



SGMM

Smart Grid Maturity Model

Smart Grid Peer Review

November 2-4, 2010

US Department of Energy

Office of Electricity Delivery and Energy Reliability

Austin Montgomery
Carnegie Mellon University
Software Engineering Institute
amontgom@sei.cmu.edu



Overall Project Purpose and Objectives

The purpose of this project is to improve and evolve the Smart Grid Maturity Model (SGMM) and make it widely accessible and useful to the electricity sector as a management tool to assist in planning, implementing and managing a smart grid transformation.



What is the Smart Grid Maturity Model?

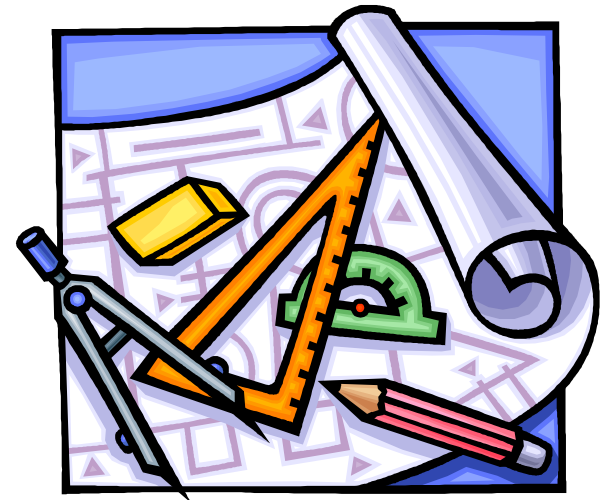
*SGMM is a
MANAGEMENT TOOL
that provides a
COMMON FRAMEWORK
for defining key elements of
SMART GRID TRANSFORMATION
and helps utilities develop a
PROGRAMMATIC APPROACH
and track their progress.*



How is the SGMM Used?

SGMM is used to help organizations:

- Identify where they are on the smart grid landscape
- Develop a shared smart grid vision and roadmap
- Communicate using a common language
- Prioritize options and support decision making
- Compare to themselves and the community
- Measure their progress
- Prepare for and facilitate change



SGMM

Smart Grid Maturity Model
V 1.1 Product Suite

Model

- Model Definition document
- Matrix

Survey

- Compass survey yields maturity ratings and performance comparisons

Navigation Process

- Licensed process led by a trained and certified “SGMM Navigator”

Training

- Overview Seminar
- SGMM Navigator Course

Licensing

- License organizations and certify individuals to deliver Navigation process



SGMM Model

Software Engineering Institute

Smart Grid Maturity Model

Model Definition

A framework for smart grid transformation


Authors:
The SGMM Team

Version 1.1
September, 2010

TECHNICAL REPORT
CMU/SEI-2010-TR-009
ESC-TR-2010-009

CERT[®] Program
Research, Technology, and System Solutions Program
Software Engineering Process Management Program
Unlimited distribution subject to the copyright.

<http://www.sei.cmu.edu>



Carnegie Mellon

Model Definition

Smart Grid Maturity Model: Matrix		SGMM
5 MATURE	Grid Operations (GO) reliability, efficiency, security, safety, observability, control	Work and Asset Management (WAM) asset monitoring, tracking and maintenance, mobile workforce
	<ol style="list-style-type: none"> Self-healing capabilities are present System-wide, analytics-based, and automated grid decision making is in place Operational plans have impact on asset health/condition 	<ol style="list-style-type: none"> The use of assets between and across supply chain participants is optimized with processes defined and executed across the supply chain Assets are leveraged to maximize utilization, including post-in-line asset retirement, based on smart grid data and systems
4 ADVANCED	Technology (TECH) IT architecture, standards, infrastructure, integration, tools	Customer (CUST) pricing, customer participation and experience, advanced services
	<ol style="list-style-type: none"> Automatic computing and machine learning are implemented The enterprise information infrastructure can automatically identify, originate, and recover from cyber incidents 	<ol style="list-style-type: none"> Customers can manage their end-to-end energy supply and usage levels There is automatic outage detection at the premise or device level Plug-and-play, customer-based generation is supported Security and privacy for all customer data is assured The organization plays a leadership role in industry-wide information sharing and standards development efforts for smart grid
3 MID-LEVEL	Value Chain Integration (VCI) demand and supply management, leveraging market opportunities	Societal and Environmental (SE) responsibility, sustainability, critical infrastructure, efficiency
	<ol style="list-style-type: none"> The optimization of energy assets is automated across the full value chain Resources are adequately disaggregated and controllable so that the organization can take advantage of granular market options Automated control and resource optimization schemes consider and support regional and/or national grid optimization 	<ol style="list-style-type: none"> Wide bottom line goals align with local, regional, and national objectives Customers control their energy-based environmental footprints through automatic optimization of their end-to-end energy supply and usage level (energy sources and mix) The organization is a leader in developing and promoting industry-wide resilience best practices and/or technologies for detection of the national critical infrastructure
2 INITIAL	Strategy Management, and Regulatory (SMR) vision, planning, governance, stakeholder collaboration	Organizational and Structure (OS) culture, structure, training, communications, knowledge management
	<ol style="list-style-type: none"> Smart grid strategy capabilities on smart grid as a foundation for the introduction of new services and product offerings Smart grid business activities provide sufficient financial resources to enable continued investment in smart grid hardware and software New business model opportunities emerge as a result of smart grid capabilities and are implemented 	<ol style="list-style-type: none"> The organizational structure enables collaboration with other grid stakeholders to optimize overall grid operation and health The organization is able to readily adapt to support new ventures, products, and services that emerge as a result of smart grid capabilities Channels are in place to harvest ideas, develop them, and reward those who help shape future advances in process, workflow complexities, and technology
1 STARTING	Smart Grid Vision and Strategy vision, strategy, and business case	Smart Grid Vision and Strategy vision, strategy, and business case
	<ol style="list-style-type: none"> Smart grid vision and strategy drive the organization's strategy and direction Smart grid is a core competency throughout the organization Smart grid strategy is shared and revised collaboratively with external stakeholders Required authorizations for smart grid investments have been secured 	<ol style="list-style-type: none"> Management systems and organizational structures are capable of making advanced and critical decisions about smart grid 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 The smart grid vision and strategy are driving organizational change Smart grid measures are incorporated into the measurement system Performance and compensation are linked to smart grid success Leadership is consistent in communication and actions regarding smart grid A regime or overlay structure to support smart grid activities is in place Education and training are aligned to exploit smart grid capabilities
0 NOT STARTED	Smart Grid Strategy vision, strategy, and business case	Smart Grid Strategy vision, strategy, and business case
	<ol style="list-style-type: none"> A new vision for a smart grid begins to drive change and affect related priorities Most operations have been aligned around end-to-end processes Smart grid implementation and deployment teams include participants from all impacted functions and OSs Education and training to develop smart grid competencies have been identified and are available The linking of performance and compensation plans to achieve smart grid milestones is in progress 	<ol style="list-style-type: none"> The organization has articulated its need to build smart grid competencies in its workforce Leadership has demonstrated a commitment to change the organization in support of achieving smart grid Smart grid awareness efforts to inform the workforce of smart grid activities have been initiated

Matrix



SGMM at a glance

8 Domains: Logical groupings of smart grid related capabilities and characteristics

SEI Smart Grid Maturity Model Version 1.1

	SMR Strategy, Management, and Regulatory Capabilities and characteristics that enable smart grid vision and strategy, establish processes, and promote collaborative relationships with stakeholders	SOS Organization and Structure Capabilities and characteristics that focus on communications, culture, structure, training and education, and knowledge management	GO Grid Operations Capabilities and characteristics that support the reliable, secure, safe, and efficient operation of the electrical grid	WAM Work and Asset Management Capabilities and characteristics that support the optimal management of assets and workforce resources	TECI Technology Capabilities and characteristics that establish processes for evaluation, acquisition, integration and testing of new smart grid technology	CUST Customer Capabilities and characteristics that enable active or passive customer participation in the use, source, and cost of energy	VCI Value Chain Integration Capabilities and characteristics that enable demand and supply management, distributed generation and load management, and leveraging market opportunities	SEI Societal and Environmental Capabilities and characteristics that enable the reliability, safety, and security of the electric power infrastructure, the quantity and source used, and the impact of energy use on the environment and quality of life.
5
4
3
2
1
0

175 Characteristics: Features you would expect to see at each stage of the smart grid journey

6 Maturity Levels: Defined sets of characteristics and outcomes



Eight SGMM domains

SMR	Strategy, Mgmt & Regulatory <i>Vision, planning, governance, stakeholder collaboration</i>	TECH	Technology <i>IT architecture, standards, infrastructure, integration, tools</i>
OS	Organization and Structure <i>Culture, structure, training, communications, knowledge mgmt</i>	CUST	Customer <i>Pricing, customer participation & experience, advanced services</i>
GO	Grid Operations <i>Reliability, efficiency, security, safety, observability, control</i>	VCI	Value Chain Integration <i>Demand & supply management, leveraging market opportunities</i>
WAM	Work & Asset Management <i>Asset monitoring, tracking & maintenance, mobile workforce</i>	SE	Societal & Environmental <i>Responsibility, sustainability, critical infrastructure, efficiency</i>



SGMM levels

Level	Description
PIONEERING 5	Breaking new ground; industry-leading innovation
OPTIMIZING 4	Optimizing smart grid to benefit entire organization; may reach beyond organization; increased automation
INTEGRATING 3	Integrating smart grid deployments across the organization, realizing measurably improved performance
ENABLING 2	Investing based on clear strategy, implementing first projects to enable smart grid (may be compartmentalized)
INITIATING 1	Taking the first steps, exploring options, conducting experiments, developing smart grid vision
DEFAULT 0	Default level (status quo)



SGMM Navigation process



Five-step process led by a certified SGMM Navigator

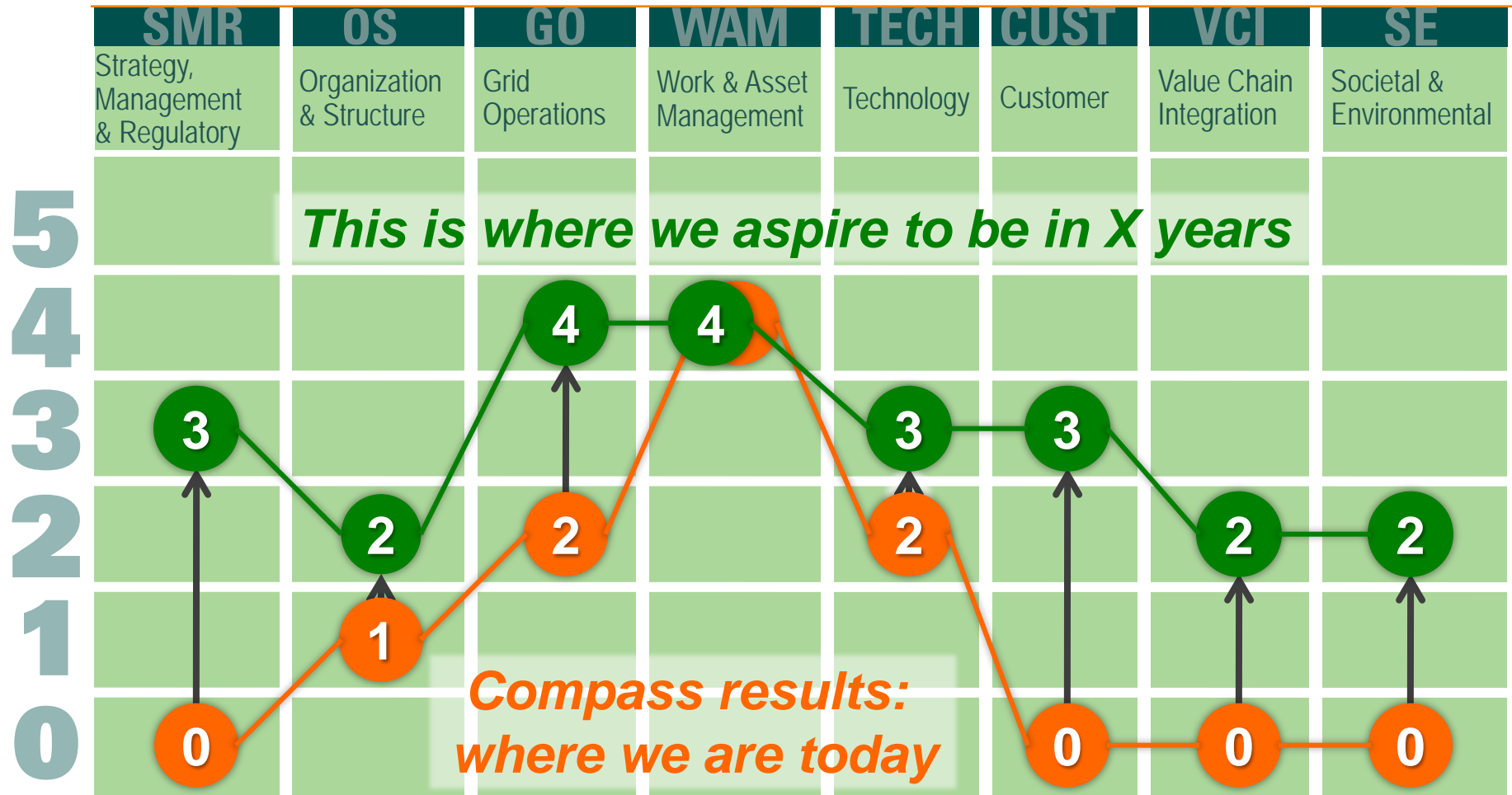
Includes two workshops:

Survey Workshop: utility stakeholders complete the SGMM Compass survey as a team, discussions occur to develop consensus responses

Aspirations Workshop: Compass results and findings are presented and discussed; aspirations are agreed through consensus discussions



SGMM Aspirations Workshop



NOTE: There is no “correct” target profile; the optimal profile will vary by utility.



SGMM Aspirations Workshop Results

SGMM Maturity targets by domain

Model provides a description of that destination and a scaffold for envisioning the future

For each domain:

- **Motivations**

What motivates the achievement of the maturity target?

- **Actions**

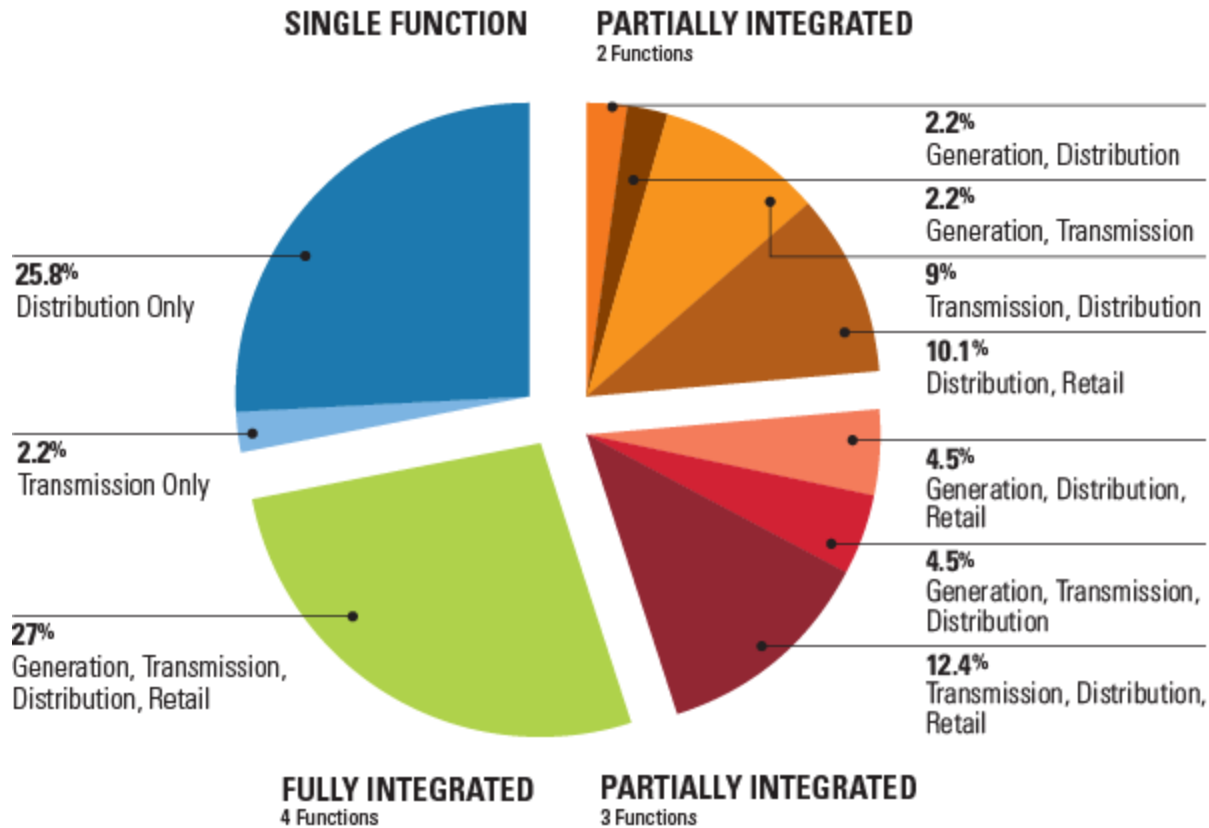
What actions must happen to achieve the target?

- **Obstacles**

What obstacles must be overcome?

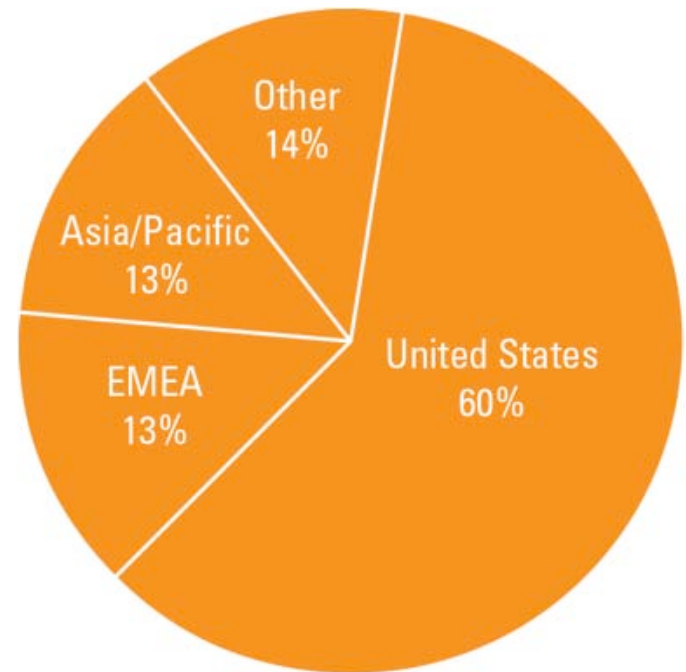
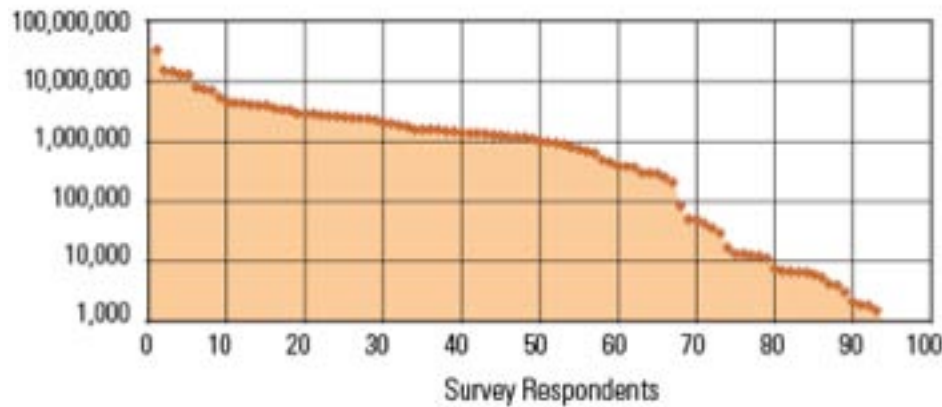


SGMM community data – utility type



SGMM community data - size and location

Meter Count

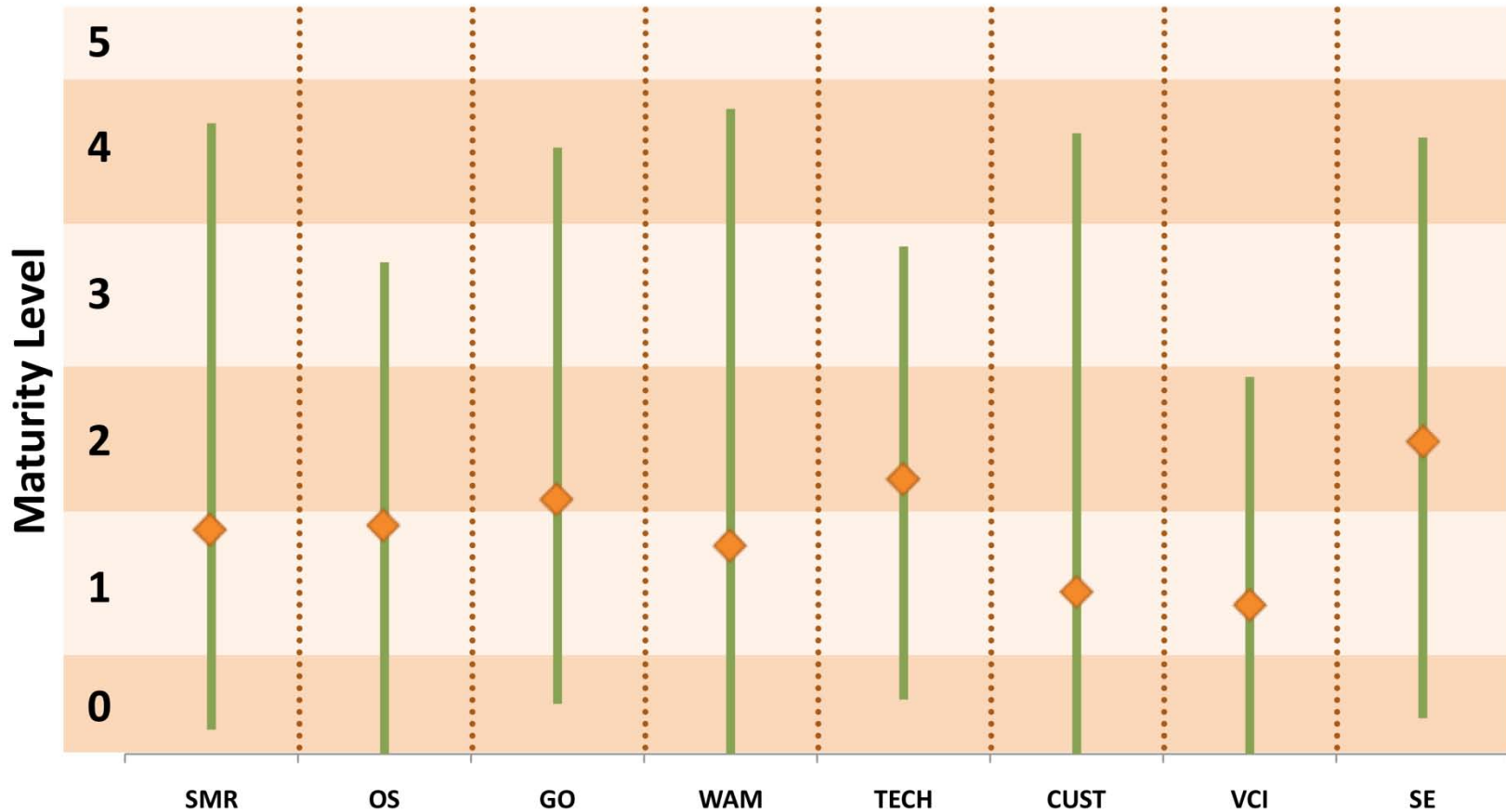


Distribution by region

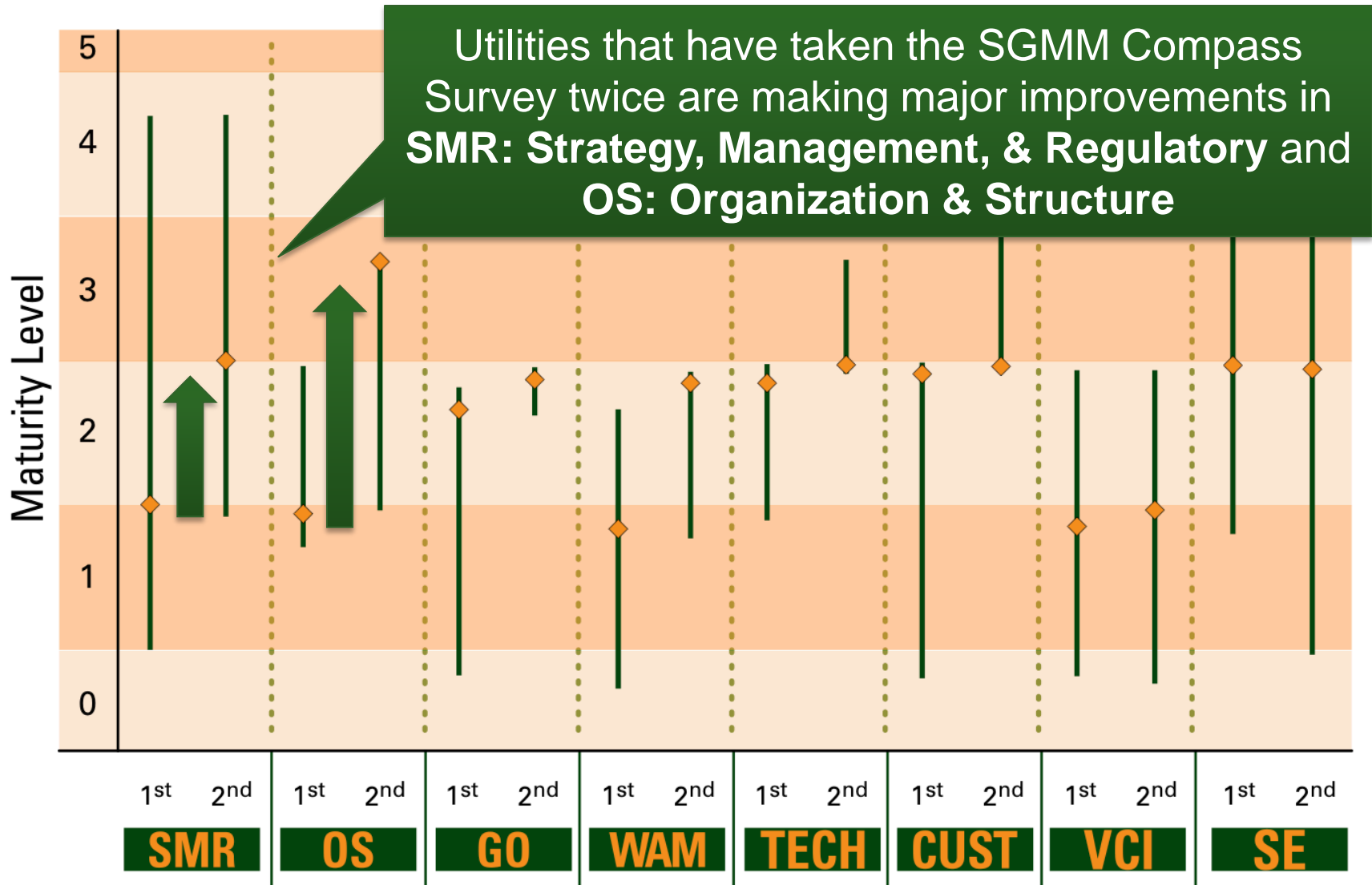


SGMM community data - average and range

Community Composite ($\geq 250,000$ Meters)



Early trends in repeat use



2010 Approach and Results

The focus in 2010 was to strengthen the model to support widespread adoption and consistent use.

Development activities included:

- Releasing Version 1.1 of the model
- Expanding the SGMM Model Definition
- Updating the SGMM Compass Survey
- Improving the mapping between model and survey
- Codifying a standard SGMM Navigation process
- Piloting V1.1 and the Navigation process with >30 utilities
- Developing a training and certification program for Navigators



2010 Pilot Activities

Pilot program designed to include diverse user perspectives for feedback on V1.1 and future evolution:

- **Large investor-owned utilities**
Including repeat users who use the SGMM to track progress
- **Public power utilities**
Testing applicability of the tool to this sector, in collaboration with the APPA
- **International**
Supporting US-Mexico collaboration by using SGMM in national smart grid roadmapping effort



2011 Plans and Expectations

In 2011 SEI will shift the focus to building out the infrastructure and growing the SGMM community.

In addition to providing direct value to users, broad adoption makes the model and accumulated knowledge base more valuable to the entire stakeholder community.

Major activities planned for 2011 include:

- Launching a license program for the SGMM Navigation process
- Training and certifying Navigators to facilitate access and use
- Conducting outreach activities like the public power pilot
- Collaborating with other OE smart grid projects
- Developing strategies for mining the SGMM database
- Building a self-sustaining business model for ongoing support



Technology Transfer, Collaboration, Partnerships

The SGMM project is fundamentally a technology transfer effort to extend and enhance the model and make it accessible and useful to the industry at large.

A Stakeholder Panel from across the industry provides high level guidance, and the user community collaborates directly in ongoing evolution of the model and associated knowledge base.

A network of licensed transition partners will provide accelerated access and expert assistance, under quality control by SEI as neutral steward of the model and community.



More information

Austin Montgomery
amontgom@sei.cmu.edu

David White
dwhite@cert.org

www.sei.cmu.edu/smartgrid

