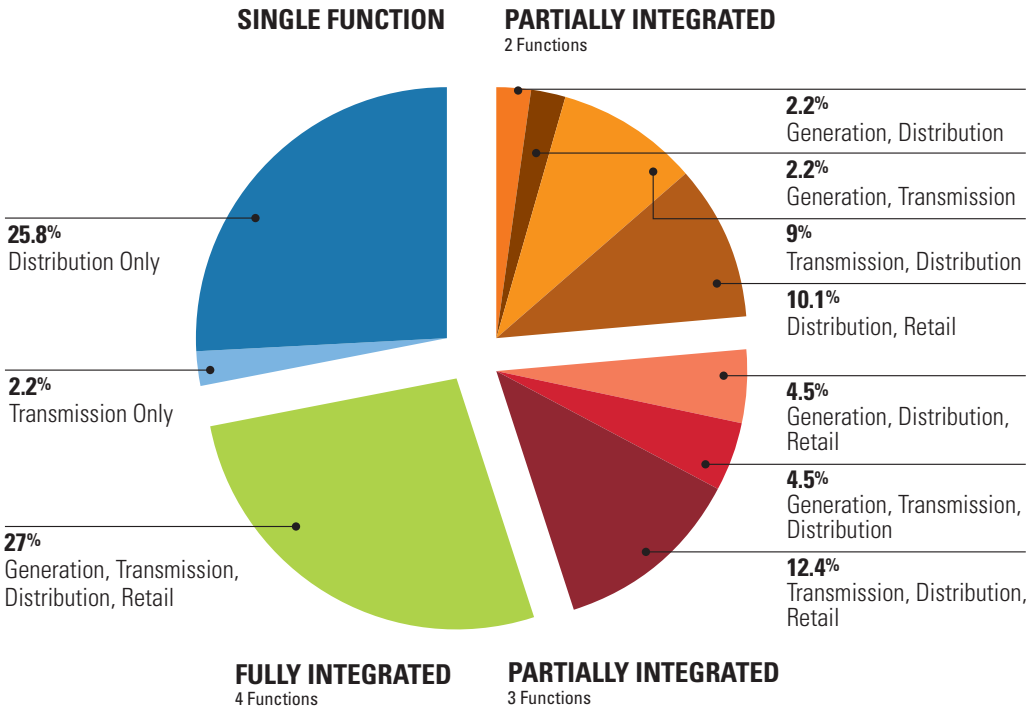


Figure 6: Detailed breakdown of utility type reported by SGMM users

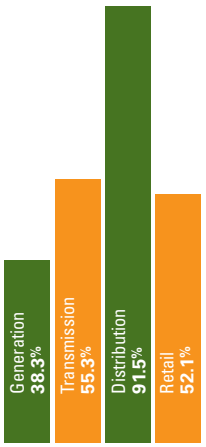


Figure 7: Functions reported by SGMM users (percentages equal more than 100 because many users report multiple functions)

Broader Participation – Public Power

In addition to expanding the size of the SGMM community, the SEI is making a concerted effort to increase the diversity of the community. Among the steps taken to elicit broad-based input and participation was the creation of a stakeholder panel to represent the full range of SGMM stakeholders. One question voiced by panel members was to what extent the SGMM could be useful to all types – investor-owned, publicly owned, cooperative – and sizes of utilities. With the support of the Department of Energy and the American Public Power Association's Demonstration of Energy-Efficient Developments (DEED) research program, the SEI conducted a pilot study using the SGMM Navigation process with American Municipal Power (AMP), in Columbus, Ohio, and 22 of its member utilities.

The participating utilities found that the SGMM provided a common language and framework for discussing smart grid and recommended it for other public power utilities.

At the same time, the SEI gained valuable insight into how the SGMM can be made accessible and useful to the public power sector, and the SEI plans to continue to conduct this kind of outreach to the broad spectrum of U.S. utilities.

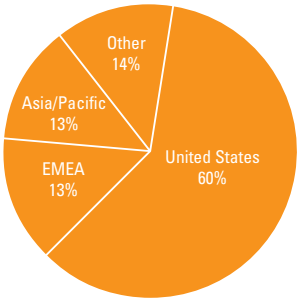


Figure 8: Distribution of SGMM users by region

International Application

Utilities outside the United States continue to use the SGMM as they have since its inception. More recently, the SEI has been asked to work with government authorities to apply the SGMM at a national or regional level.

In the summer of 2010, the Mexican national utility, Comisión Federal de Electricidad (CFE), and the Mexican Energy Ministry, Secretaría de Energía de México (SENER), became the first organizations to apply the SGMM at the national level as an aid in developing a national smart grid roadmap. CFE is one of the world's largest utilities, serving 33.9 million customers.

After familiarizing themselves with the SGMM, the CFE/SENER team selected a group from three CFE divisions (representing different regions, load profiles, and conditions within Mexico) to participate in an SGMM pilot, thus providing insight at both the national and regional levels. With the support of the U.S. Department of Energy and U.S. Embassy in Mexico City, CFE applied the model using the SGMM Navigation process facilitated by the SEI. A group of some 30 CFE and SENER staff members completed the Compass survey in a workshop in Mexico City. A month later, a CFE/SENER team traveled to Washington, D.C. for a second workshop to review the findings and use the SGMM in setting aspirations for smart grid planning and deployment.

The CFE team found the process very helpful in identifying issues for discussion, providing a baseline for measuring progress, and generating valuable inputs into the planning process. CFE and SENER agreed that the SGMM can be usefully applied at the national level in developing a smart grid roadmap for Mexico, and potentially for other countries embarking on a smart grid transformation.

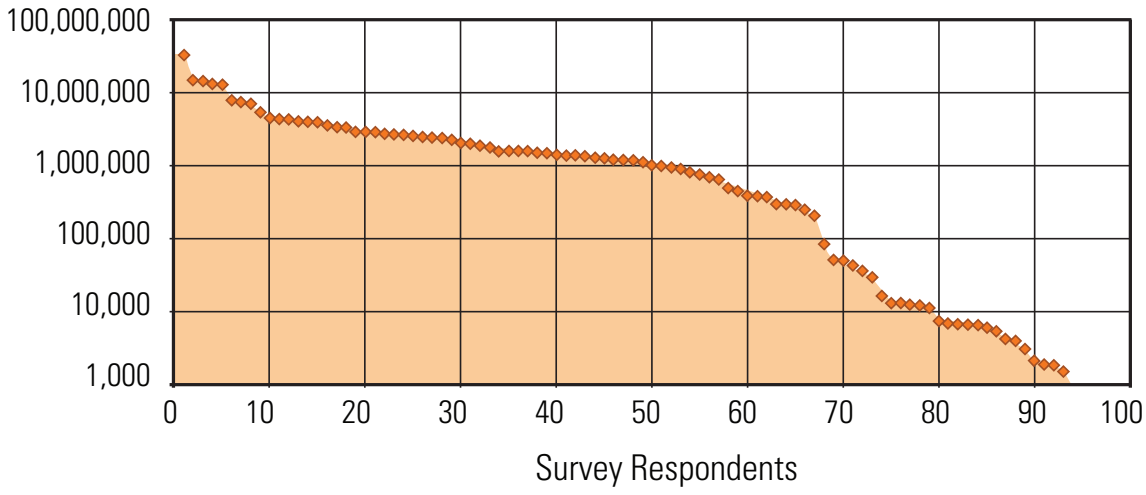


Figure 9: Meter count for SGMM users.

Highlights from the Aspiration Workshops Conducted in 2010

SGMM Domains	**Motivations** What motivates your aspirations?	**Actions** What actions must happen?	**Obstacles** What obstacles must be overcome?
SMR	• improved business performance, success, and growth • improved productivity and profitability	• integrate with existing strategy • secure funding • prioritize and plan • educate stakeholders	• budget constraints and justification • skepticism of value • scale, scope, and pace of change
OS	• empowered and involved workforce • improved decision making • addressed aging workforce	• create a unified vision, strategy, goals, and plan • provide training • transform policies and processes	• resistance to change • culture • skill gaps
GO	• supported distributed generation (DG) cost savings • resiliency and reliability	• deploy the necessary infrastructure • implement plan • develop improved analytic capabilities	• interoperability and availability of technology • risk and complexity • security and privacy
WAM	• decreased recovery time • increased asset utilization and extend asset life	• improve GIS systems • develop standards for new technologies	• high-risk environment • managing large amounts of data • perceived ROI
TECH	• systems integration and compatibility • security and critical infrastructure protection • complex grid operations management	• enforce architecture and standards • fill application gaps • devise IT master plan • develop dynamic data distribution model	• cyber security risks • regulatory and statutory issues • increased systems complexity • technology lifespan
CUST	improved customer • satisfaction • choice • quality of service • empowerment	• develop customer enabling technologies and programs • understand customer wants/needs • educate customers	• customer willingness, acceptance, and adoption • privacy issues • customer attitudes and behaviors
VCI	• market demand for DG • enabled supply and demand management • fuel diversity • reduced emissions	• obtain regulatory approvals • create new rate structures • promote adoption of enabling technologies • develop DG incentives	• tariff structure • reduced revenue from reduced use • marketplace readiness • cross company pricing
SE	• meeting public policy objectives • being socially responsible • sustainability • improved image	• develop clear direction • define and report metrics and measures • support technological advancements	• ability to make it cost effective • balancing conflicting goals among stakeholders

Figure 10: Data points gathered during aspirations workshops conducted in 2010 with 20 utilities

Smart Grid Maturity Model: Matrix

The Matrix offers a summary view of the Smart Grid Maturity Model. It has an easy-to-access format with shortened versions of the expected characteristics contained in the model and is an excellent reference for SGMM users.

	Technology (TECH) IT architecture, standards, infrastructure, integration, tools	**Customer (CUST)** pricing, customer participation and experience, advanced services
PIONEERING **5**	1 Autonomic computing and machine learning are implemented. 2 The enterprise information infrastructure can automatically identify, mitigate, and recover from cyber incidents.	1 Customers can manage their end-to-end energy supply and usage levels. 2 There is automatic outage detection at the premise or device level. 3 Plug-and-play, customer-based generation is supported. 4 Security and privacy for all customer data is assured. 5 The organization plays a leadership role in industry-wide information sharing and standards development efforts for smart grid.
OPTIMIZING **4**	1 Data flows end to end from customer to generation. 2 Business processes are optimized by leveraging the enterprise IT architecture. 3 Systems have sufficient wide-area situational awareness to enable real-time monitoring and control for complex events. 4 Predictive modeling and near real-time simulation are used to optimize support processes. 5 Performance is improved through sophisticated systems that are informed by smart grid data. 6 Security strategy and tactics continually evolve based on changes in the operational environment and lessons learned.	1 Support is provided to customers to help analyze and compare usage against all available pricing programs. 2 There is outage detection and proactive notification at the circuit level. 3 Customers have access to near real-time data on their own usage. 4 Residential customers participate in demand response and/or utility-managed remote load control programs. 5 Automatic response to pricing signals for devices within the customer's premise is supported. 6 In-home net billing programs are enabled. 7 A common customer experience has been integrated.
INTEGRATING **3**	1 Smart grid-impacted business processes are aligned with the enterprise IT architecture across LOBs. 2 Systems adhere to an enterprise IT architectural framework for smart grid. 3 Smart grid-specific technology has been implemented to improve cross-LOB performance. 4 The use of advanced distributed intelligence and analytical capabilities are enabled through smart grid technology. 5 The organization has an advanced sensor plan. 6 A detailed data communication strategy and corresponding tactics that cross functions and LOBs are in place.	1 The organization tailors programs to customer segments. 2 Two-way meter communication has been deployed. 3 A remote connect/disconnect capability is deployed. 4 Demand response and/or remote load control is available to residential customers. 5 There is automatic outage detection at the substation level. 6 Residential customers have on-demand access to daily usage data. 7 A common experience has been implemented across two or more customer interface channels. 8 Customer education on how to use smart grid services to curtail peak usage is provided. 9 All customer products and services have built-in standards based on security and privacy controls.
ENABLING **2**	1 Tactical IT investments are aligned to an enterprise IT architecture within an LOB. 2 Changes to the enterprise IT architecture that enable smart grid are being deployed. 3 Standards are selected to support the smart grid strategy within the enterprise IT architecture. 4 A common technology evaluation and selection process is applied for all smart grid activities. 5 There is a data communications strategy for the grid. 6 Pilots based on connectivity to distributed IEDs are underway. 7 Security is built into all smart grid initiatives from the outset.	1 Pilots of remote AMI/AMR are being conducted or have been deployed. 2 The organization has frequent (more than monthly) knowledge of residential customer usage. 3 The organization is modeling the reliability of grid equipment. 4 Remote connect/disconnect is being piloted for residential customers. 5 The impact on the customer of new services and delivery processes is being assessed. 6 Security and privacy requirements for customer protection are specified for smart grid-related pilot projects and RFPs.
INITIATING **1**	1 An enterprise IT architecture exists or is under development. 2 Existing or proposed IT architectures have been evaluated for quality attributes that support smart grid applications. 3 A change control process is used for applications and IT infrastructure. 4 Opportunities are identified to use technology to improve departmental performance. 5 There is a process to evaluate and select technologies in alignment with smart grid vision and strategies.	1 Research is being conducted on how to use smart grid technologies to enhance the customer's experience, benefits, and participation. 2 Security and privacy implications of smart grid are being investigated. 3 A vision of the future grid is being communicated to customers. 4 The utility consults with public utility commissions and/or other government organizations concerning the impact on customers.
DEFAULT **0**		

Smart Grid Maturity Model: Matrix

	Strategy, Management, and Regulatory (SMR) vision, planning, governance, stakeholder collaboration	**Organization and Structure (OS)** culture, structure, training, communications, knowledge management
PIONEERING **5**	1 Smart grid strategy capitalizes on smart grid as a foundation for the introduction of new services and product offerings. 2 Smart grid business activities provide sufficient financial resources to enable continued investment in smart grid sustainment and expansion. 3 New business model opportunities emerge as a result of smart grid capabilities and are implemented.	1 The organizational structure enables collaboration with other grid stakeholders to optimize overall grid operation and health. 2 The organization is able to readily adapt to support new ventures, products, and services that emerge as a result of smart grid. 3 Channels are in place to harvest ideas, develop them, and reward those who help shape future advances in process, workforce competencies, and technology.
OPTIMIZING **4**	1 Smart grid vision and strategy drive the organization's strategy and direction. 2 Smart grid is a core competency throughout the organization. 3 Smart grid strategy is shared and revised collaboratively with external stakeholders.	1 Management systems and organizational structure are capable of taking advantage of the increased visibility and control provided by smart grid. 2 There is end-to-end grid observability that can be leveraged by internal and external stakeholders. 3 Decision making occurs at the closest point of need as a result of an efficient organizational structure and the increased availability of information due to smart grid.
INTEGRATING **3**	1 The smart grid vision, strategy, and business case are incorporated into the vision and strategy. 2 A smart grid governance model is established. 3 Smart grid leaders with explicit authority across functions and lines of business are designated to ensure effective implementation of the smart grid strategy. 4 Required authorizations for smart grid investments have been secured.	1 The smart grid vision and strategy are driving organizational change. 2 Smart grid measures are incorporated into the measurement system. 3 Performance and compensation are linked to smart grid success. 4 Leadership is consistent in communication and actions regarding smart grid. 5 A matrix or overlay structure to support smart grid activities is in place. 6 Education and training are aligned to exploit smart grid capabilities.
ENABLING **2**	1 An initial smart grid strategy and a business plan are approved by management. 2 A common smart grid vision is accepted across the organization. 3 Operational investment is explicitly aligned to the smart grid strategy. 4 Budgets are established specifically for funding the implementation of the smart grid vision. 5 There is collaboration with regulators and other stakeholders regarding implementation of the smart grid vision and strategy. 6 There is support and funding for conducting proof-of-concept projects to evaluate feasibility and alignment.	1 A new vision for a smart grid begins to drive change and affect related priorities. 2 Most operations have been aligned around end-to-end processes. 3 Smart grid implementation and deployment teams include participants from all impacted functions and LOBs. 4 Education and training to develop smart grid competencies have been identified and are available. 5 The linking of performance and compensation plans to achieve smart grid milestones is in progress.
INITIATING **1**	1 Smart grid vision is developed with a goal of operational improvement. 2 Experimental implementations of smart grid concepts are supported. 3 Discussions have been held with regulators about the organization's smart grid vision.	1 The organization has articulated its need to build smart grid competencies in its workforce. 2 Leadership has demonstrated a commitment to change the organization in support of achieving smart grid. 3 Smart grid awareness efforts to inform the workforce of smart grid activities have been initiated.
DEFAULT **0**		

Smart Grid Maturity Model: Matrix

	Value Chain Integration (VCI) demand and supply management, leveraging market opportunities	**Societal and Environmental (SE)** responsibility, sustainability, critical infrastructure, efficiency
PIONEERING **5**	1 The optimization of energy assets is automated across the full value chain. 2 Resources are adequately dispatchable and controllable so that the organization can take advantage of granular market options. 3 Automated control and resource optimization schemes consider and support regional and/or national grid optimization.	1 Triple bottom line goals align with local, regional, and national objectives. 2 Customers control their energy-based environmental footprints through automatic optimization of their end-to-end energy supply and usage level (energy source and mix). 3 The organization is a leader in developing and promoting industry-wide resilience best practices and/or technologies for protection of the national critical infrastructure.
OPTIMIZING **4**	1 Energy resources (including Volt/VAR, DG, and DR) are dispatchable and tradable. 2 Portfolio optimization models that encompass available resources and real-time markets are implemented. 3 Secure two-way communications with Home Area Networks (HANs) are available. 4 Visibility and potential control of customers' large-demand appliances to balance demand and supply is available.	1 The organization collaborates with external stakeholders to address environmental and societal issues. 2 A public environmental and societal scorecard is maintained. 3 Programs are in place to shave peak demand. 4 End-user energy usage and devices are actively managed through the utility's network. 5 The organization fulfills its critical infrastructure assurance goals for resiliency, and contributes to those of the region and the nation.
INTEGRATING **3**	1 An integrated resource plan is in place and includes new targeted resources and technologies. 2 Customer premise energy management solutions with market and usage information are enabled. 3 Additional resources are available and deployed to provide substitutes for market products to support reliability or other objectives. 4 Security management and monitoring processes are deployed to protect the interactions with an expanded portfolio of value chain partners.	1 Performance of societal and environmental programs are measured and effectiveness is demonstrated. 2 Segmented and tailored information that includes environmental and societal benefits and costs is available to customers. 3 Programs to encourage off-peak usage by customers are in place. 4 The organization regularly reports on the sustainability and the societal and environmental impacts of its smart grid programs and technologies.
ENABLING **2**	1 Support is provided for energy management systems for residential customers. 2 The value chain has been redefined based on its smart grid capabilities. 3 Pilots to support a diverse resource portfolio have been conducted. 4 Secure interactions have been piloted with an expanded portfolio of value chain partners.	1 Smart-grid strategies and work plans address societal and environmental issues. 2 Energy efficiency programs for customers have been established. 3 The organization considers a "triple bottom line" view when making decisions. 4 Environmental proof-of-concept projects are underway that demonstrate smart grid benefits. 5 Increasingly granular and more frequent consumption information is available to customers.
INITIATING **1**	1 Assets and programs necessary to facilitate load management are identified. 2 Distributed generation sources and the capabilities needed to support them are identified. 3 Energy storage options and the capabilities needed to support them are identified. 4 There is a strategy for creating and managing a diverse resource portfolio. 5 Security requirements to enable interaction with an expanded portfolio of value chain partners have been identified.	1 The smart grid strategy addresses the organization's role in societal and environmental issues. 2 The environmental benefits of the smart grid vision and strategy are publicly promoted. 3 Environmental compliance performance records are available for public inspection. 4 The smart grid vision or strategy specifies the organization's role in protecting the nation's critical infrastructure.
DEFAULT **0**		

Smart Grid Maturity Model: Matrix

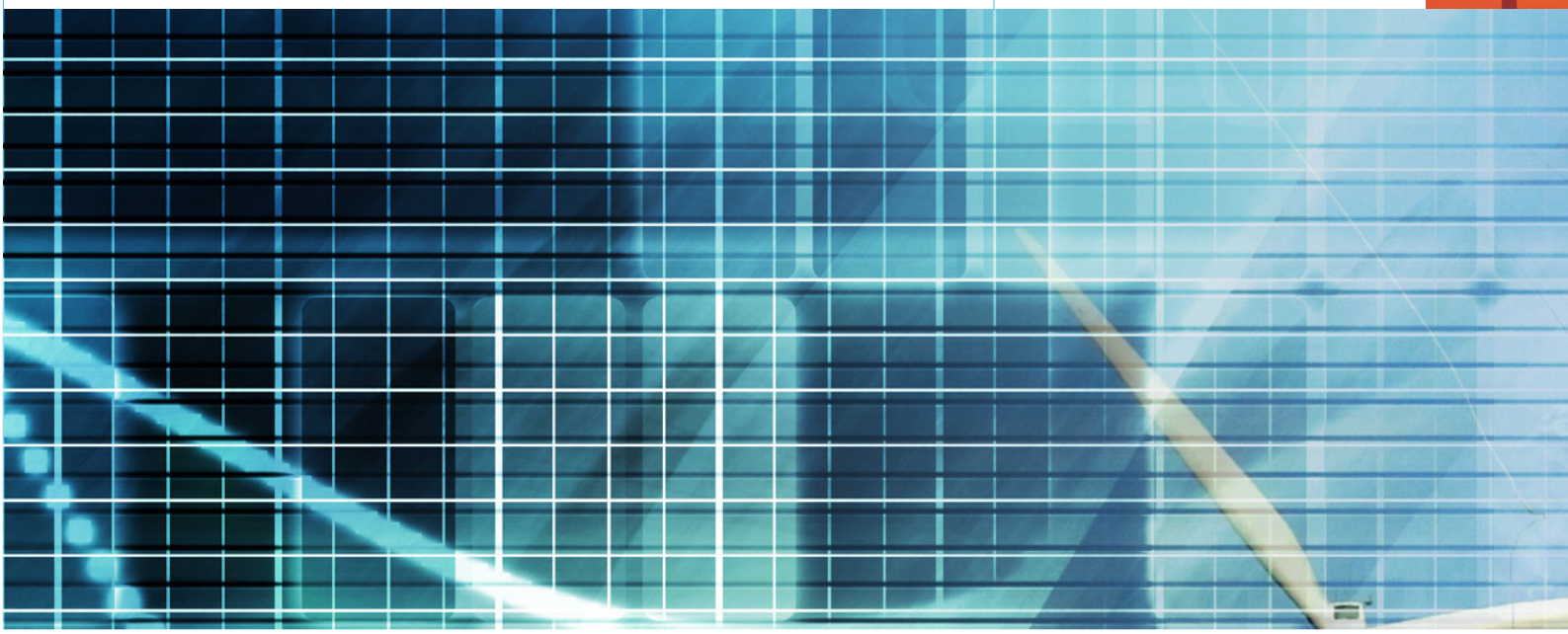
	Grid Operations (GO) reliability, efficiency, security, safety, observability, control	**Work and Asset Management (WAM)** asset monitoring, tracking and maintenance, mobile workforce
PIONEERING **5**	1 Self-healing capabilities are present. 2 System-wide, analytics-based, and automated grid decision making is in place.	1 The use of assets between and across supply chain participants is optimized with processes defined and executed across the supply chain. 2 Assets are leveraged to maximize utilization, including just-in-time asset retirement, based on smart grid data and systems.
OPTIMIZING **4**	1 Operational data from smart grid deployments is being used to optimize processes across the organization. 2 Grid operational management is based on near real-time data. 3 Operational forecasts are based on data gathered through smart grid. 4 Grid operations information has been made available across functions and LOBs. 5 There is automated decision-making within protection schemes that is based on wide-area monitoring.	1 A complete view of assets based on status, connectivity, and proximity is available to the organization. 2 Asset models are based on real performance and monitoring data. 3 Performance and usage of assets is optimized across the asset fleet and across asset classes. 4 Service life for key grid components is managed through condition-based and predictive maintenance, and is based on real and current asset data.
INTEGRATING **3**	1 Smart grid information is available across systems and organizational functions. 2 Control analytics have been implemented and are used to improve cross-LOB decision-making. 3 Grid operations planning is now fact-based using grid data made available by smart grid capabilities. 4 Smart meters are important grid management sensors. 5 Grid data is used by an organization's security functions. 6 There is automated decision-making within protection schemes.	1 Performance, trend analysis, and event audit data are available for components of the organization's systems. 2 CBM programs for key components are in place. 3 Remote asset monitoring capabilities are integrated with asset management. 4 Integration of remote asset monitoring with mobile workforce systems, in order to automate work order creation, is underway. 5 An integrated view of GIS and asset monitoring is in place. 6 Asset inventory is being tracked using automation. 7 Modeling of asset investments for key components is underway.
ENABLING **2**	1 Initial distribution to substation automation projects are underway. 2 Advanced outage restoration schemes are being implemented, which resolve or reduce the magnitude of unplanned outages. 3 Aside from SCADA, piloting of remote asset monitoring of key grid assets to support manual decision making is underway. 4 Investment in and expansion of data communications networks in support of grid operations is underway.	1 An approach to track, inventory, and maintain event histories of assets is in development. 2 An integrated view of GIS for asset monitoring based on location, status, and interconnectivity (nodal) has been developed. 3 An organization-wide mobile workforce strategy is in development.
INITIATING **1**	1 Business cases for new equipment and systems related to smart grid are approved. 2 New sensors, switches, and communications technologies are evaluated for grid monitoring and control. 3 Proof-of-concept projects and component testing for grid monitoring and control are underway. 4 Outage and distribution management systems linked to substation automation are being explored and evaluated. 5 Safety and security (physical and cyber) requirements are considered.	1 Enhancements to work and asset management have been built into approved business cases. 2 Potential uses of remote asset monitoring are being evaluated. 3 Asset and workforce management equipment and systems are being evaluated for their potential alignment to the smart grid vision.
DEFAULT **0**		

About the Software Engineering Institute

In 2009, Carnegie Mellon University's Software Engineering Institute (SEI) became the steward of the SGMM. A global leader in software and systems engineering, security best practices, process improvement, and maturity modeling, the SEI is partnering with government and industry to improve the security, resiliency, and interoperability of the grid. With the support of the Department of Energy and the National Energy Technology Laboratory, the SEI and its collaborator APQC are maintaining and evolving the SGMM as a resource for industry transformation.

About APQC

APQC is a non-profit member-based research organization with more than 30 years of systematic quality and process improvement research experience. APQC is working in collaboration with the SEI to evolve the SGMM and to analyze and maintain the data collected from organizations that use the SGMM.



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