SGMM

Smart Grid Maturity Model

SGMM Around the World

May 15, 2014

Notices

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DM-0000130

About the Speaker

Jeffere H. Ferris is a managing consultant in IBM's Global Center of Competency for Energy and Utilities, specialized in business case and roadmap development. He develops and executes business strategies for a range of utility clients in North American, Europe, Asia, and Australia. He offers depth with business case assessment, performance improvement and large initiative planning across utility Smart Grid planning and development.

Polling Question #1

How familiar are you with the SGMM?

a) Not at all familiar

b) Somewhat familiar

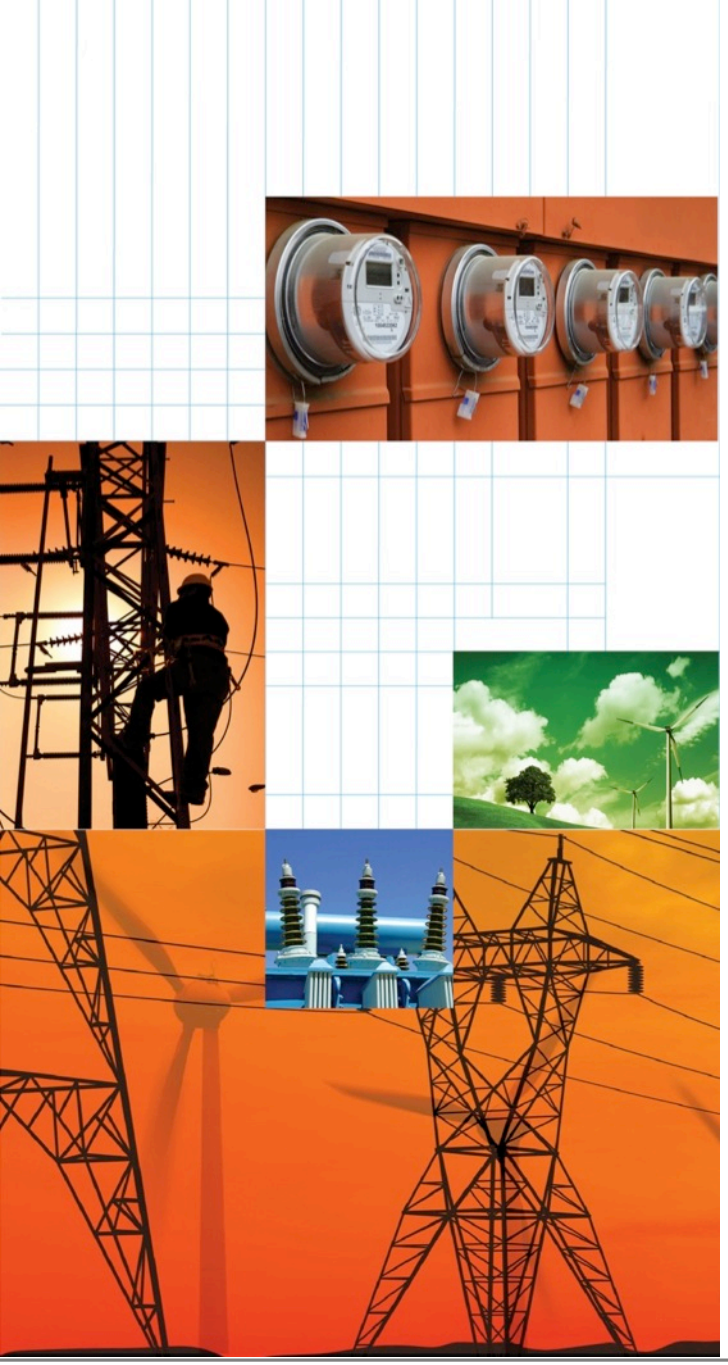
c) Familiar

d) Very familiar

Webinar objectives

The objectives are for you to learn:

- benefits of using a common model and data
- why the model applies to many different utility types without needing to be customized
- the demographics, structure, motivations, and maturity of the utilities included in the SGMM database
- how conclusions about utility peer groups are supported by actual data
- the importance of the Navigators in interpreting a utility's results and setting goals



A major power grid transformation is underway

How can utilities

- Develop effective roadmaps?
- Track progress?
- Understand their posture in comparison to peers?

The Smart Grid Maturity Model was developed by utilities to address these concerns

The Smart Grid Maturity Model is

A management tool

that provides a

common language and framework

for defining key elements of

smart grid transformation

and helping utilities develop a

programmatic approach

and track their progress

SGMM Timeline

Developed by Utilities for Utilities

2007 2008 2009 2010 2011 2012 2013 2014

Global Intelligent Utility Network Coalition (GIUNC) develops SGMM

Utilities use SGMM v1.0 | v1.1 | v1.2

SEI, supported by Department of Energy, is model steward

- SEI releases SGMM v1.1 product suite
- Licensing & certification program for SGMM Navigation begins
- SEI releases SGMM v1.2 product suite

GIUNC:

CenterPoint Energy
Progress Energy
DONG Energy
North Delhi Power Ltd
Country Energy
Sempra Energy
Pepco Holdings
IBM
APQC

The Software Engineering Institute

The SEI is a federally-funded research and development center at Carnegie Mellon University, a global university **recognized worldwide** for its energy and environmental research initiatives.

A **trusted, objective source** of best practices, methods and tools to organizations worldwide, the SEI is a **global leader** in software and systems engineering, process improvement and security best practices – all critical elements of smart grid success.

The SEI collaborates in **public-private partnership** with government and industry on important cybersecurity, architecture, and interoperability challenges of the smart grid. The Department of Energy sponsored the SEI's smart grid efforts.

Carnegie Mellon University

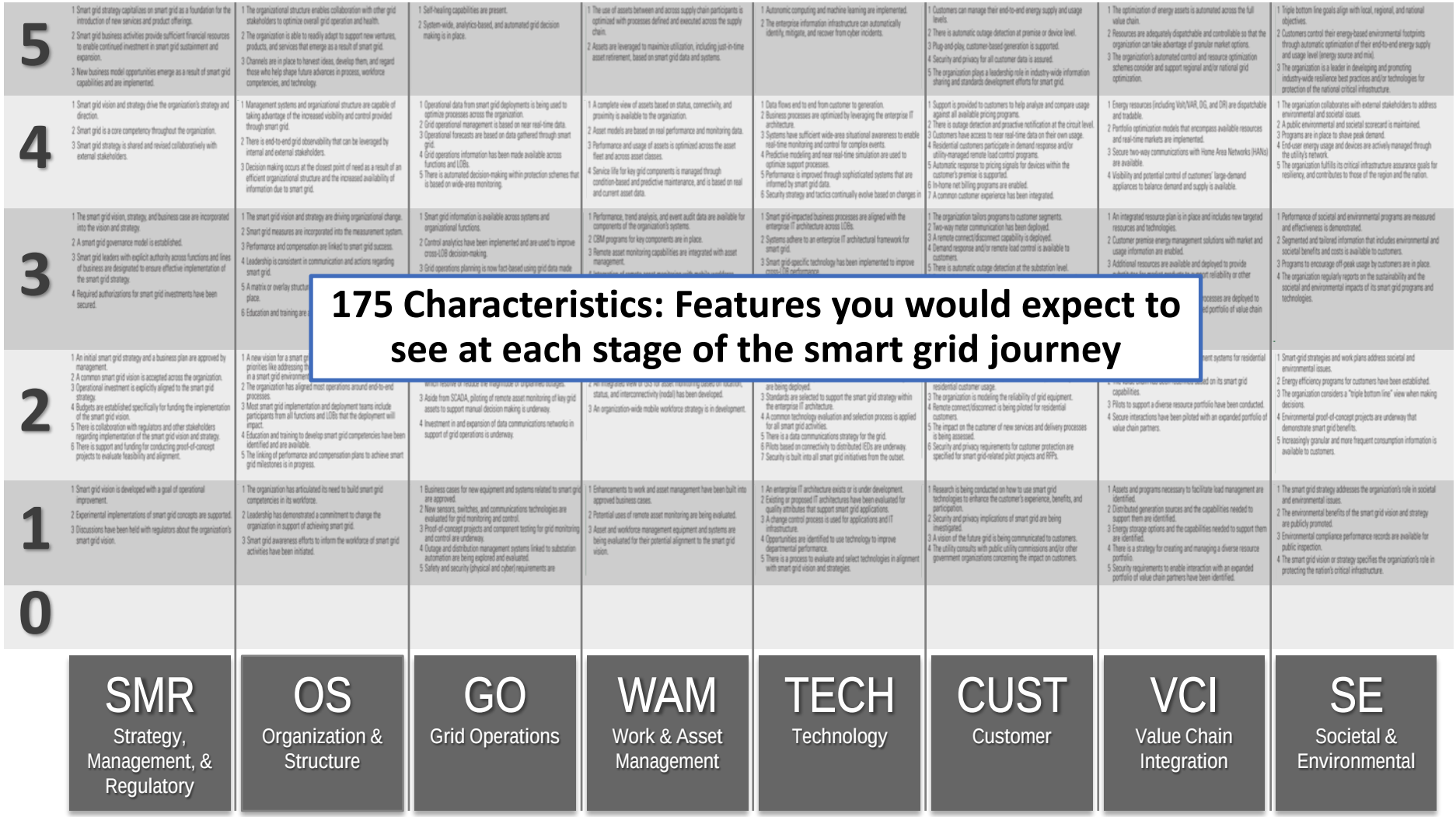
The SEI's Role as Steward of the SGMM

As a trusted third party between government and industry, and as part of the internationally recognized Carnegie Mellon University, the SEI

- provides **governance** working with multiple stakeholders
- enables **widespread availability**, adoption, and use of the model for the benefit of the community
- **evolves the model** based on stakeholder needs, market developments, user feedback, and interactions with domain experts
- develops **transition** mechanisms—education, training, awareness, research collaboration—to support the model
- grows the SGMM **community** of users worldwide

SGMM at a glance

6 Maturity Levels: Defined sets of characteristics and outcomes



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

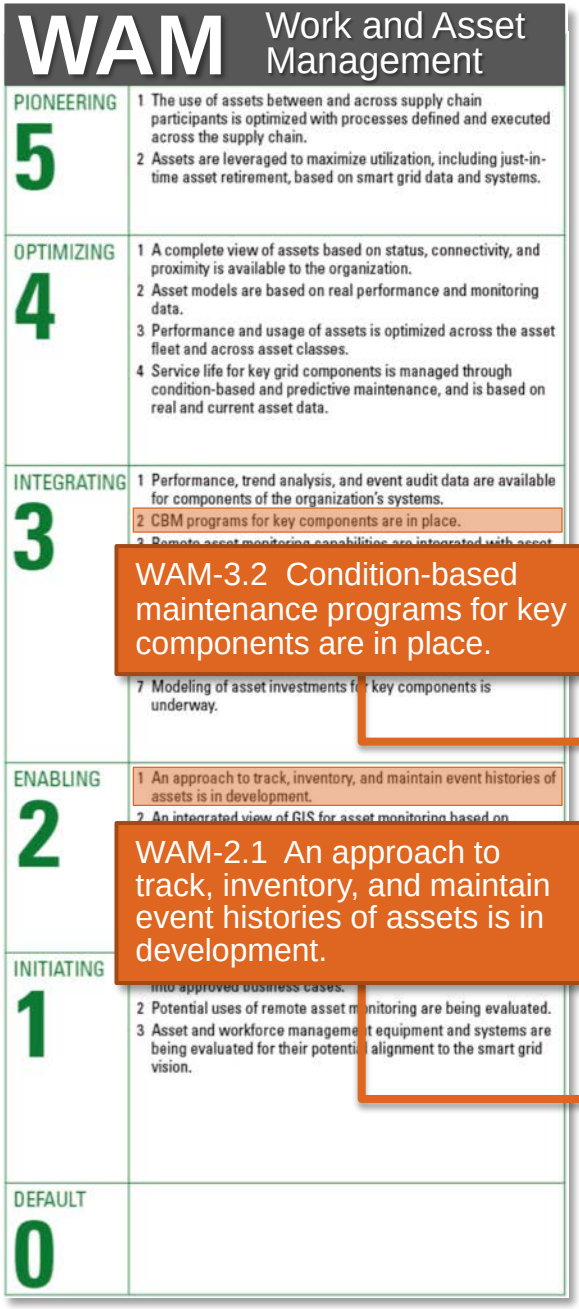
8 Domains: Logical groupings of smart grid related characteristics

Smart Grid Maturity Model – levels

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)

Smart Grid Maturity Model – domains

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



WAM-3.2 Condition-based maintenance programs for key components are in place.

WAM-2.1 An approach to track, inventory, and maintain event histories of assets is in development.

SGMM Compass Survey

Contains

- One question for each expected characteristic in the model and
- Attribute and performance questions

Example questions:

WAM-3.2 For what percentage of key components have you implemented condition-based maintenance that uses real-time data from asset monitoring to drive maintenance and replacement decisions?

A. 0%
B. 1 - 25%
C. 26 - 50%
D. 51 - 75%
E. 76 - 100%

WAM-2.1 Have you established an approach to track, inventory, and maintain event histories of assets using smart grid capabilities?

A. No
B. In documented plan including committed schedule and budget
C. In development
D. Being piloted
E. Completed

SGMM

Smart Grid Maturity Model

V 1.2 Product Suite

Model	Fully described in the Model Definition document
Compass Survey	Questionnaire-based assessment yields maturity ratings and comparisons
Navigation Process	Expert-led workshops to complete Compass and use results to develop consensus aspirations
Training	Overview Seminar and SGMM Navigator Course
Partner Program	License organizations and certify individuals to deliver Navigation process

www.sei.cmu.edu/smartgrid

SGMM Navigation: five-phase, expert-led process

Stakeholders complete SGMM Compass survey

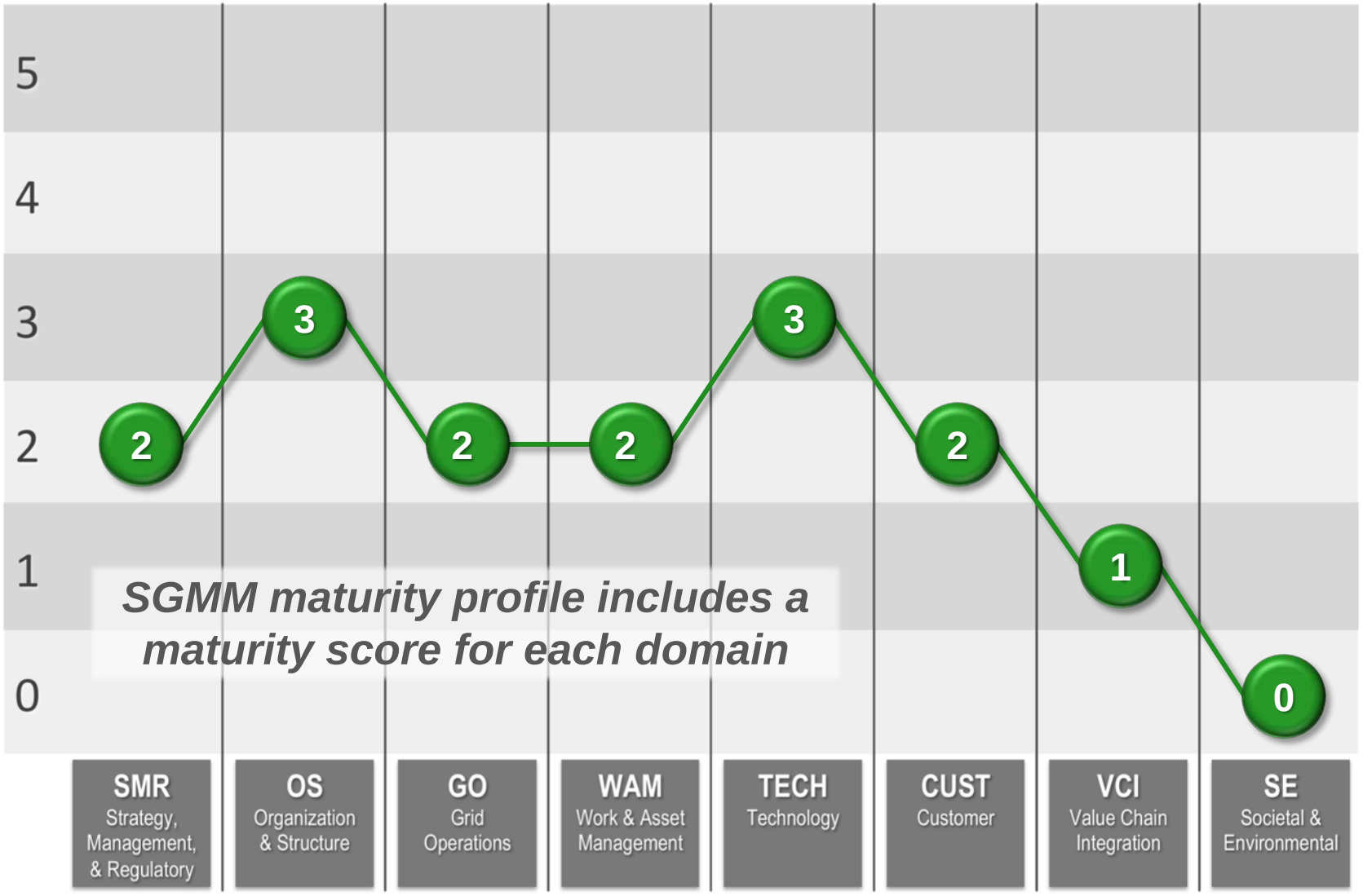
Discussion and consensus answers lead to internal alignment on current state

Stakeholders review survey findings & set aspirational profile

Consensus on aspirational state and identification of motivations, actions, and obstacles to achieve it

Compass results: maturity profile

example results



Compass results: dashboard

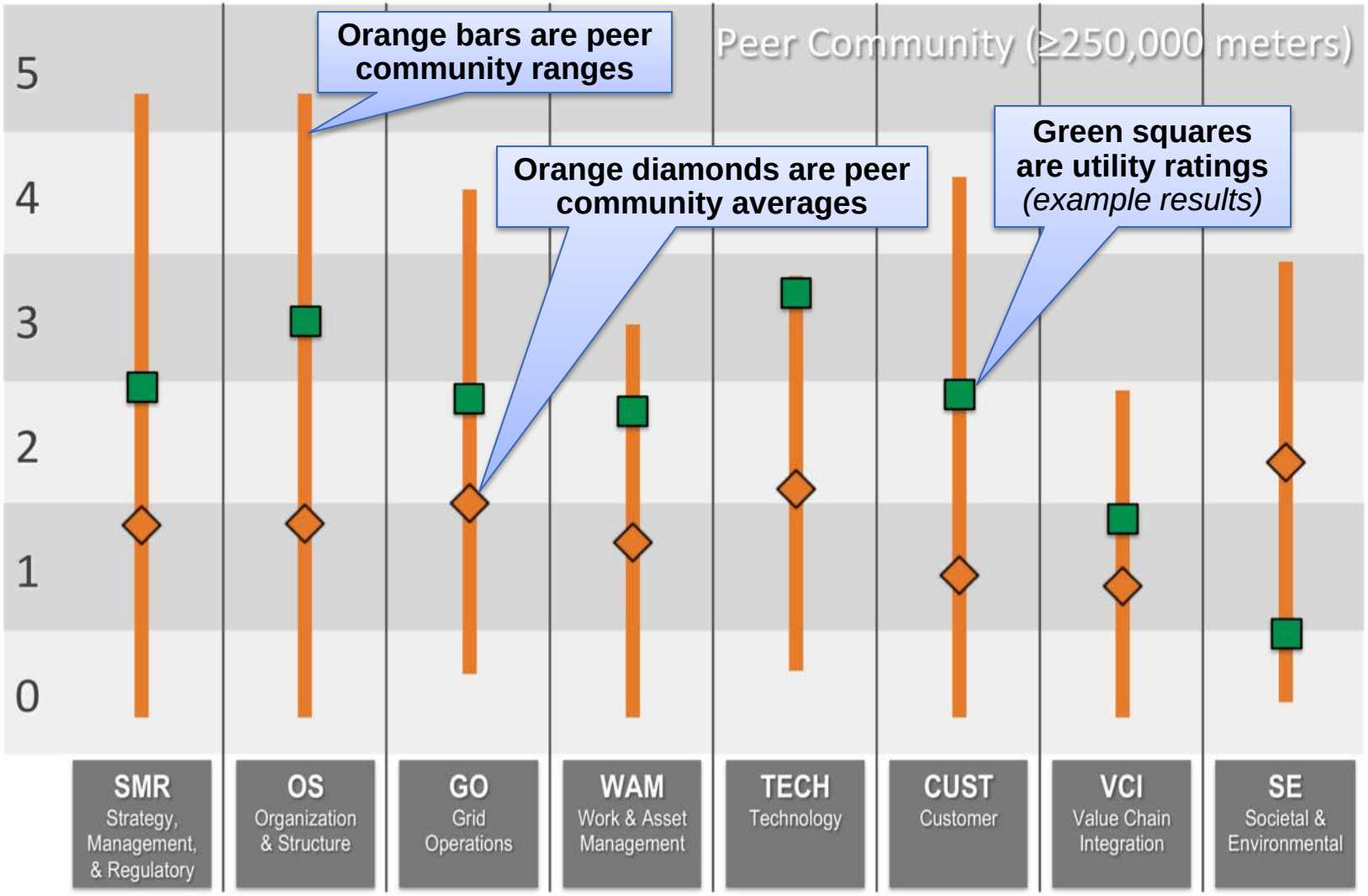
example results

Sample Results								
Level	Strategy, Management & Regulatory	Organization & Structure	Grid Operations	Work & Asset Management	Technology	Customer	Value Chain Integration	Societal & Environmental
5	0.53	0.50	0.25	0.00	0.00	0.20	0.30	0.30
4	0.57	0.17	0.28	0.30	0.40	0.36	0.25	0.40
3	0.65	0.75	0.57	0.47	0.73	0.59	0.58	0.35
2	1.00	0.82	0.93	1.00	1.00	0.92	0.58	0.76
1	0.90	1.00	1.00	1.00	0.84	0.85	0.78	0.68
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

	Point Range	Meaning
	≥ 0.70	Green reflects level compliance within the domain
	≥ 0.40 and < 0.70	Yellow reflects significant progress
	< 0.40	Red reflects initial progress
	= 0	Grey reflects has not started

Compass results: peer community comparison

example results



Legend: Top 10-33% | Bottom 33% | Top 10% | *Red Italics* Weakness against the model

Example results
Fictitious organization

Strategy, Mgmt, & Regulatory

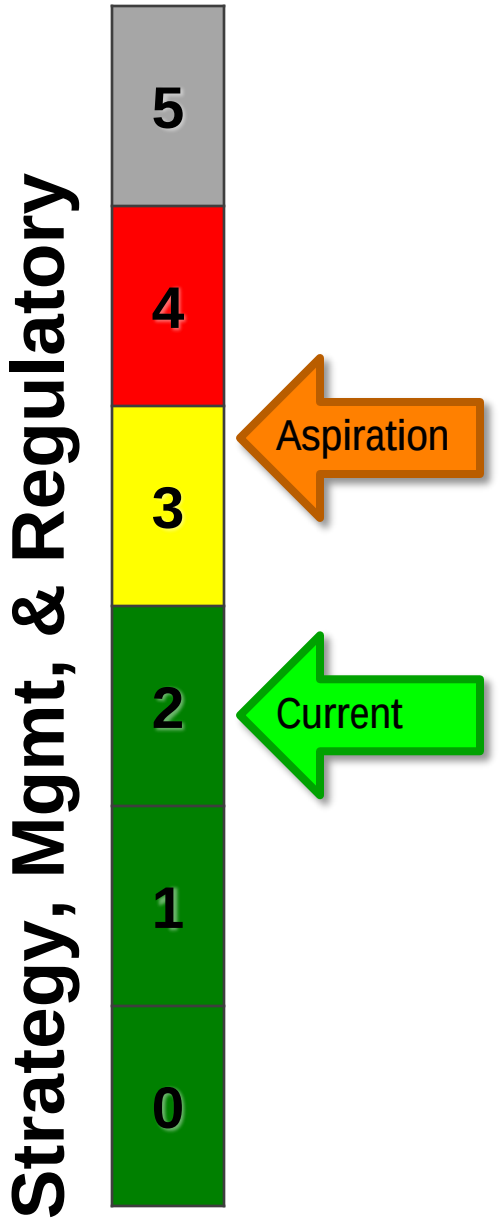
5		5.3 New business model opportunities emerge as a result of smart grid capabilities and are i
		5.2 Smart grid business activities provide sufficient financial resources to enable continued i sustainment and expansion.
		5.1 Smart grid strategy capitalizes on smart grid as a foundation for the introduction of new services and product offerings.
4		4.3 Smart grid strategy is shared and revised collaboratively with external stakeholders.
		4.2 Smart grid is a core c
		4.1 Smart grid v
3		3.4 Required author
		3.3 Smart grid leaders w implementation of the
		3.2 A smart grid governa
		3.1 The smart grid vision
2	✚	2.6 There is support and
		2.5 There is collaboration with regulators and other stakeholders regarding implementation of the smart grid vision and strategy.
	⇩	2.4 Budgets are established specifically for funding the implementation of the smart grid vision.
		2.3 Operational investment is explicitly aligned to the smart grid strategy.
		2.2 A common smart grid vision is accepted across the organization.
		2.1 An initial smart grid strategy and a business plan are approved by management.
1	★	1.3 Discussions have been held with regulators about the organization's smart grid vision.
		1.2 Experimental implementations of smart grid concepts are supported.
		1.1 Smart grid vision is developed with a goal of operational improvement.

Aspiration setting:

1. Model characteristics are sequentially reviewed, discussed, and considered for levels that have not yet been achieved.
2. Consensus on relevance and importance to organization for achieving characteristics is used to set aspiration.

Aspiration Setting Tool

Example results
Fictitious organization



What motivates this aspiration?

-
-
-
-

What actions must happen to achieve this aspiration?

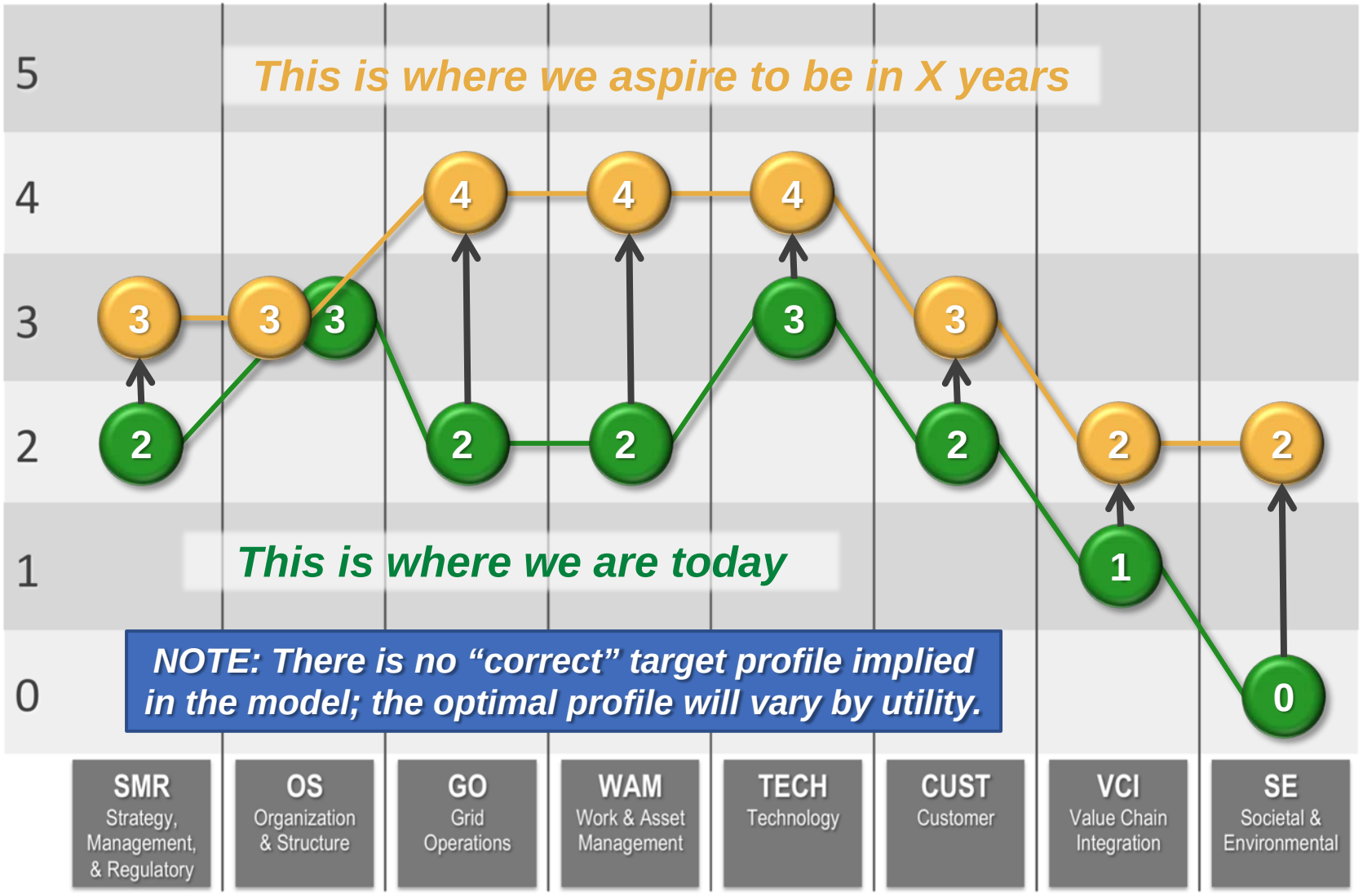
-
-
-
-

What obstacles must be overcome to achieve this aspiration?

-
-
-

Navigation results: consensus aspirations

example results

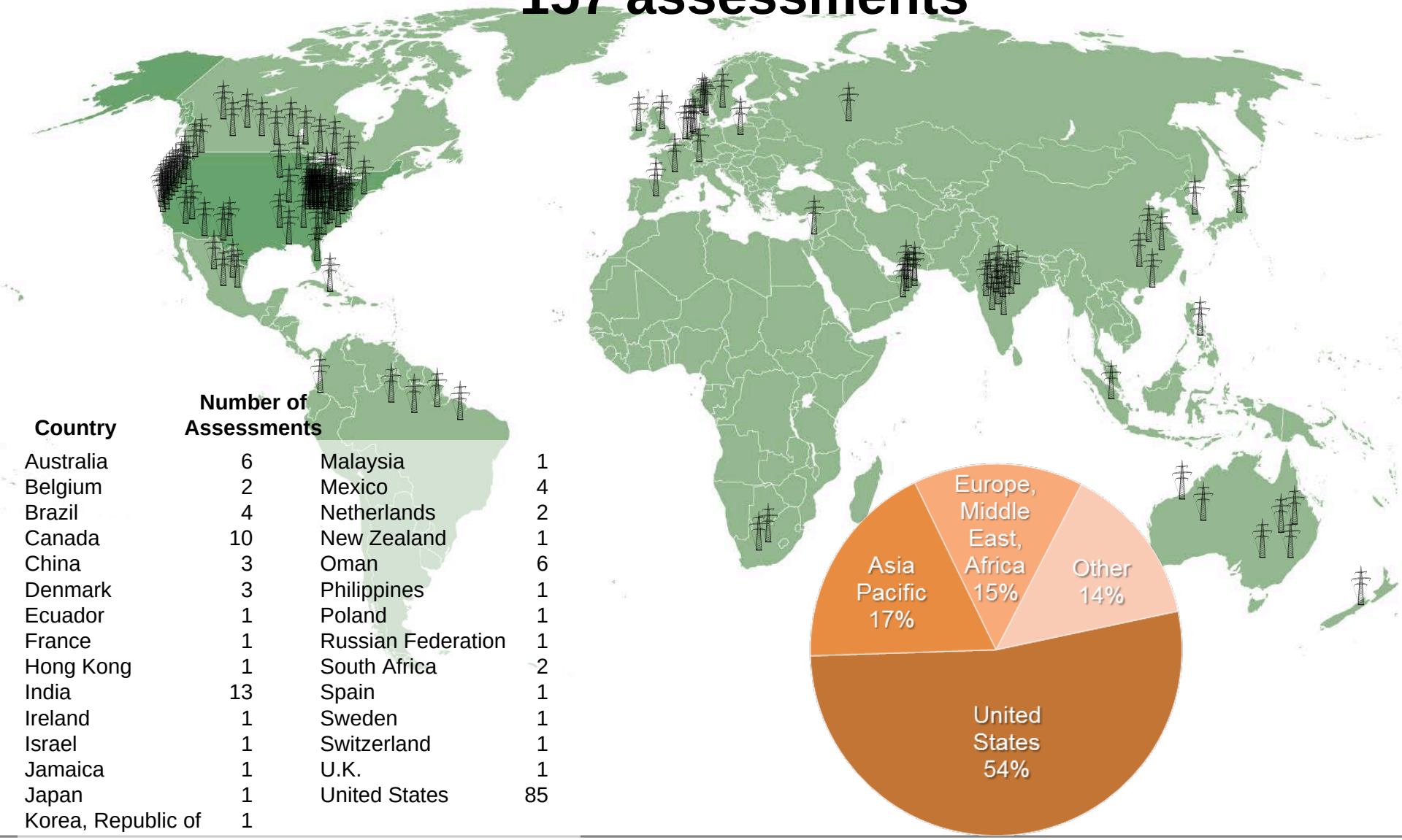


SGMM data

The following charts provide SGMM data from North American grid utilities and the international community:

- SGMM History
- Size (meter count)
- Type
  - Industry participation
  - Service territory (urban vs. rural)
  - Ownership structure
  - Regulatory environment
- Community
  - Partners
  - Navigators
  - Number of assessments per year
- Results
  - Motivations
  - SGMM maturity
  - Repeat users

SGMM History – 142 utilities, 29 countries, 157 assessments

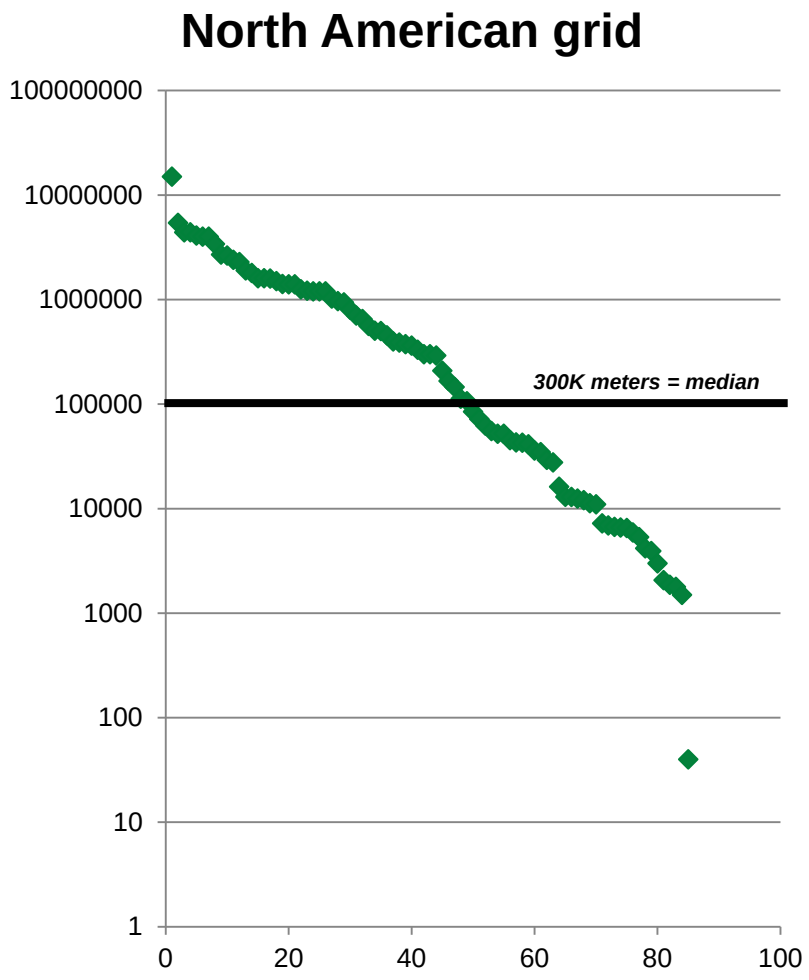


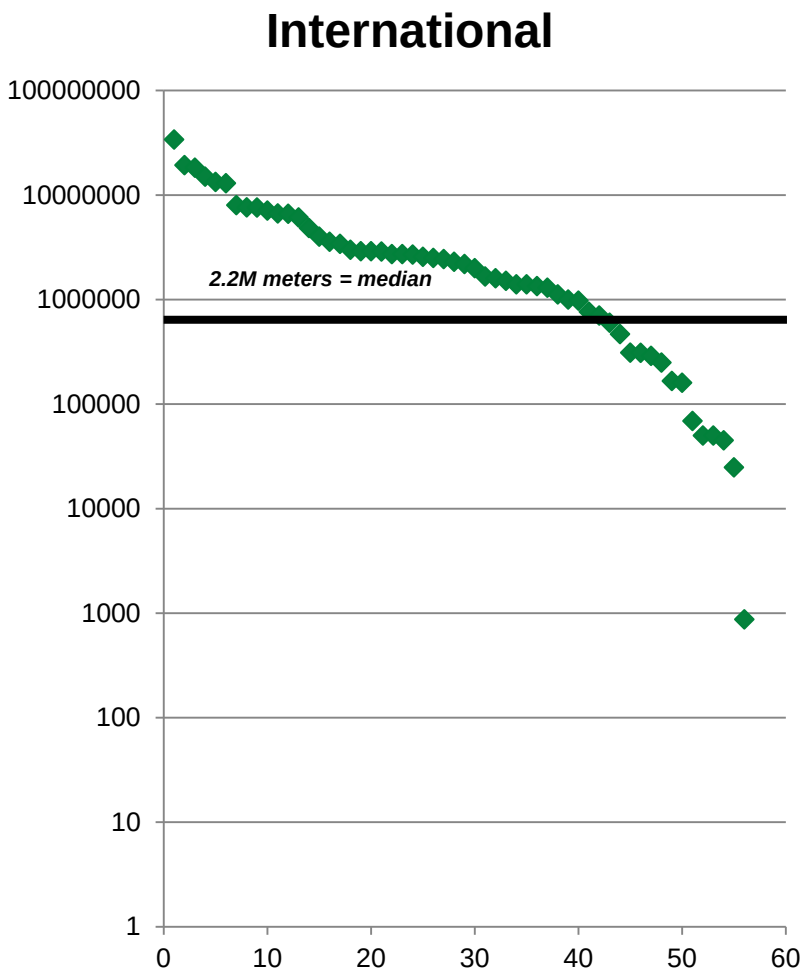
Country	Number of Assessments	Country	Number of Assessments
Australia	6	Malaysia	1
Belgium	2	Mexico	4
Brazil	4	Netherlands	2
Canada	10	New Zealand	1
China	3	Oman	6
Denmark	3	Philippines	1
Ecuador	1	Poland	1
France	1	Russian Federation	1
Hong Kong	1	South Africa	2
India	13	Spain	1
Ireland	1	Sweden	1
Israel	1	Switzerland	1
Jamaica	1	U.K.	1
Japan	1	United States	85
Korea, Republic of	1		

SGMM History – 142 utilities, 29 countries, 157 assessments

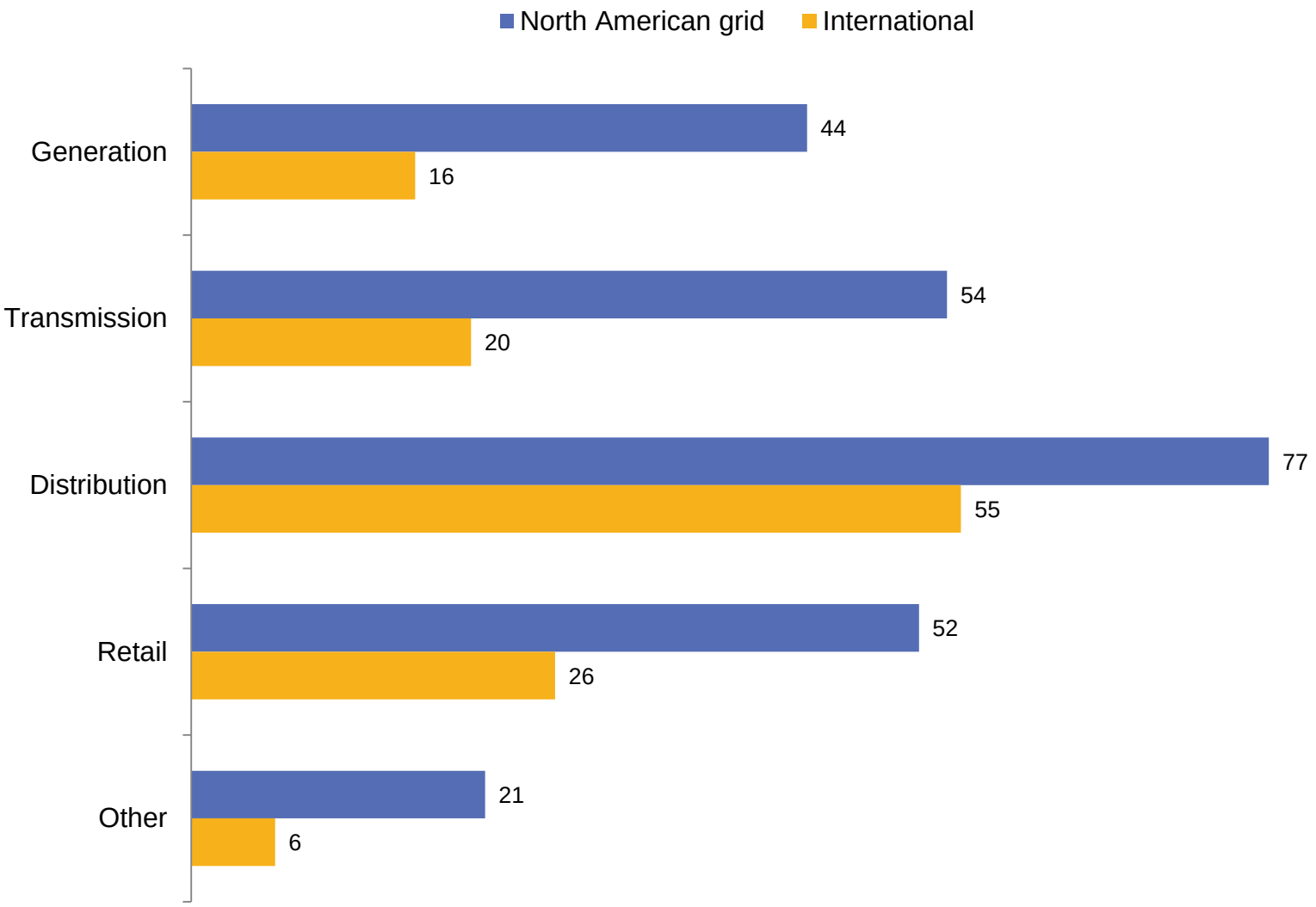
AES Electropaulo
Alameda Municipal Power
Allegheny Power
Alliander
Ameren Illinois
Ameren Missouri
American Electric Power
APCPDCL
ATCO Electric
ATCO Gas
Ausnet
Austin Energy
AZUSA Light and Water
BC Hydro
BESCOM
Bonneville Power Admin.
BSES-Rajdhani
BSES Yamuna Power Limited
Burbank Water and Power
CELPE
CenterPoint Energy
Centro Sur
CESC Limited
CESC, Mysore
CFE (Mexico) Gulfonorte
CFE (Mexico) Jalisco
CFE (Mexico) Peninsular
Chelan County PUD
CitiPower and Powercor Australia Ltd
City of Anaheim
City of Columbus
City of Danville
City of Dover
City of Hamilton
City of Hudson
City of Jackson
City of Napoleon
City of Painesville
City of Palo Alto
City of Piqua Power System
City of Riverside Public Utilities
City of Wapakoneta
City of Westerville
CLP Power
Coldwater Board of Public Utilities
Comisión Federal de Electricidad-Corporativo
Country Energy
CPFL Paulista
Dhofar Power Company S.A.O.C.
Dominion Virginia Power
DONG Energy Sales & Distribution A/S
DPSC Limited
DTE Energy
Duke Energy
Eandis
East Miss EPA
EDF Energy Networks Branch
EDP - Energias do Brasil, S.A.
EnergyAustralia
Enexis
Entergy
EPCOR Distribution & Transmission
Ephrata Borough
ERDF
ESB Networks
Eskom Holdings SOC Limited
eThekwini Municipality, Electricity Unit
Exelon/ComEd
Exelon/PECO Energy
FirstEnergy
Fortum
Glendale Water & Power
Guandong Power Co.
Holland Board of Public Works
Hydro One
Hydro One - Distribution
Hydro Ottawa Limited
IEC
Imperial Irrigation District
Integral Energy
Intergys
Jamaica Public Service Company
KEPCO
Los Angeles Department of Water and Power
Majan Electricity Company S.A.O.C.
Manila Electric Company
Manitoba Hydro - T&D
Marietta Board of Lights and Water
Mazoon Electricity Company
Memphis Light, Gas and Water Division
MSEDCL
Muscat Electricity Distribution Company S.A.O.C
Muscatine Power & Water
Nashville Electric Service
NB Power
NDPL
Noida Power Company Limited
Oberlin Municipal Light & Power System
Oman Electricity Transmission Co.
Pasadena Water and Power
Pepco Holdings/PHI
PG&E
PGN Carolina
PGN Florida
PNM
Portland General Electric
PPL Electric Utilities
Princeton Electric Plant Board
Progress Energy
Puget Sound
Redding
Reliance Energy
Roseville Electric
Rural Areas Electricity Company
Sacramento Municipal Utility District
Salt River Project
Santee Cooper
SCANA
SDG&E
SIG Geneva
Silicon Valley Power
SMEPC - International Cooperation Dept.
Snohomish
Southern Company
Tata Power
Tenaga Nasionale Berhad
Tokyo Electric Power Co.
Toronto Hydro Electric System Ltd.
Town of Front Royal
Tucson Electric Power
UGVCL
Unión Fenosa Distribución
Unison Networks Limited
Vattenfall Distribution
VELCO
Village of Carey, Ohio
Village of Clinton
Village of Oak Harbor
Village of Yellow Springs
Wadsworth Electric And Communications
Wyandotte Municipal Service
Xcel Energy
Yantarenergo
Zhejiang Jiaxing Electric Power Bureau

Meter count


North American grid
100000000
10000000
1000000
100000
10000
1000
100
10
1
0
20
40
60
80
100
300K meters = median

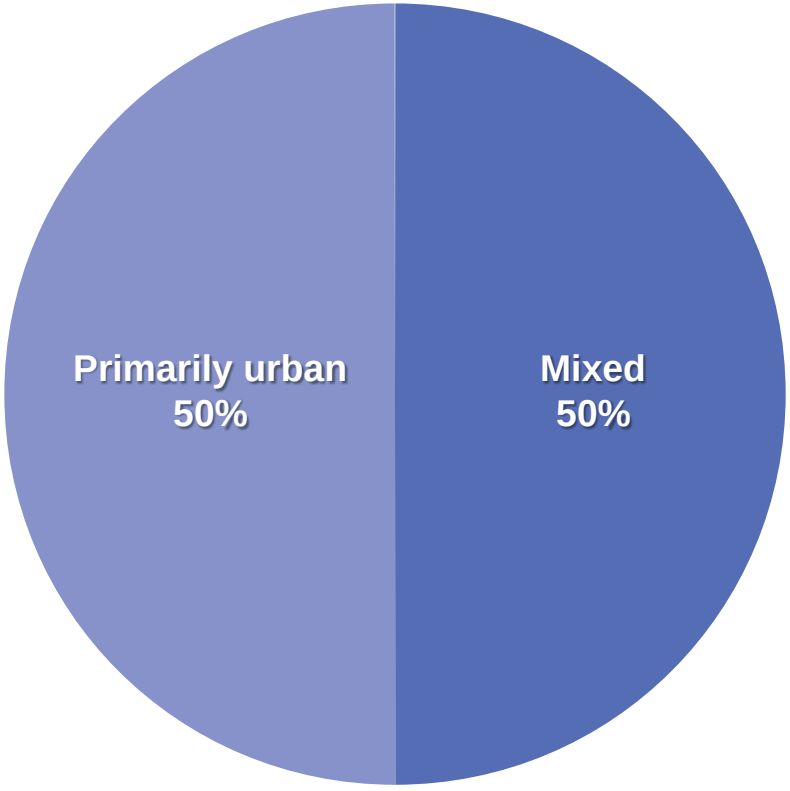

International
100000000
10000000
1000000
100000
10000
1000
100
10
1
0
10
20
30
40
50
60
2.2M meters = median

Industry participation

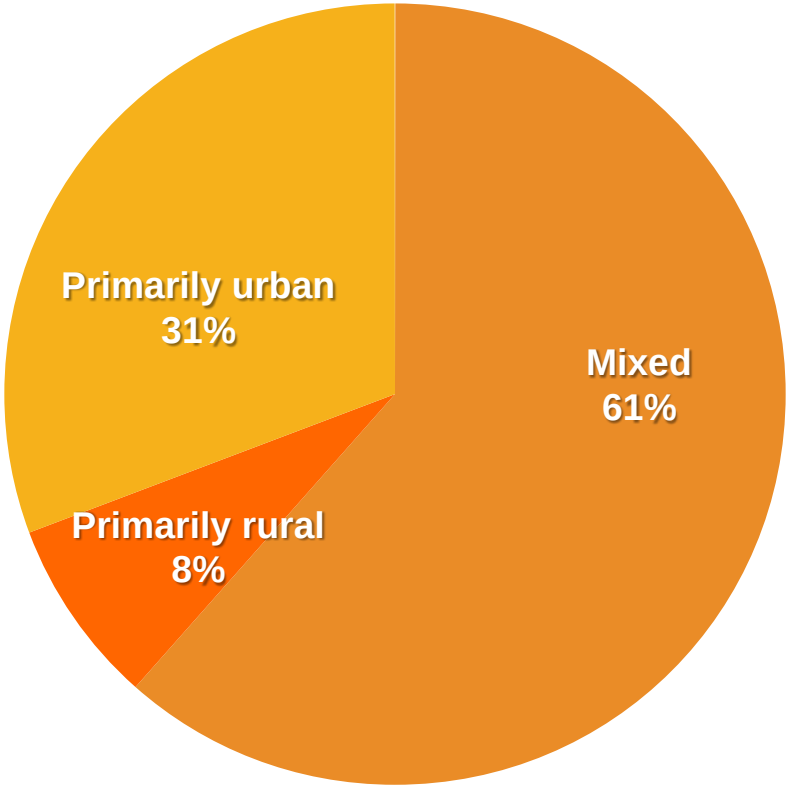


Service territory

North American grid

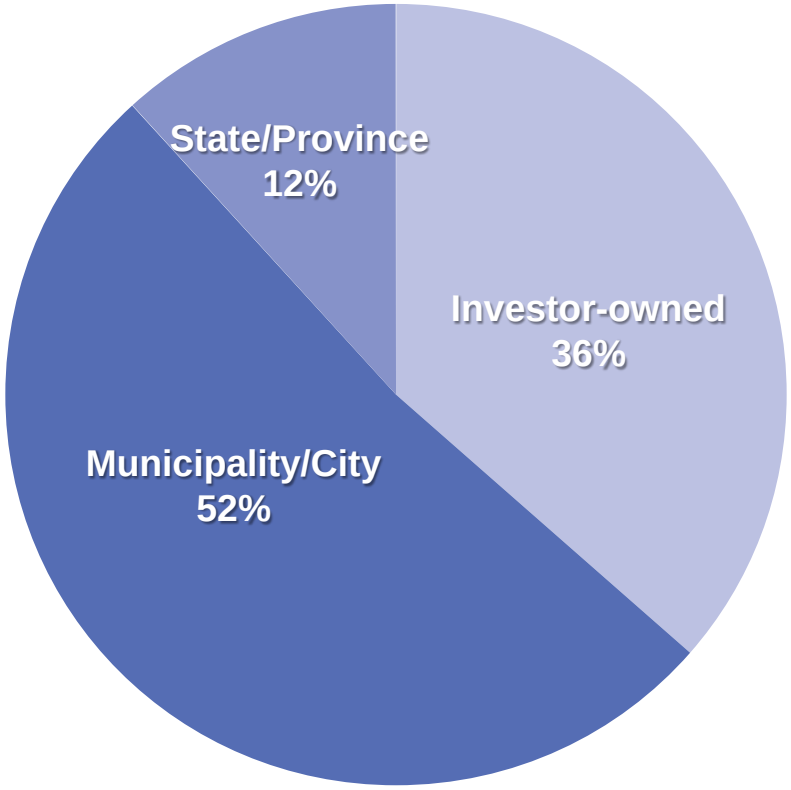


International

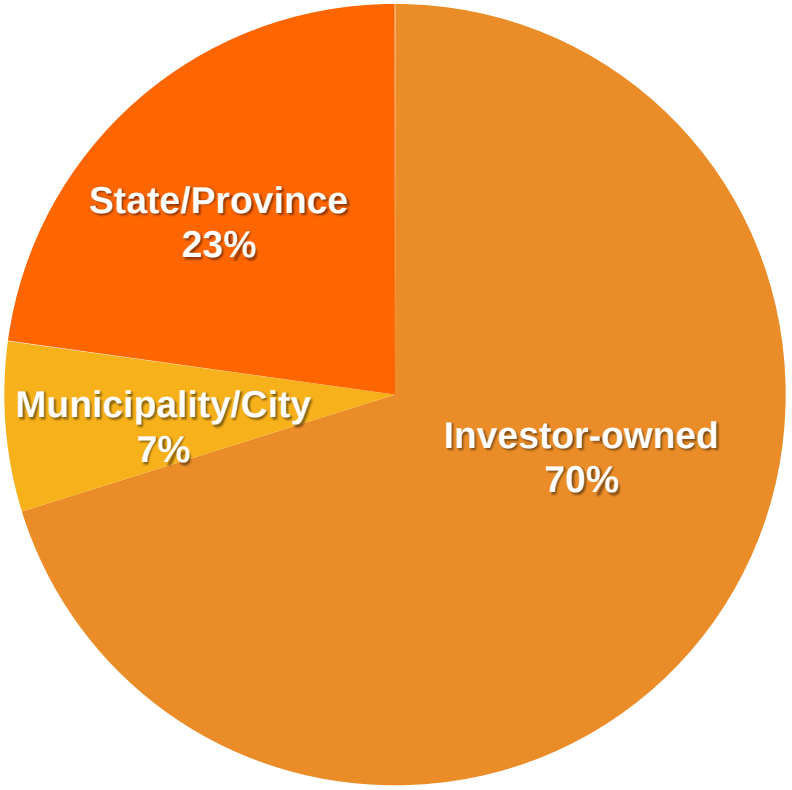


Ownership structure

North American grid

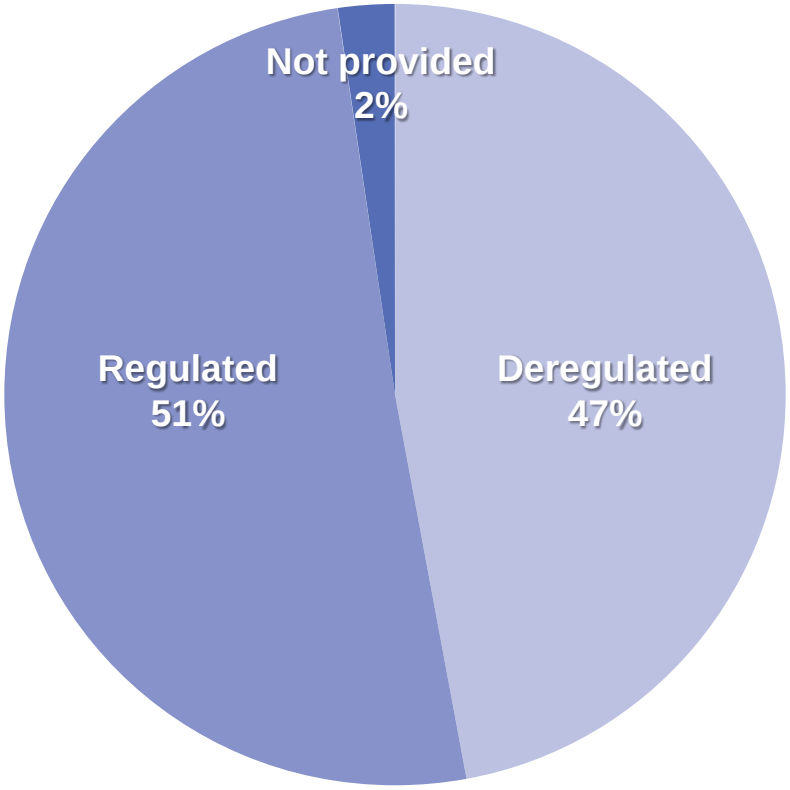


International

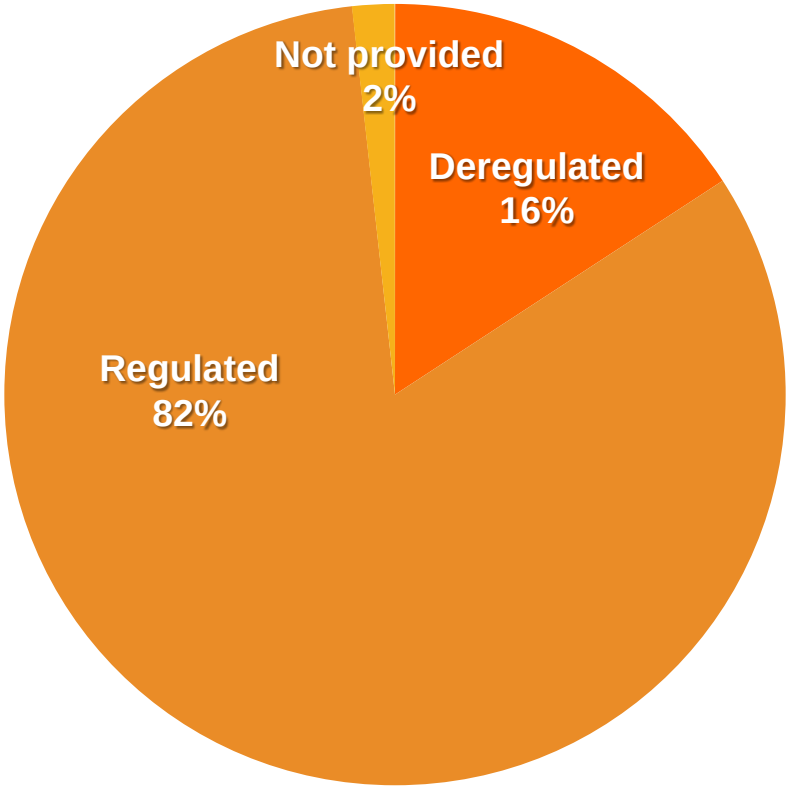


Regulatory environment

North American grid



International



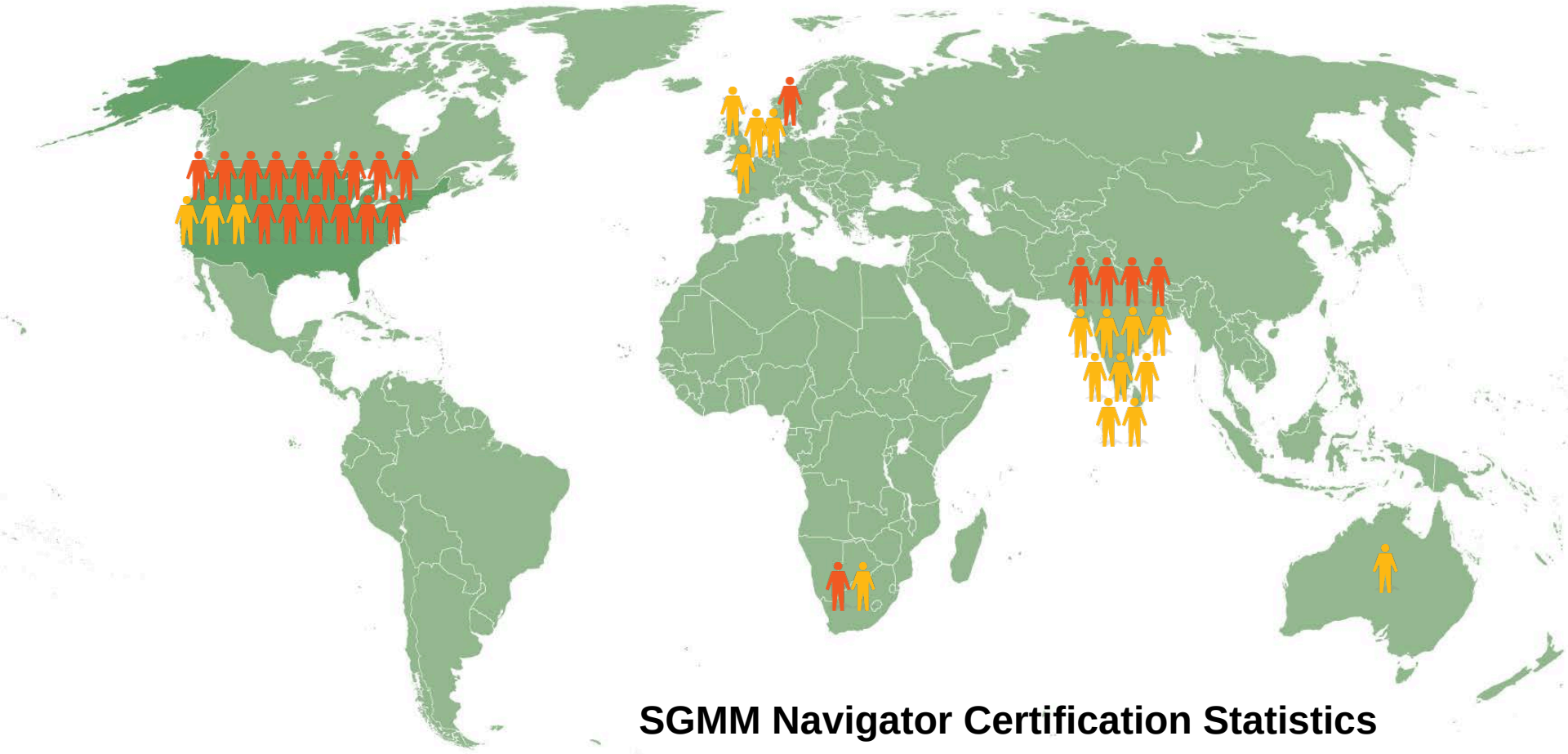
SGMM Partners

SGMM Partners are licensed by the SEI to provide official SGMM services, which are delivered by SEI-certified SGMM Navigators.

John F. Ryskowski Consulting

http://partners.clearmodel.com/partners

SGMM Navigator population

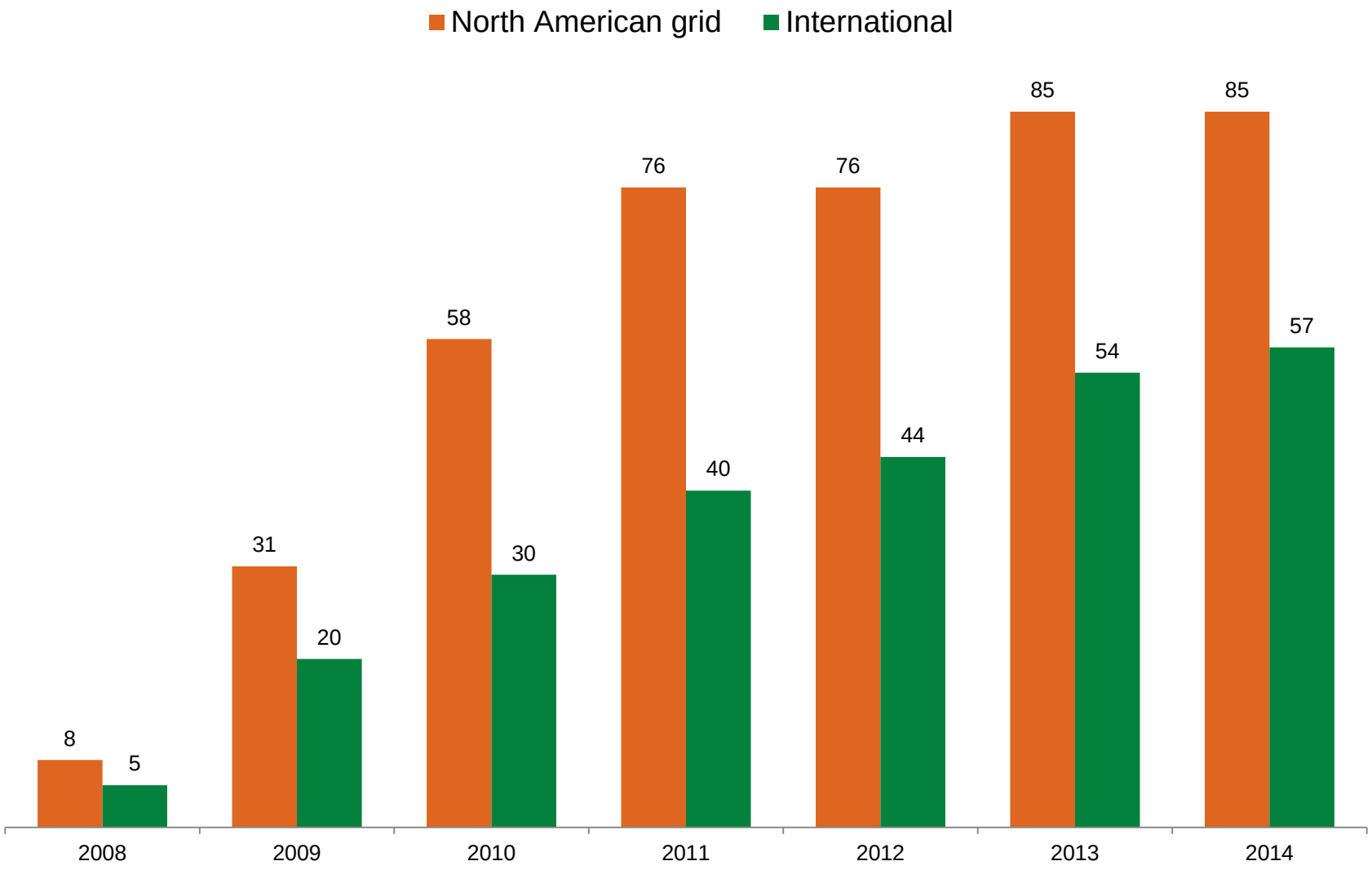


SGMM Navigator Certification Statistics

18 Candidate Navigators *(passed exam)*

18 Certified Navigators *(completed all requirements)*

Number of assessments per year



Polling Question #2

What do you think is the most frequent motivation for utilities to conduct an SGMM Navigation?

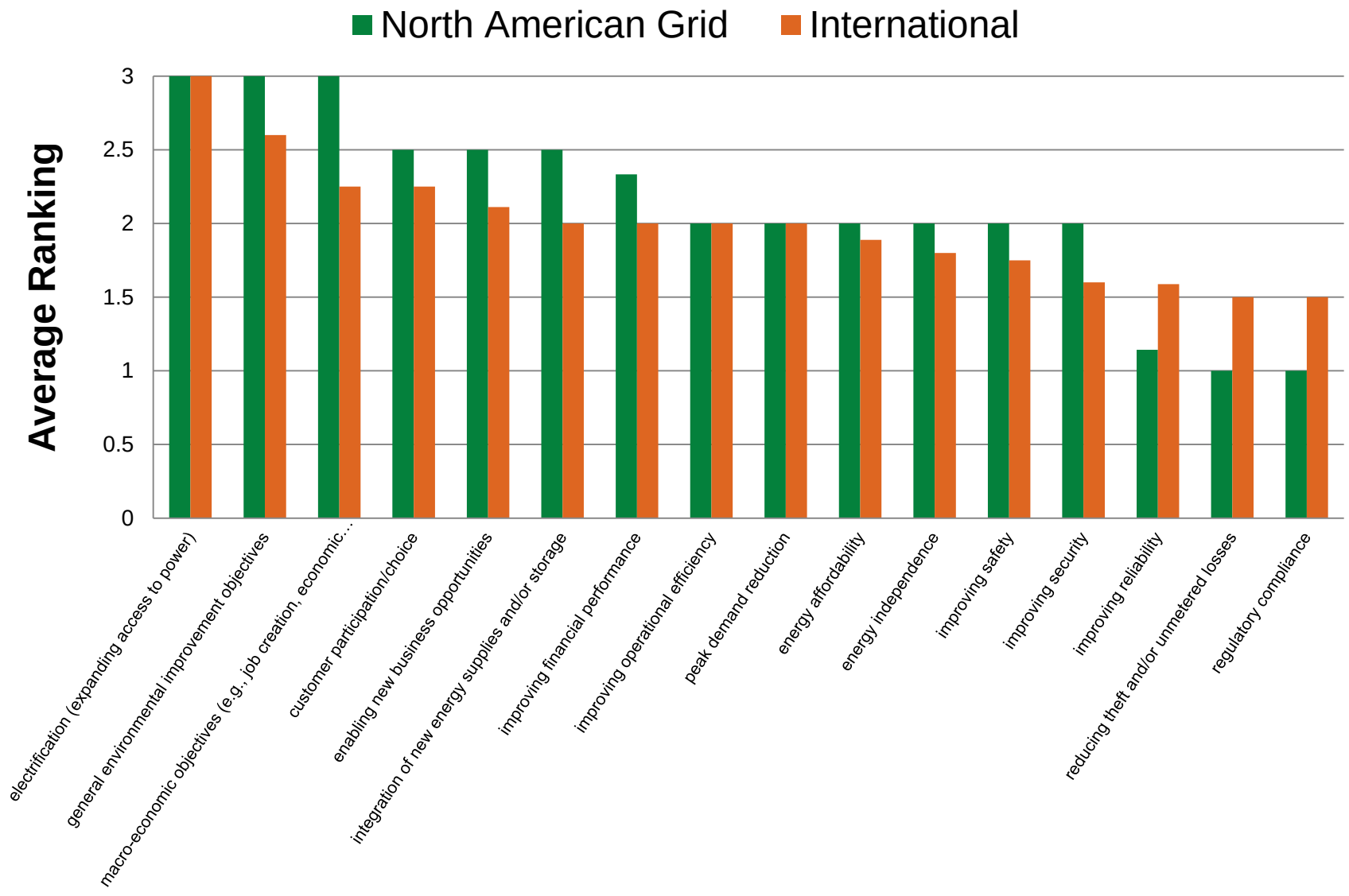
a) Expanding access to electric power

b) Enabling new business opportunities

c) Regulatory compliance

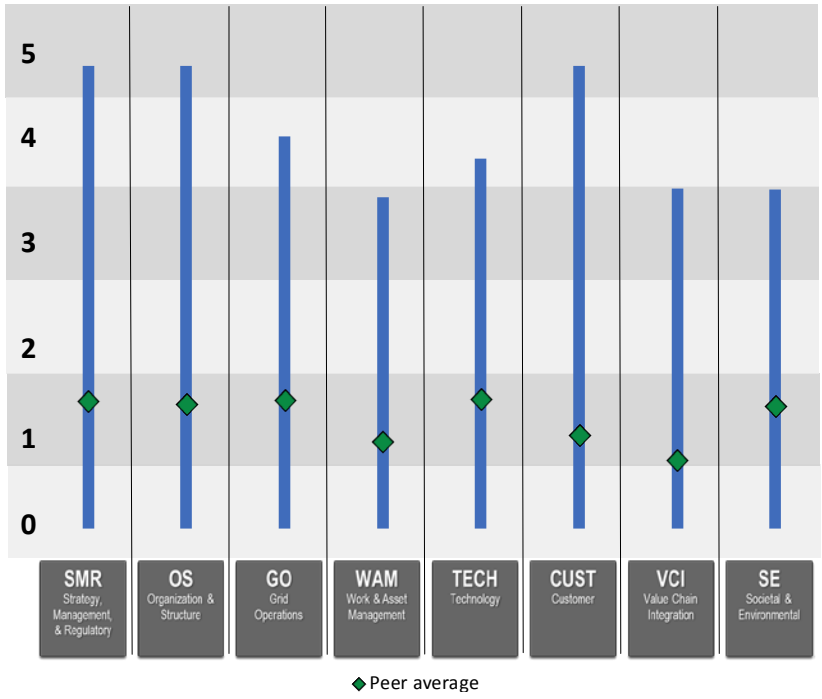
d) Improving reliability

Motivations

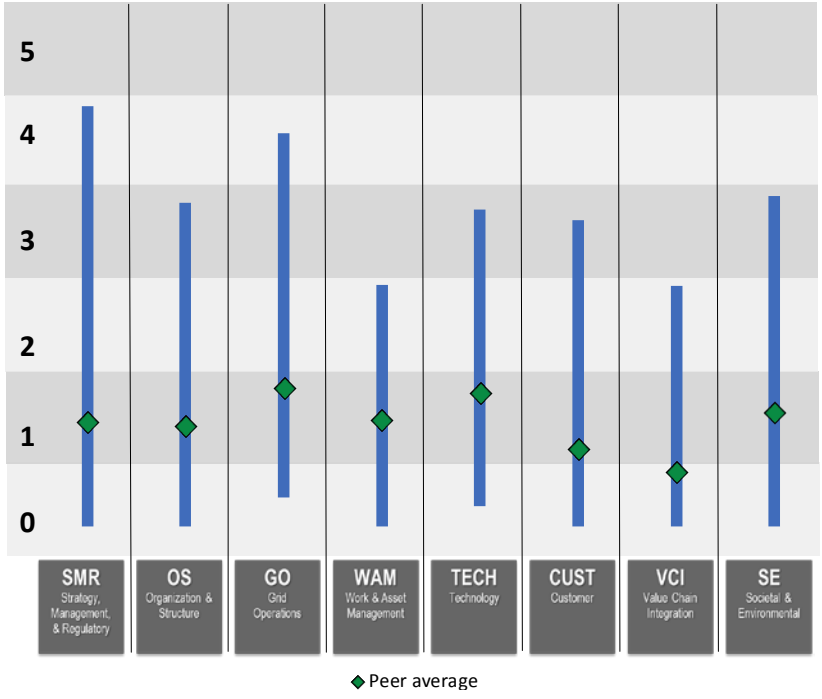


SGMM maturity

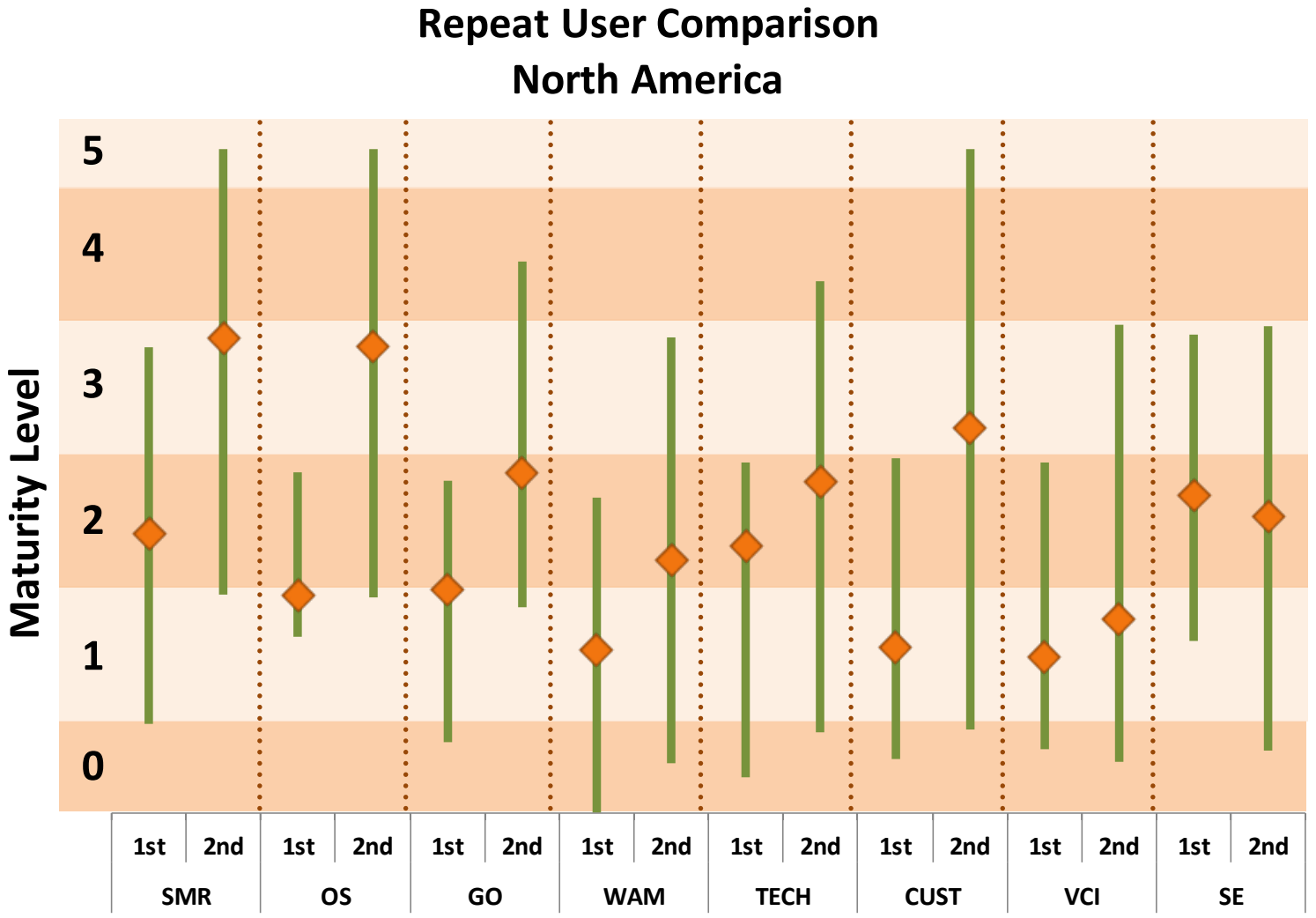
North American grid



International

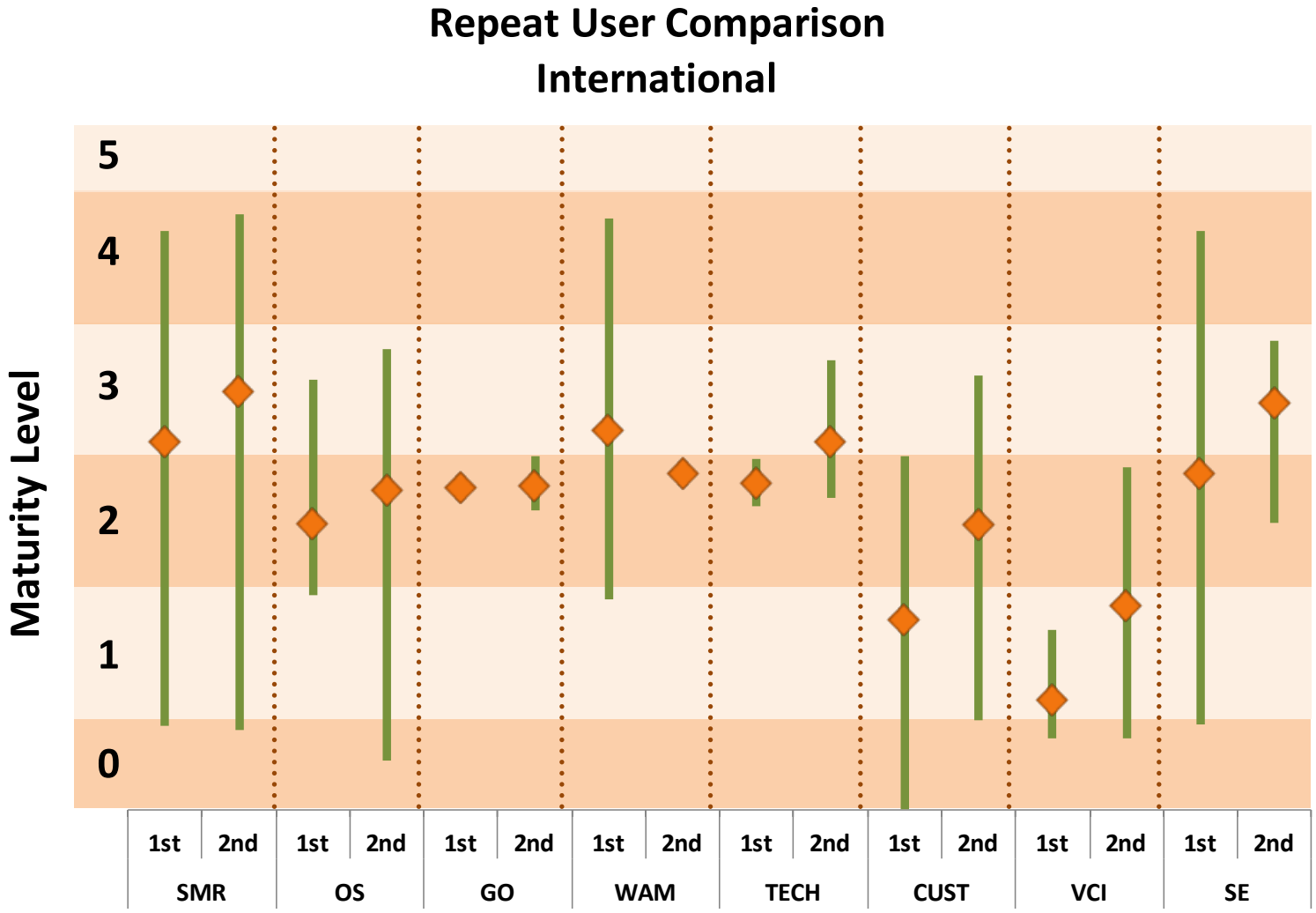


Before and after: North American grid



Average time between submissions: 31 months

Before and after: International



Average time between submissions: 31 months

Concluding thoughts

The SGMM is globally relevant.

- North American grid utilities are as varied as in the international community.
- Use of the SGMM outside the United States has been steady since the model's inception.

The SGMM provides benefits to the utilities that have used it.

The assistance of a certified Navigator is critical to

- ensuring that the characteristics are interpreted correctly
- analyzing the utility's results against the model and the community data
- facilitating a consensus view of grid modernization aspirations

Plug in and Get Connected to the SGMM

@SGMM_Navigator

SEI|CMU

SGMM User Forum

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