National Smart Grid Mission
Ministry of Power
Government of India

Smart Grid Readiness – Self Assessment Tool (SGR-SAT)

2nd Meeting of State Level Project Management Units (SLPMU) Representatives of NSGM SGR-SAT

PSR Programme - Supporting Structural Reforms in the Indian Power Sector

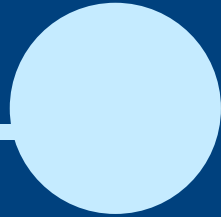26th November 2019

Contents

Context & Objective

Context

1. Discoms are at varied stages of development in terms of physical infrastructure and process maturity with each having their set of challenges and resources at disposal to mitigate such issues

2. Modernization to smart grid systems is a common priority for all with number of initiatives already underway

3. A common framework that helps understand these journeys, and provides basis for discoms to - 'self asses', 'understand gaps in their areas of priorities' and 'learn from each other' is much desired

4. International frameworks exist however are not specific to the context in India

5. In this context, NSGM has developed the Smart Grid Readiness-Self Assessment Tool (SGR-SAT), under the UK-India bilateral PSR programme, that aims to facilitate DISCOMs better understand the grid modernization journey and prepare them for this transition

Objective

Objective of the SGR-SAT is to:

- ✓ **Establish a generic reference notion of the smart grid journey;**

- ✓ **Use as a common framework for – (i) self assessing their readiness to implement smart grid initiatives, and (ii) support inter-se learning from each other**

- ✓ **Enable the utilities to define their smart grid goals, and prioritize investment/intervention areas that are relevant to their respective context**

Status
• NSGM, MOP identified the requirement of SGR-SAT under the NSGM Implementation Framework *(approved as part of the Governing Council meeting held during Jan 2019)*
• Work Commenced on June, 2018
• First draft SGR-SAT report prepared and submitted to NSGM on 26th September 2018
• Multiple meetings held with NSGM and utilities on draft SGR-SAT
• A framework of this tool was presented at the 1st NSGM's SL-PMU workshop on 8th February 2019 to representatives of state utilities
• Draft tool hosted on private server for inviting comments in a time bound manner

Design Consideration
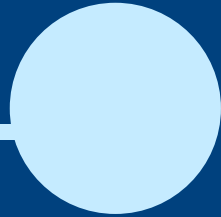
Design Consideration: SGR-SAT Architecture

Tool takes a systems view of the utility from smart grid perspective, and attempts to analyze each of the distinct utility component (domains) and sub-systems (sub-domains) to create a common and holistic evaluation methodology (maturity level)

Maturity level captures the progression across a defined sub-domain

Domains are reflective of the key utility functions

(6 functions)

Domain

Sub-Domain 1
Sub-Domain 2
Sub-Domain 3
Sub-Domain 4

:

Sub-Domain n

Sub-Domains are a sum of parts of various sub-systems/capabilities that amalgamate to complete the utility internal structure *(24 sub-domains)*
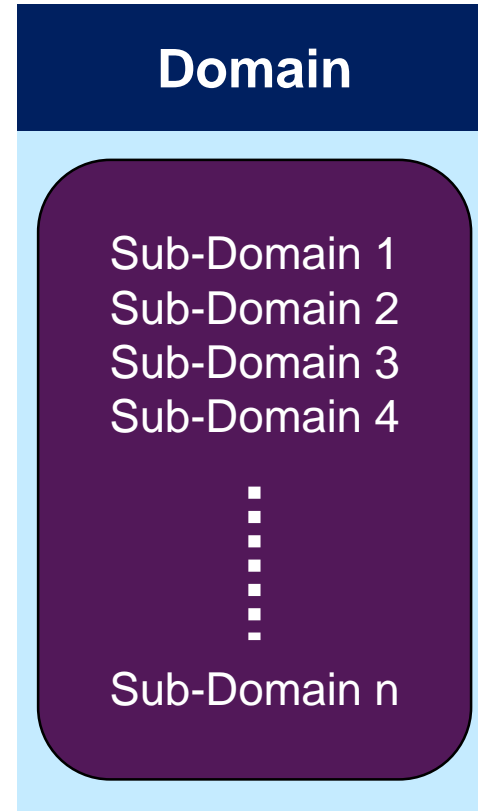
Maturity Level

Maturity levels have been classified across 5 levels

Design Consideration: 6 Domains reflect key utility functions

1

Organization (Utility)

Represented by - (i) vision & strategy; (ii) people/ HR; (iii) Skills and capacities; (iv) mgt. reporting

Network

2

Network planning, Asset deployment and Mgmt.

Network & load planning, network (substation & distribution) modernization, communication systems and asset maintenance

3

Grid operations

Enabling Grid observability, reliability and quality of power supply

Retail

4

Revenue Management

Process related to metering, billing, and collection

5

Customer

Customer services and enabling customer engagement & participation

6

Regulatory & Policy

This also includes utility's external interaction with policy makers/regulators for enabling investments & ensuring consumer protection

Design Consideration: 24 Sub-domains capturing the sub-systems within the core utility functions

Domains

| 1. Organization | 2.Network Planning, Asset Deployment & Asset Mgt. | 3.Grid Operations | 4.Revenue Mangement & Energy Audit | 5.Customer | 6.Regulatory & Policy |

Sub-domains

|					
Vision & Strategy	Load Growth & Net. Expansion Planning	Grid Observability & Security Management	Consumer Metering & Indexing	Consumer Connection Mgt.	Regulatory Interface
People/ Human Resources	Asset Survey and GIS	Power Quality Monitoring	DT/Feeder Metering	Customer Care Infrastructure	Data Privacy and Cyber Security
Training & Capacity Building	Substation Modernization	Outage Management	MDMS and Energy Audit	Consumer Engagement Program	
Management Reporting & MIS	Distribution System Modernization	Demand Response	Billing and Collection	Net Metering	
	Communication System Modernization				
	Asset Maintenance Management				

Design Consideration: Levels within each sub-domain map the utility modernization journey and support defining the 'To-be targets'

Core business processes and technologies that allow a utility to function are **being initiated**

Performance measures show marked improvements from baseline with visibility across the organization

Optimization of processes and technology across the entire network to create industry wide benchmarks

Level 1

Level 2

Level 3
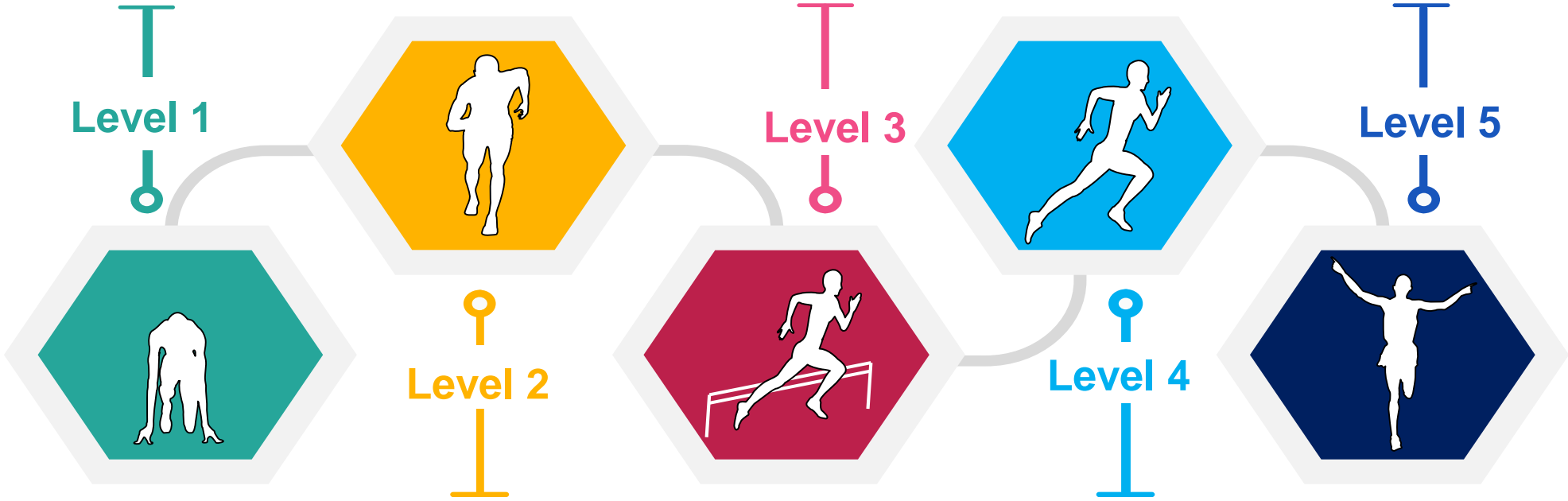
Level 4

Level 5

**Performance measures identified** in various domains and technologies are being **tested**

Successfully **implemented best available processes/ technologies at a large scale** and sustained level of improved performance measures

Design Consideration: Self-Assessment Survey

- Maturity is defined by few attributes that need to be responded through Yes/No criteria

- This is **not a tool for 'Ranking'** the Discoms

- This tool emphasizes on **maturity assessment based on Discom's own set of priorities and supports 'Peer-to-Peer Learning'**

- Maturity Assessment Levels:

    I. Level 1 - Self-assessment by utilities and set target maturity levels based on its business objectives and overall organizational vision

    II. Level 2 – Review/Validation of the self-assessment by NSGM (basis review of information submitted by the utility)

- Tool will have provision for **uploading/ submitting relevant documentation/ files/ information** for validation of the self-assessment
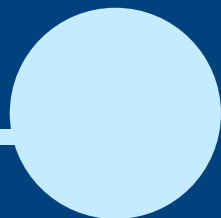
Way Forward
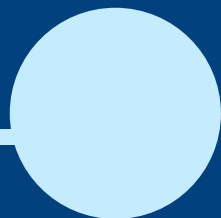
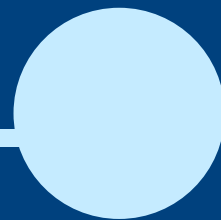# Way forward

1. Finalization of SGR-SAT tool basis stakeholder feedback and comments

2. Hosting of the tool on NSGM website

3. Launch of the tool to the utilities

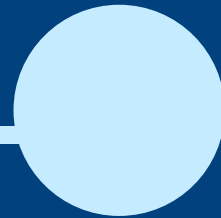4. Continuous handholding by NSGM to facilitate use of the tool and create avenues for peer-to-peer learning

Thank You!

Annexure

Tool Snapshot

Tool Snapshot (1/2) – Domain View

1. Organization	2.Network Planning, Asset Deployment & Asset Mgt.	3.Grid Operations	4.Revenue Mgt. & Energy Audit	5.Customer	6.Regulatory & Policy

Maturity levels

	L1	L2	L3	L4	L5
Vision & Strategy	o Vision document and strategic roadmap under preparation o Budget planning initiated	o Vision document and strategic roadmap drawn o At least one pilot launched o Separate budget for each smart grid business case	o Performance measures and ROI being measured, documented and analyzed o Lessons learned and scale-up planned o Base of funding sources enhanced	o Tweaking of utility business processes o Larger coverage o Self-sustained operational performance	o Industry leading bench marks created o New offerings explored /integrated o Organization wide roll-out
Human Resources	o Plans for establishing a smart grid team o Nodal officer selected	o Cross-functional team established & roles defined o Active resource planning	o Rewards program created o Clear growth trajectory o Core team engaged to monitor performance & document lessons	o Talent retention & succession planning o Proactive planning to create larger investment cases	o Smart grid Cell/core team oversees organization wide implementation of technology initiatives
Training & Capacity Building	o No smart grid training goals o Employees are nominated annually for training from external sources	o Competencies identified for smart grid training o Annual training completed for smart grid team members / nodal officers	o Defined SG competency matrix cross different levels and functions o Policy for SG trainers o Initiated program for training of SG trainers	o Initiated strategic tie-ups with national and international entities o External staff certifications in defined operational areas	o E-learning programs introduced o SG trainers ready to offer trainings industry wide
Management Information System	o Manual processes for data management and management reporting	o Standalone computer based systems used for data management and management reporting	o MIS implemented as web-based app o Reporting structures are well-defined and are being generated	o Data collection automated o MIS integrated with IT-OT systems of smart grid o MIS generates user defined reports	o Business Intelligence tools incorporated for enhanced data analysis o Informed decision making using MIS dashboards

Tool Snapshot (1/2) – Sub-Domain View

Domain:

1. Organization

Subdomain:

Vision & Strategy	Human Resources	Training & Capacity Building	Management Information System	Budgeting

Maturity levels (Selection to be made by the utilities)

Level 1	Level 2	Level 3	Level 4	Level 5
○ Discom is considering development of vision document and strategic roadmap for smart grid interventions	○ Organization vision document formulated and approved	○ Performance measures and Return-on-Investment (ROI) of smart grid business cases are being measured, documented and analyzed	○ Tweaking of business processes carried out for completed pilot audits	○ Organization wide roll-out under-way
○ Discom in the initial stages of preparation for pilot program	○ Strategic Roadmap drawn up in line with Organization vision	○ Performance measures & ROIs show tangible improvements	○ Implementation completed for a larger area	○ Industry leading bench marks achieved for different business cases
○ Budget planning initiated for smart grid pilot program	○ Separate budget made for each smart grid business case	○ Base of funding sources enhanced	○ Results demonstrate sustained performance measures, and predictive problem solving	○ New service/ product offerings (like Electric Vehicle (EV) charging, prosumer connectivity, etc.) are being explored /integrated
	○ State Level Project Management Unit (SLPMU) has been setup	○ Audit of completed Pilots done, lessons documented. Scale-up plan prepared	○ ROI sufficient to sustain future smart grid opportunities	⬆ *Options to upload existing documents for review*
	○ At least one pilot program launched			
	○ SG training initiated			

Tool Snapshot (2/2) – Domain View

1. Organization	2.Network Planning, Asset Deployment & Asset Mgt.	3.Grid Operations	4.Revenue Mgt. & Energy Audit	5.Customer	6.Regulatory & Policy

Maturity levels

	L1	L2	L3	L4	L5
Consumer Connection Management	o Manual process for new/existing connection mgmt.	o Centralized new connection management activities o KPIs defined and monitored	o Online services for new connection. o Responsible staff access DT loading online before connection is approved o Improvement in KPIs	o Online tracking of new connection application o Online invoicing and issuance of work order o Online monitoring of load /maximum demand	o Analysis of customer's historical data for improving services o Utility has created industry benchmarks for KPIs
Customer Care Infrastructure	o Customer help-desk established	o Customer care centers IT enabled o KPIs defined and monitored (e.g.: complaint resolution time)	o Optimum routing of consumer calls through IT systems, o Improvement in KPIs observed	o CCS integrated with MDMS and OMS o Call center workforce management system implemented	o Self-service options such as chat-bots introduced
Consumer Engagement Program	o Customer engagement on reactive basis	o Customer segmentation o Trained customer care executives o Engagement activities for pilots o KPIs defined & monitored	o Budget allocated o Dynamic website and CRM implemented. o Improvement in KPIs	o On-demand information o Consumer account added to utility website o Mobile application o Feedback/complaint mgt. system deployed	o Social media used for creating awareness o Dedicated staff for handling social media accounts
Net Metering	o No net metering policy in-place/ Development of net metering policy under consideration	o Net metering policy developed. o Manual application process o KPIs defined & monitored	o Online application & payment services for net metering o Improvement in KPIs	o End-to-end online process for net metering application replicated o Marked improvement in KPIs	o Net-metering application system automatically determines consumer DT and feasibility o Created industry benchmarks for KPIs

Tool Snapshot (2/2) – Sub-Domain View

Domain:

> **5. Customer**

Subdomain:

Customer Connection Mgt.	**Customer Care Infrastructure**	Customer Engagement	Net Metering

Maturity levels (Selection to be made by the utilities)

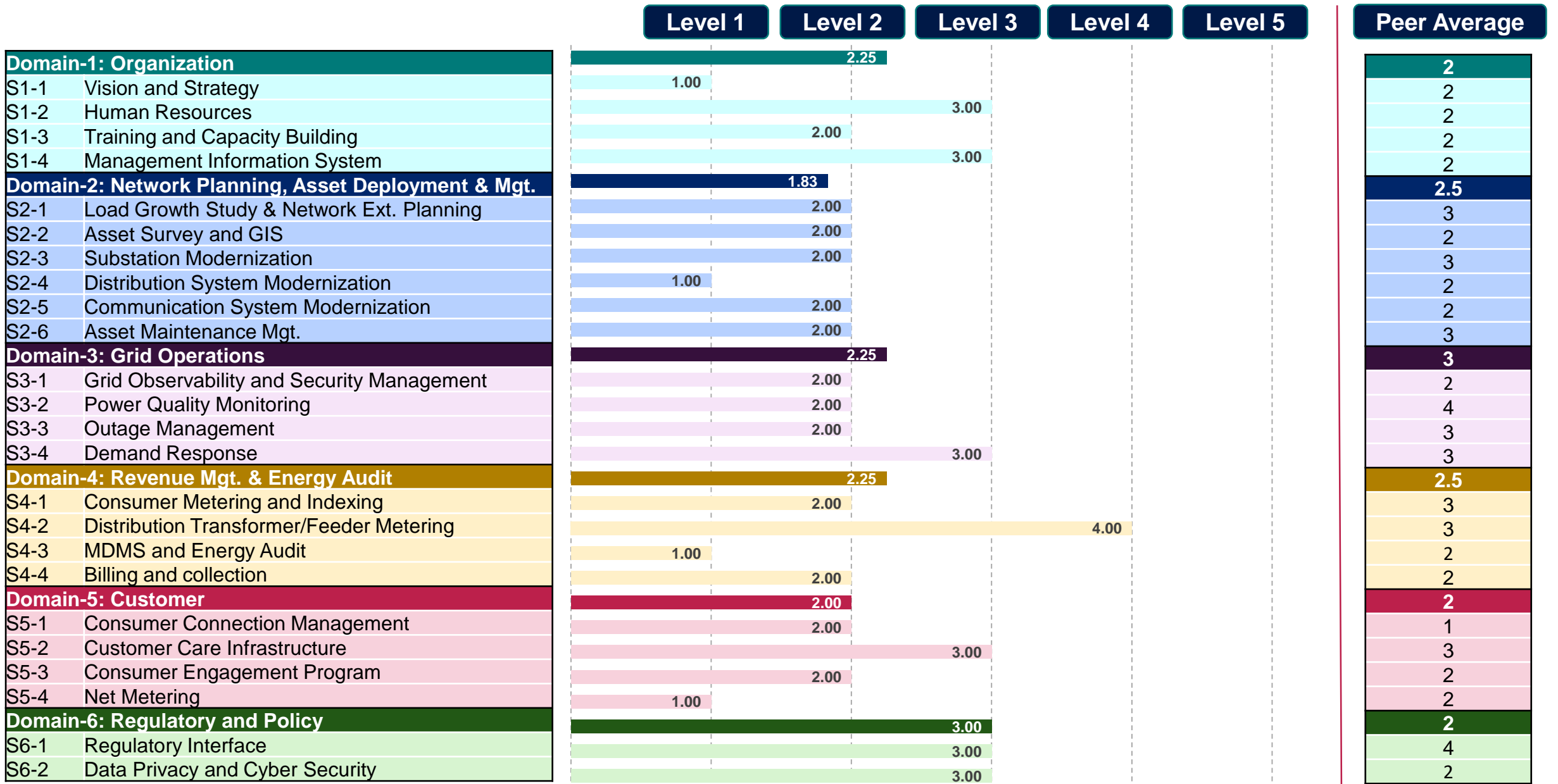| Level 1	Level 2	Level 3	Level 4	Level 5
◯ Customer help-desk in customer care center established	◯ Customer care centers are IT enabled with Customer Relationship Management implemented	◯ Technologies like Interactive Voice Response (IVRS), Computer Telephony Integration (CTI), automatic call distributor implemented for optimum routing of consumer calls	◯ Customer Care Services integrated with Meter Data Management System (MDMS) and Outage Management System (OMS)	◯ Self-service options such as chat-bots are introduced
	◯ KPIs defined (e.g.: Average waiting time for complaint/ feedback registration; Average complaint resolution time) & are monitored on monthly/quarterly basis	◯ Improvement in KPIs due to automation in customer care infrastructure	◯ Call center workforce management system implemented for optimal scheduling of customer care executives	Industry wide benchmarks in KPIs achieved
			◯ Marked improvement in KPIs	⬆ *Options to upload existing documents for review*

Usefulness
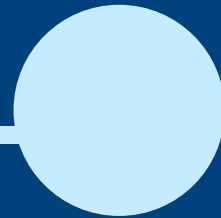
Tool Usefulness– Illustrative Example
Creating the As-Is Maturity View (Full-View)

		Level 1	Level 2	Level 3	Level 4	Level 5	Peer Average
Domain-1: Organization			2.25				**2**
S1-1	Vision and Strategy	1.00					2
S1-2	Human Resources			3.00			2
S1-3	Training and Capacity Building		2.00				2
S1-4	Management Information System			3.00			2
Domain-2: Network Planning, Asset Deployment & Mgt.		1.83					**2.5**
S2-1	Load Growth Study & Network Ext. Planning		2.00				3
S2-2	Asset Survey and GIS		2.00				2
S2-3	Substation Modernization		2.00				3
S2-4	Distribution System Modernization	1.00					2
S2-5	Communication System Modernization		2.00				2
S2-6	Asset Maintenance Mgt.		2.00				3
Domain-3: Grid Operations			2.25				**3**
S3-1	Grid Observability and Security Management		2.00				2
S3-2	Power Quality Monitoring		2.00				4
S3-3	Outage Management		2.00				3
S3-4	Demand Response			3.00			3
Domain-4: Revenue Mgt. & Energy Audit			2.25				**2.5**
S4-1	Consumer Metering and Indexing		2.00				3
S4-2	Distribution Transformer/Feeder Metering				4.00		3
S4-3	MDMS and Energy Audit	1.00					2
S4-4	Billing and collection		2.00				2
Domain-5: Customer			2.00				**2**
S5-1	Consumer Connection Management		2.00				1
S5-2	Customer Care Infrastructure			3.00			3
S5-3	Consumer Engagement Program		2.00				2
S5-4	Net Metering	1.00					2
Domain-6: Regulatory and Policy				3.00			**2**
S6-1	Regulatory Interface			3.00			4
S6-2	Data Privacy and Cyber Security			3.00			2

Tool Usefulness– Illustrative Example

Peer Learning

Your Sub-Domain Maturity

2

Load Growth &
Net. Exp.
Planning Score

Peer Group Analysis

28 utilities

24 utilities

6 utilities

2 utilities

2 utilities

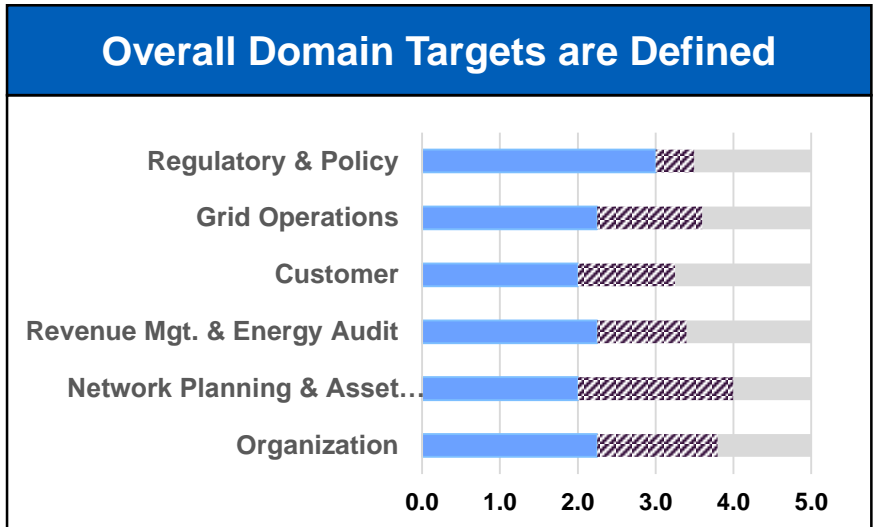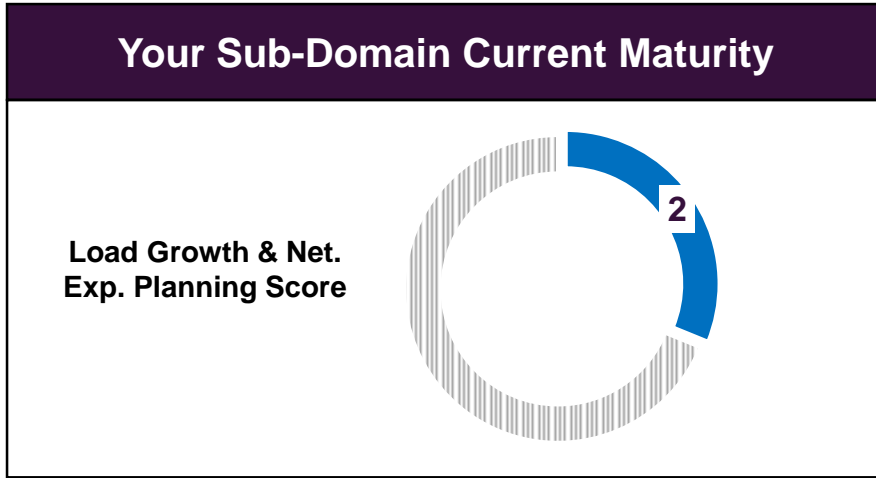Level 1   Level 2   Level 3   Level 4   Level 5
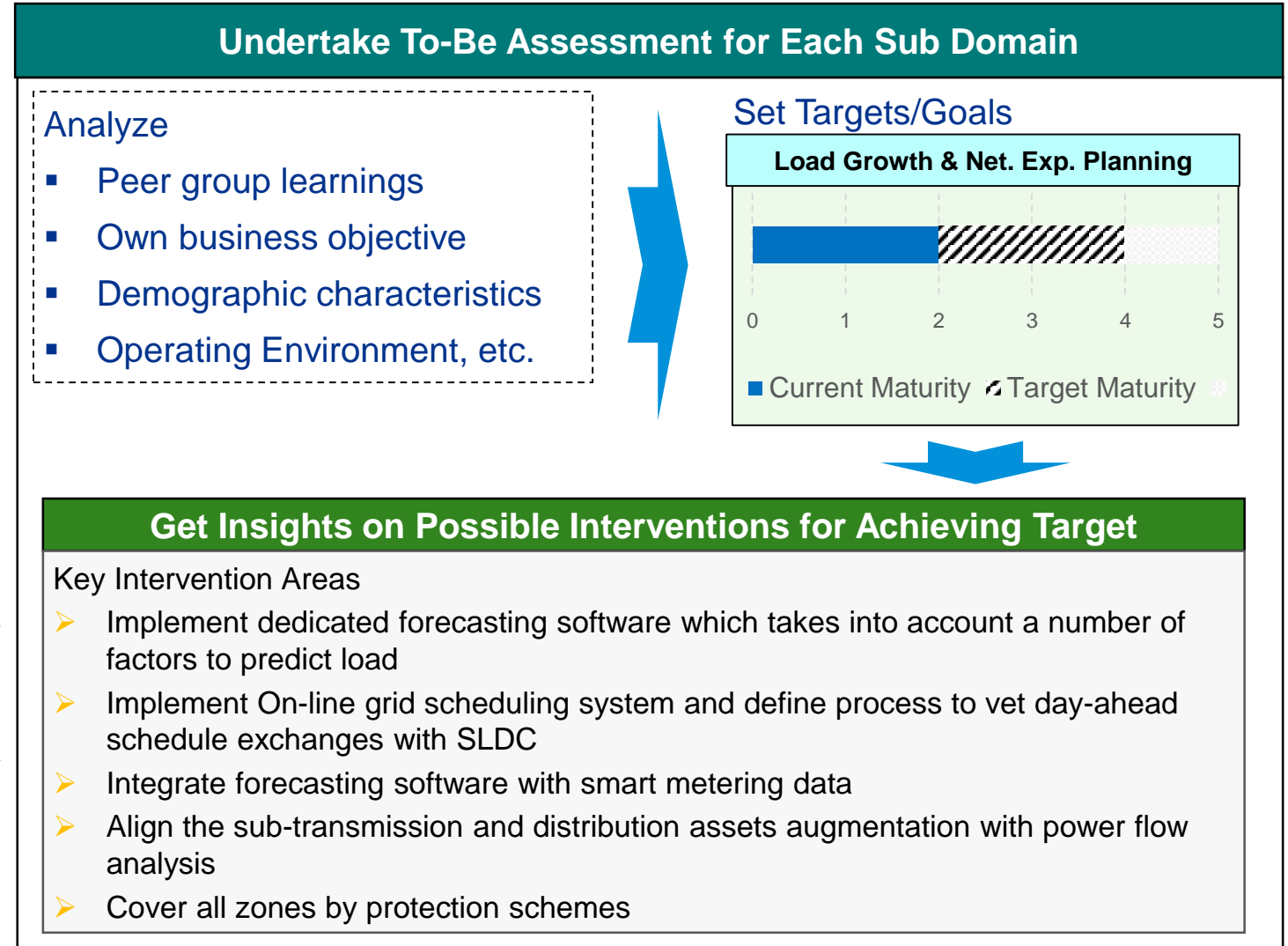
Learning Opportunities
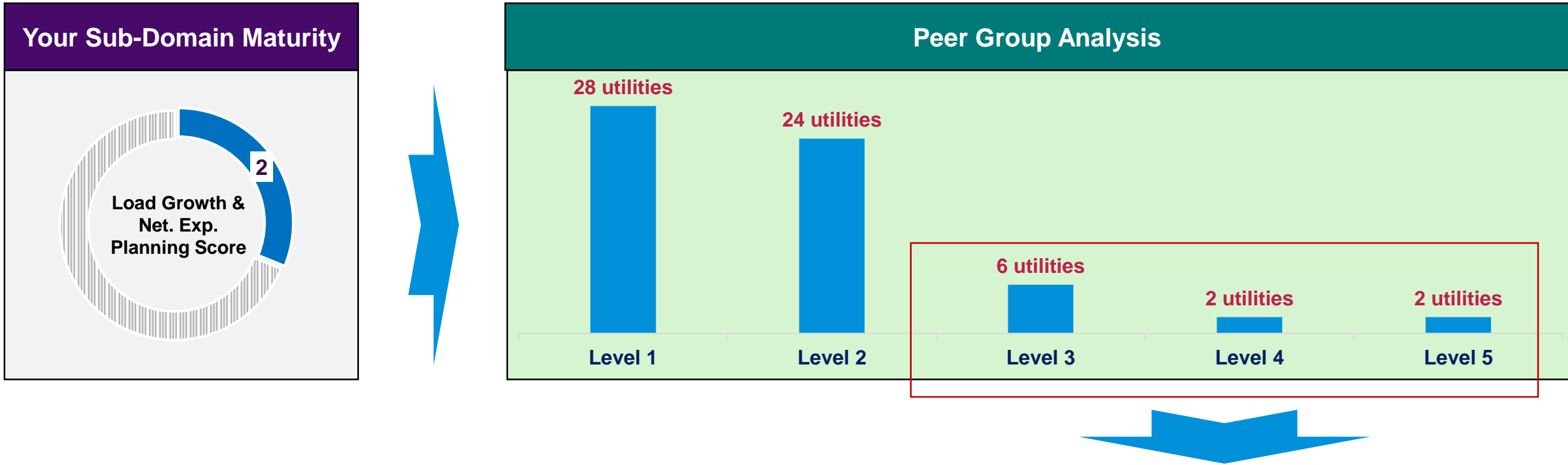
- Get insights on peer group maturity and possible areas of interventions for your utility
- Undertake visits/knowledge exchange with peers to understand good practices for the specific sub-domain, understand cost & benefits, business model, etc.

Tool Usefulness– Illustrative Example

Create a To-Be States

Your Sub-Domain Current Maturity

Load Growth & Net. Exp. Planning Score

2

Undertake To-Be Assessment for Each Sub Domain

Analyze

- Peer group learnings
- Own business objective
- Demographic characteristics
- Operating Environment, etc.

Set Targets/Goals

Load Growth & Net. Exp. Planning

0　1　2　3　4　5

■ Current Maturity　◩ Target Maturity

Get Insights on Possible Interventions for Achieving Target

Key Intervention Areas

➢ Implement dedicated forecasting software which takes into account a number of factors to predict load

➢ Implement On-line grid scheduling system and define process to vet day-ahead schedule exchanges with SLDC

➢ Integrate forecasting software with smart metering data

➢ Align the sub-transmission and distribution assets augmentation with power flow analysis

➢ Cover all zones by protection schemes

Overall Domain Targets are Defined

Regulatory & Policy
Grid Operations
Customer
Revenue Mgt. & Energy Audit
Network Planning & Asset…
Organization

0.0　1.0　2.0　3.0　4.0　5.0
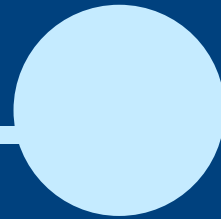
■ **Current Maturity** ◩ **Target Maturity**

Tool Usefulness– Illustrative Example

Undertake regular assessments to monitor progress and to re-calibrate targets if required
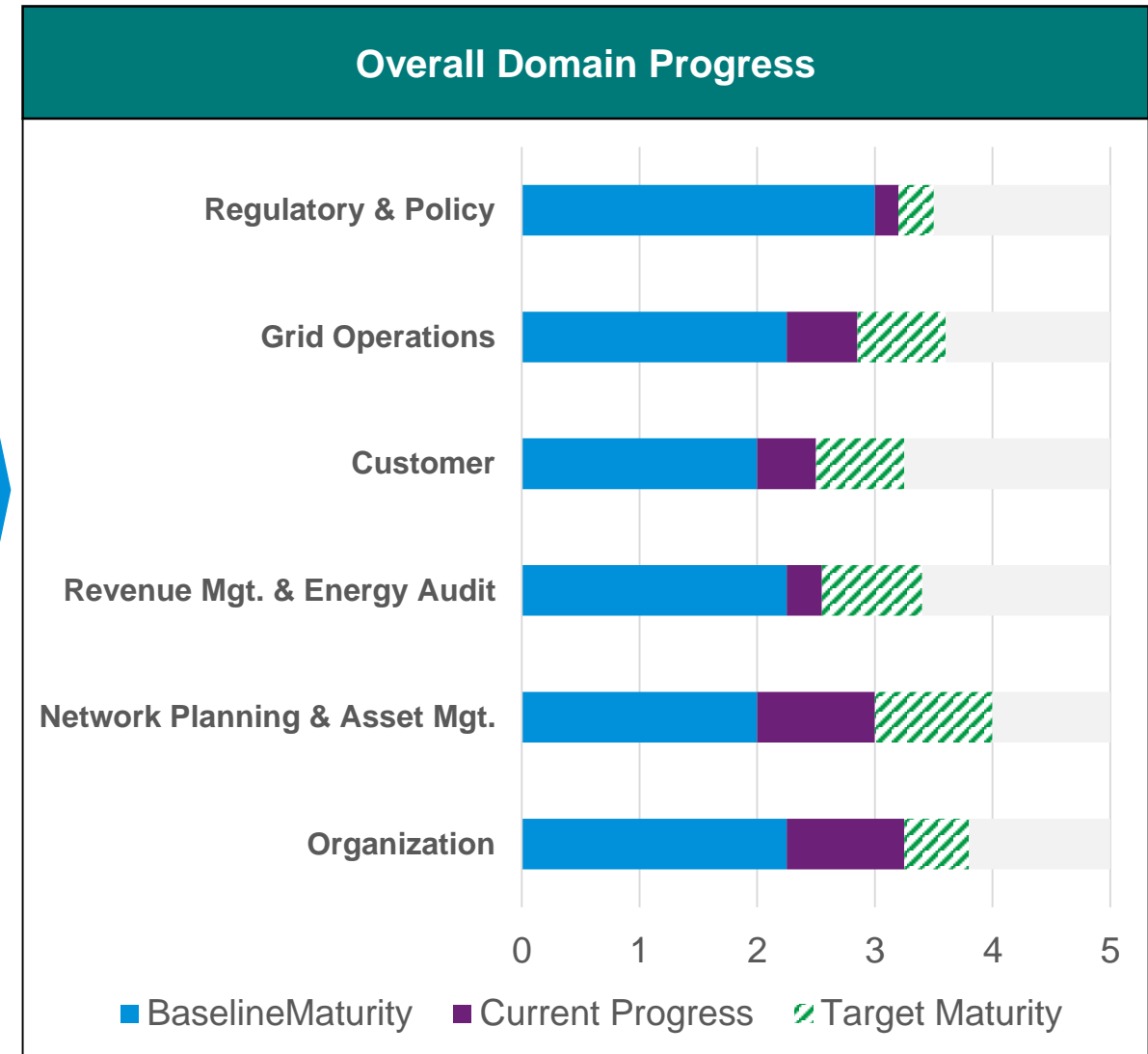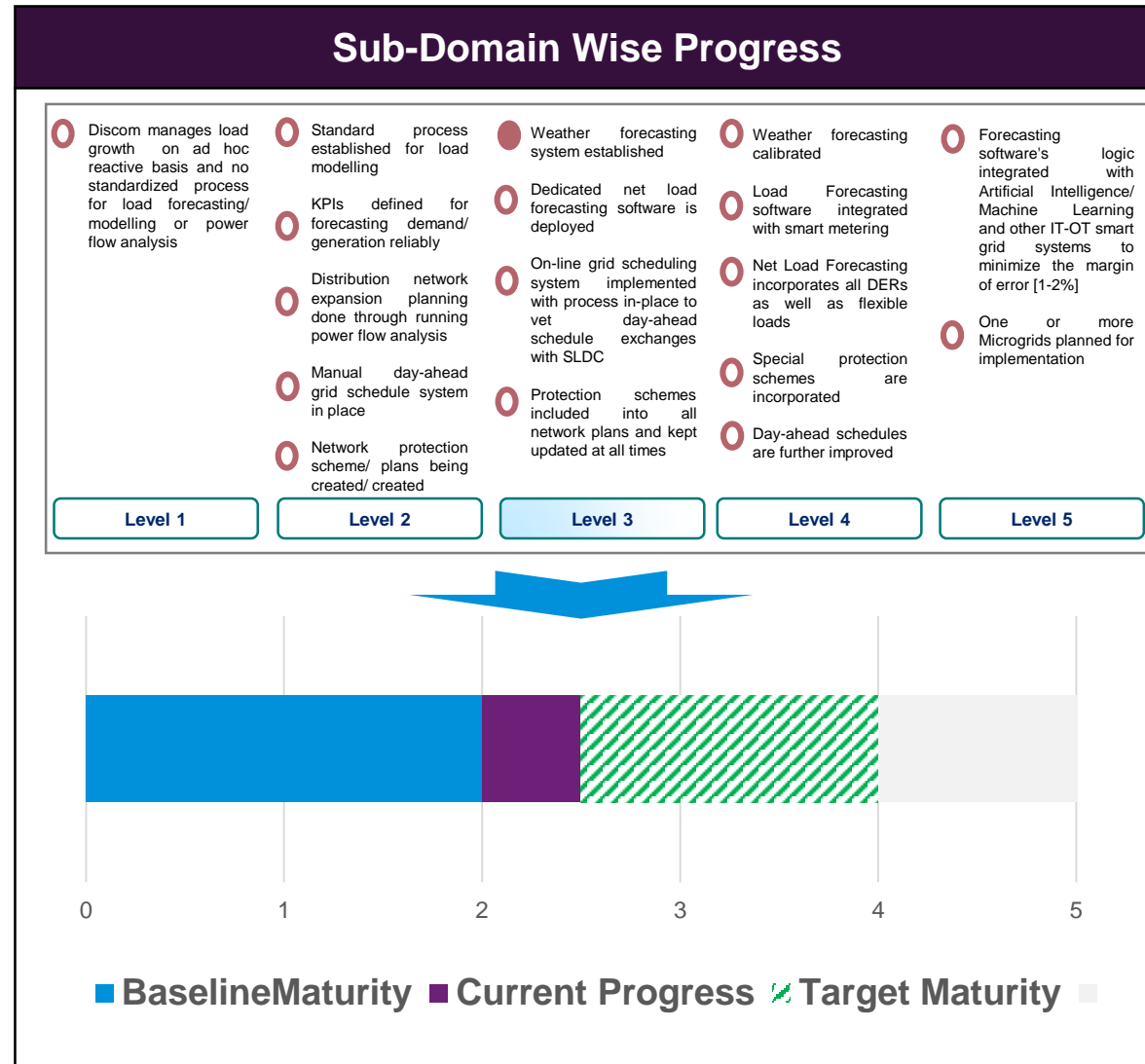
Applicability

Applicability

- SGR-SAT has wide applicability for different areas, however, At **First Level** it is recommended that the tool be applied to a more homogenous power distribution area

- Areas/Towns under RAPDRP and IPDS schemes provides a reasonably homogenous boundary set

- This would help in:
  - Creating a better benchmark
  - Understanding on how utilities have performed in these areas, and how they have built upon these measures

Some of the Key R-APDRP Initiatives

Part – A

- Consumer Indexing, Asset Mapping
- GIS Mapping of the entire distribution network
- Automatic Meter Reading (AMR) on Distribution Transformers & Feeders
- Automatic Data Logging for all Distribution Transformers and Feeders
- Supervisory Control and Data Acquisition (SCADA)/Distribution Management System (DMS) in big towns / cities (with population > 4 lakh & energy input > 350 MU)
- Feeder Segregation / Ring Fencing
- Establishment of Information Technology (IT) enabled customer service centres
- Establishment of the Base Line data System

Part – B

- Renovation, modernization and strengthening of 11 kV level Substations, Transformers/Transformer Centres
- Re-conducting of lines at 11 kV level and below
- Load Bifurcation, Load Balancing
- HVDS (11kV)
- Installation of capacitor banks and mobile service centres etc.
- Aerial Bunched Conductors in populated areas
- Strengthening at 33 kV or 66 kV level.