Panel: Grid Network Data Quality Is More Than a Data Issue

- The Need: Reliable, up-to-date, and end-to-end electrical network models
  - For planning, designing, constructing, operating, maintaining & protecting
  - With simultaneously overlapping and unique uses of data
  - For transmission, substations, distribution, customer meters, …
- The Challenge: Data is modeled/used differently across many systems
  - GIS, EMS, ADMS, engineering design, asset management, protection, work management, outage management…
  - Data varies in scope, timelines, and frequencies
  - Different perspectives - physical assets and facilities, others on geographical relationships and still others on electrical connectivity

“Grid Network Data Quality Is More Than a Data Issue”

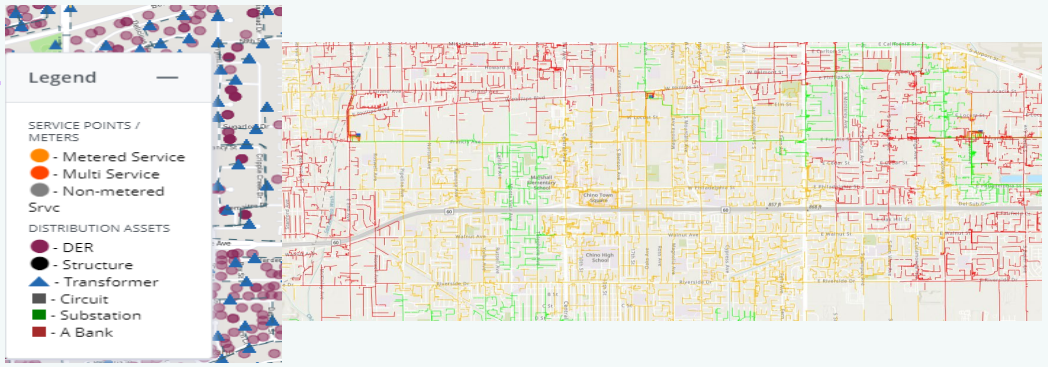
Meet Our Panelists

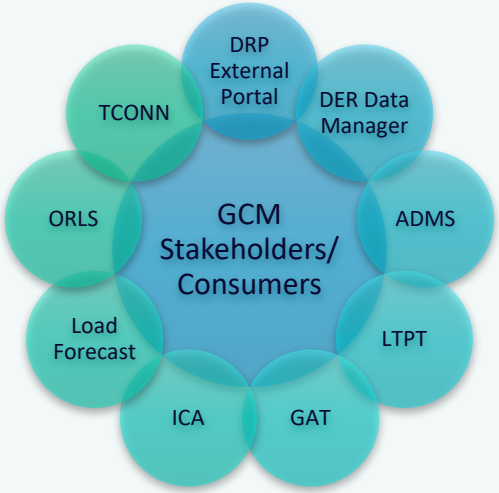
Greg Robinson, Xtensible
Moderator

Lesia Bilitchenko

Rich Rosenstiel

SCE's Grid Connectivity Model (GCM)



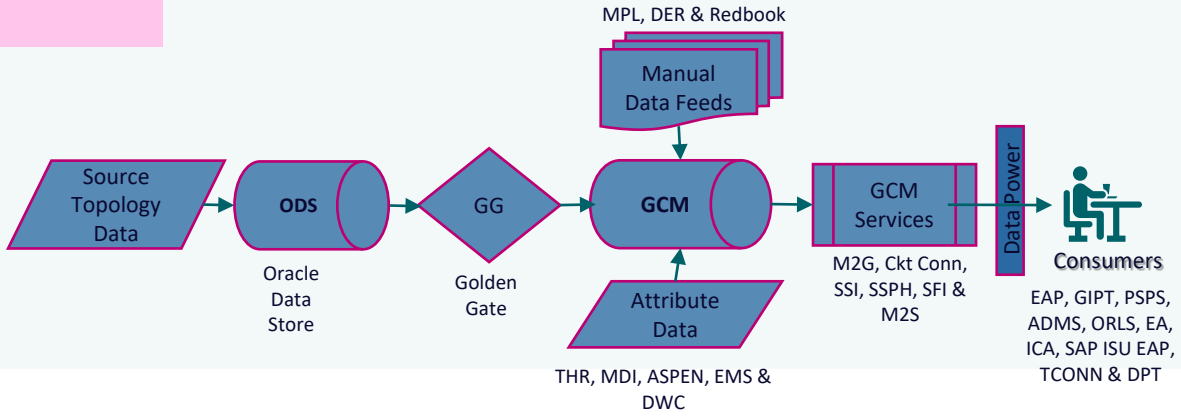


About GCM

The Grid Connectivity Model (GCM) serves as the **source of truth** for up-to-date **electrical connectivity and structural data** of the SCE grid so that system planners, engineers, and operators, all have **consistent information for their analysis and planning.** The system is capable of modeling from meters to A-Banks currently and we are enhancing GCM with further capabilities to complete the system.

GCM services are made available to the enterprise to better model the system and is foundational to the integration of green-energy and customer-side alternatives, such as **Distributed Energy Resources (DERs) and battery storage** into the SCE distribution grid planning and operations. This aligns with California Public Utilities Code § 769 and enables the use of these non-traditional methods in reaching our **Pathway 2045 electricity Carbon Neutrality goal**. This supports our goals for **safety, reliability and affordability** by ensuring that planners, forecasters, and external users have access to the latest most accurate data.

- Leveraging reliable up to date and end to end electrical network models enables various business processes such as Long-Term Capacity Planning, Asset Management, Wildfire Mitigations, Load & Gen Interconnections and Grid Operations
- Each group/department has unique and overlapping use cases that vary in scope, granularity and frequency (i.e. as build, as planned, as operated)
- GCM aggregation of network data creates opportunities and brings challenges to light



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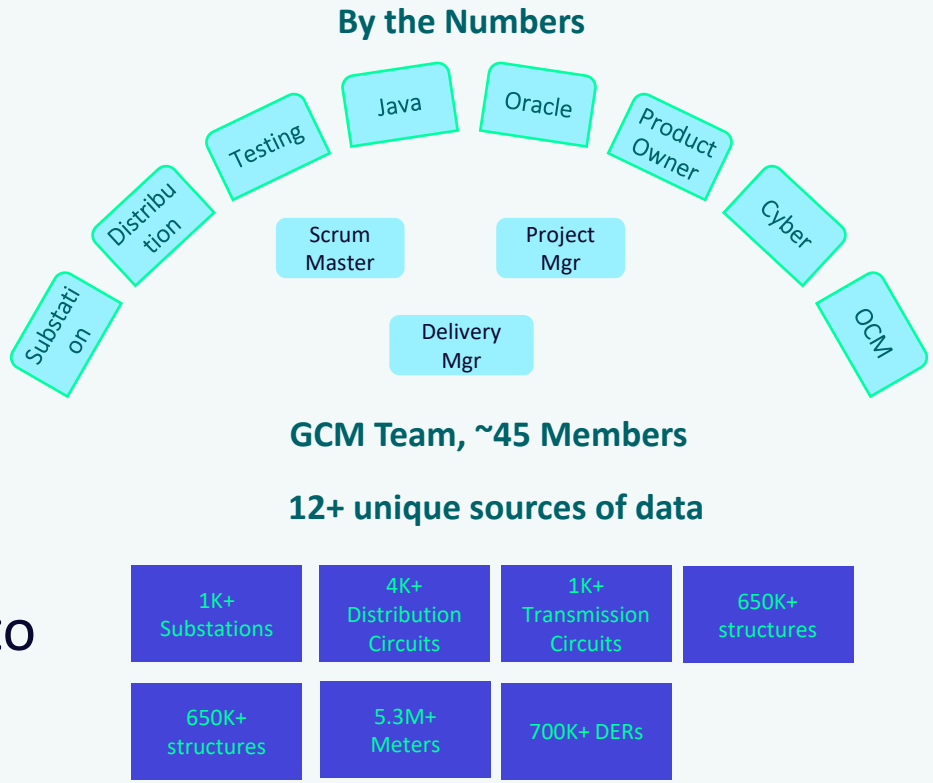
GCM data challenges & opportunities

- Lack of common semantic model (CIM-common information model)
  - Data is scattered across best-of-breed applications that have proprietary model
  - Inconsistency in the reference and semantics across applications
  - Difficult to establish data lineage
  - Takes time to understand data quality issue root causes
- Delay in data remediation at System of Records (SoR) due to
  - Competing business priorities of groups
  - Data Dictionary and process agreements not consistent or widely shared/understood across various departments
  - Flow of data is single direction (from SoR to GCM to consumers), missing bi-directional flow through direct user feedback and/or automatic correcting AI algorithms



Accurate & Congruent GCM data: Strategies and Solutions

Strategic

- Consolidate the GIS solution and its data into a unified solution to reduce data duplication and fragmentation
- Improve the end-to-end Business Process Management and monitoring to assign data stewardship roles that align with Enterprise goals
- Align tools capability roadmaps with data capability roadmaps for holistic end to end solution to business

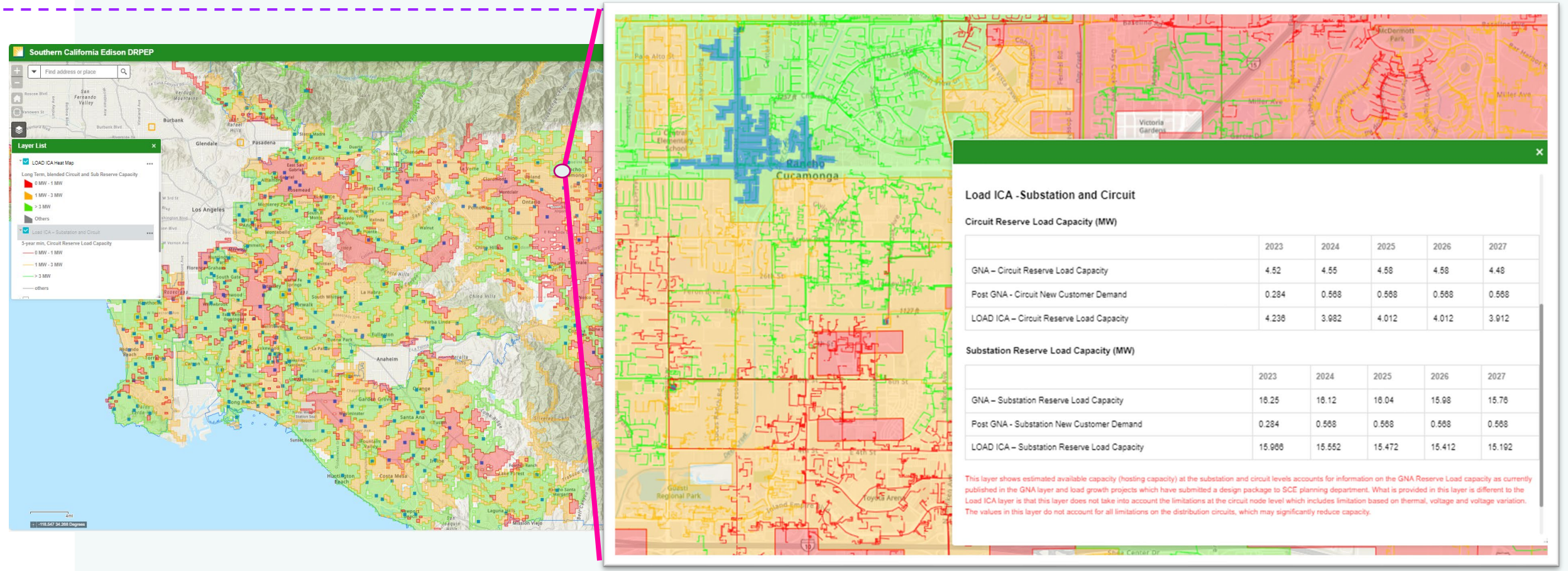
Tactical

- Create & Visualize “Data lineage” to provide visibility to the root cause of Data Quality issues
- Develop governance process to accept corrected data from Consuming Systems into System of Records
- Reduce “manual cleansing” and develop cleansing algorithms to enable remediation automation with Artificial Intelligence and Machine Learning capabilities

Network data quality: Lessons Learned

- Single user-friendly interface for network modeling is key for enabling business processes and data quality improvements
- Data Quality is not a simple issue with a simple solution, and requires dedicated enterprise-wide programs, strong architectural platform foundations and cross organizational business stakeholder buy in
- Standards like CIM enable successful network modeling, software integration and ongoing operational support
- Not all data quality issues can be visible and addressed in the office, there still exist a need for some level of targeted field verification (while strengthening record update processes and deploying telemetry technology)
- Good network data quality brings business value through improved decision making (safety, reliability, capital investment), user efficiency and reduced operational support costs
- Analytical capabilities and technology evolve over time and a strong foundation of network connectivity should support that

Bringing it all together: Value for the customer



https://drpep.sce.com/drpep/

SCE's DRP External Portal (DRPEP) combines Grid Connectivity Network Data and Distribution System Planning Studies to provide insights into future available grid capacity for EV Load Interconnections

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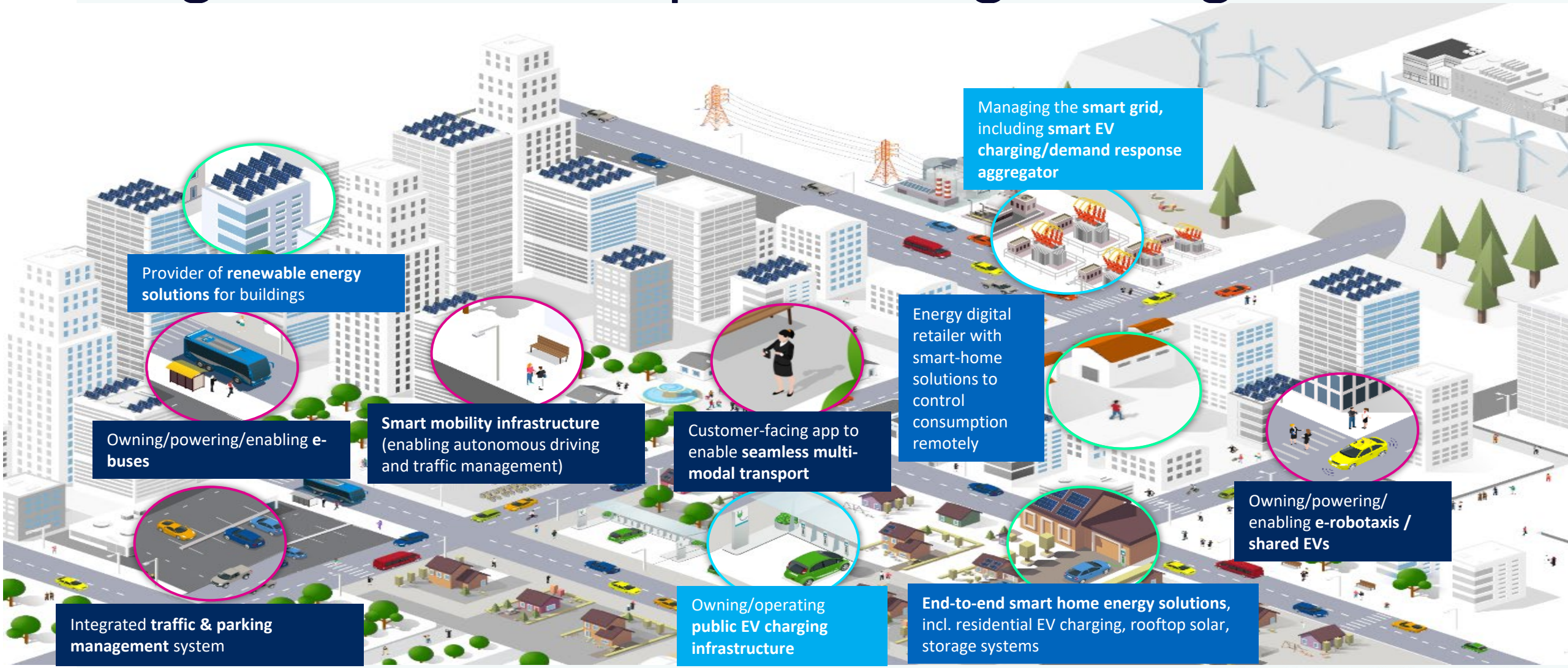
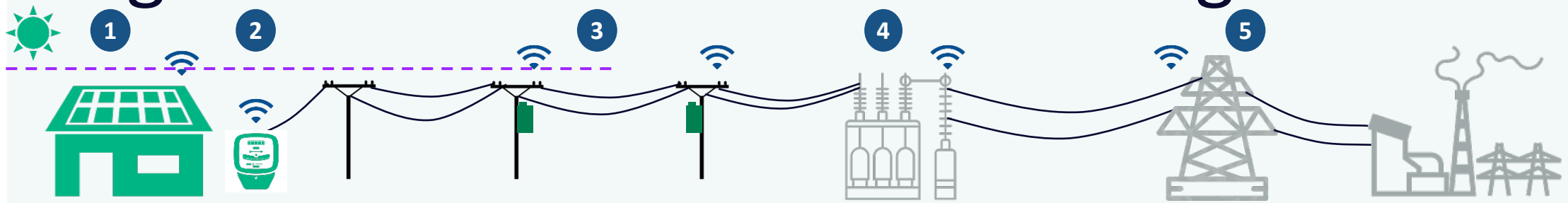
Digitization Develops Meaningful Insights



Digital Infrastructure Provides Insights at Scale



What's New

1 Customer
- Less predictable, intermittent loads
- Customer awareness and engagement in energy programs
- Social media

2 Meter
- AMI interval voltage, usage data
- Meter temperature
- Last gasps

3 Distribution
- Distribution automation devices, reclosers
- Volt-var optimization, CVR devices

4 Substation
- Remote monitoring and sensing equipment
- Remote dissolved gas analysis (DGA)

5 Transmission
- Aerial drone videography
- LiDAR
- Remote sensing equipment

Use Cases

- **Asset Health Analytics (Transmission, Substation and Distribution)**
- **EV Charging Analytics**
- **Outage Analysis, Prediction, Storm Readiness**
- **Cust. DER Integration**
- **Network Connectivity Analytics**
- **Real-time Supply / Demand Optimization**
- **Vegetation Management Analytics**
- **Asset Investment Planning & Mgmt. (AIPM), Long-term Load Forecasting Analytics**

Outcomes

Improved Reliability
SAIFI, CAIDI, Societal Benefit

Reduced Operational Costs
O&M, CapEx, Regulated Return

Reduced System Risk
$/Risk Mitigated, DER Integration

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Leveraging the Data Analytics Platform

Exelon Utilities Grid (T&D) Use Case Catalog

Category	Sub-category	Use Case Count	Use Cases
(1) Asset Management	Asset Invest. Planning	1	Asset Investment Planning & Management (AIPM)
	Asset Health	2	***Asset Health Analytics (T&S), Asset Health Analytics (Distribution)***
	Network Planning	3	***Network Connectivity Analytics***, Long-term Load Forecasting, Transformer & Feeder Sizing
	Gas Assets	1	Gas Asset Analytics
(2) Grid Operations	Operations Planning	3	VVO Analytics, Power Quality Assessment, Synchrophasor Systems for Grid Awareness
	System Optimization	2	Grid Monitoring Analytics, Network Cyber Security Analysis
	Outage Management	5	***Outage Prediction***, FLISR Performance, ***Historical Outage Analytics, Storm Response Analytics***, Veg Mgmt Analytics
(3) Extended System	Extended System	5	Customer DER Integration Analytics, Utility Storage Optimization, Transactive Energy Analytics, Smart EV Charging Stations, Real-time Supply/ Demand Optimization

Data Governance - Operating Model

Privacy Steering Committee

Customer & Employee PII Data Privacy Policies

Information Governance Council

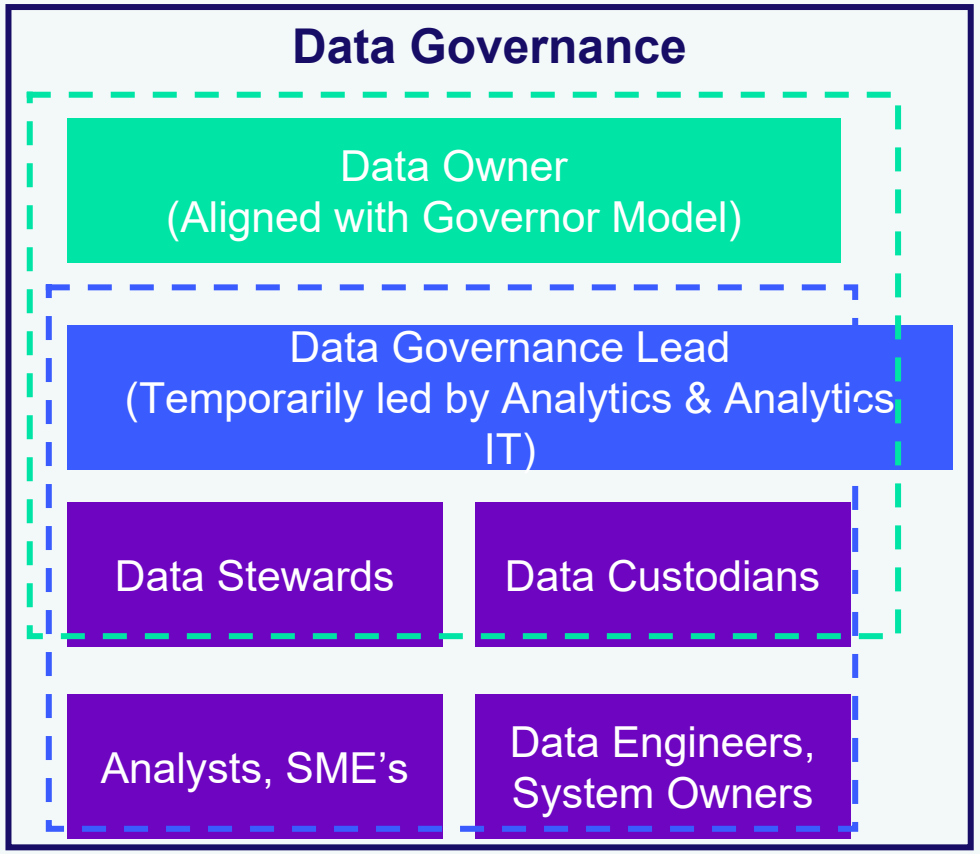
Information & Data Governance to be governed by the same body. It should include Legal, Compliance, IT Security & Architecture, Analytics, Innovation, etc.

Other IG Activities

Data Deletion & Retention

Access & Usage Policies

AI Task Force

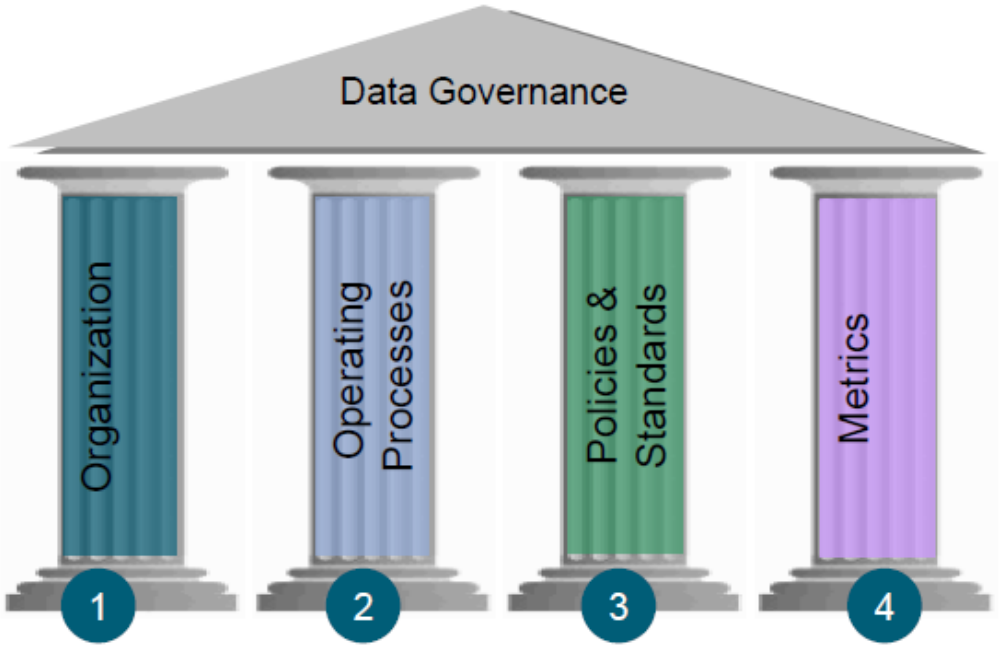


Role / Team	Responsibility
Data Owner (5% Commitment)	Accountable for domain quality & documentation
Data Domain Team *(See Green Box)*	Sets strategy for domain & addresses domain needs
Data Gov. Lead (Incremental FTE)	Drives data quality & operates working groups across domains
Working Group *(See Blue Box)*	Investigates & resolves data issues & documents data
Data Stewards (10% Commitment)	Support data owners & focus on quality and documentation
Data Custodians (10% Commitment)	Implement quality & access controls within IT systems

Data Governance – Pillars of Success

Data governance is to be treated as an ongoing business-oriented program involving people, standards, and processes required to create and manage a consistent view of organizational data.

1	• Onboard new data community member • Maintain the data owner & steward directory
2	• Issue escalation & resolution • New data project evaluation • Fast track escalation • Request data element update • Manage & publish data definitions • Assign data owners
3	• Create DG policies & standards • Update DG policies & standards • Create new DG process
4	• Monitor data quality metrics • Monitor data cleansing



Technology Investment Portfolio

CC&B

Relies on asset & connectivity data to **enable customer solutions** such as call centre interactions, self-service options like outage notifications & ETR communications, as well as service start/stop.

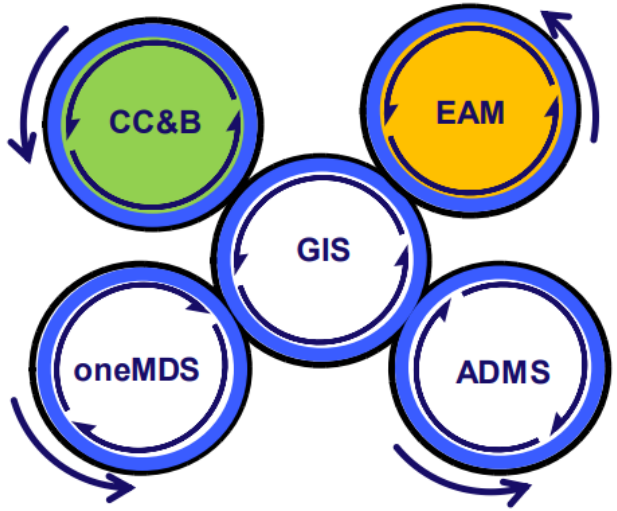
ComEd and PECO are migrating to a single CC&B platform used by BGE today

One MDS

Relies on asset & geographical data and **process integration**. This allows **mobile device-enabled work outputs** to be possible. Separate from other programs, GIS enables One MDS to place a strong focus on the **improvement of how mobile information is received**, **accessed**, and in the future, **updated** from the field.

Single platform that is leveraged by 4 Operating Companies

*ORA & OT Security program not included in this view



GIS

The GIS Program is the foundation of other programs shaping Exelon's future. GIS **sets** the **data**, **IT,** and **operational infrastructure** required to **empower** the **utility of the future**, including intelligent applications, mobile tools, & advanced analytics.

4 solutions converging into single GIS platform

EAM

Central system for **asset and work management** activities, integrated with GIS for connectivity and location information. Asset Suite 8 is the current NorthStar and an aging technology first implemented at Exelon in the 1990s. Implementing a common, modern platform across Exelon with standard business processes

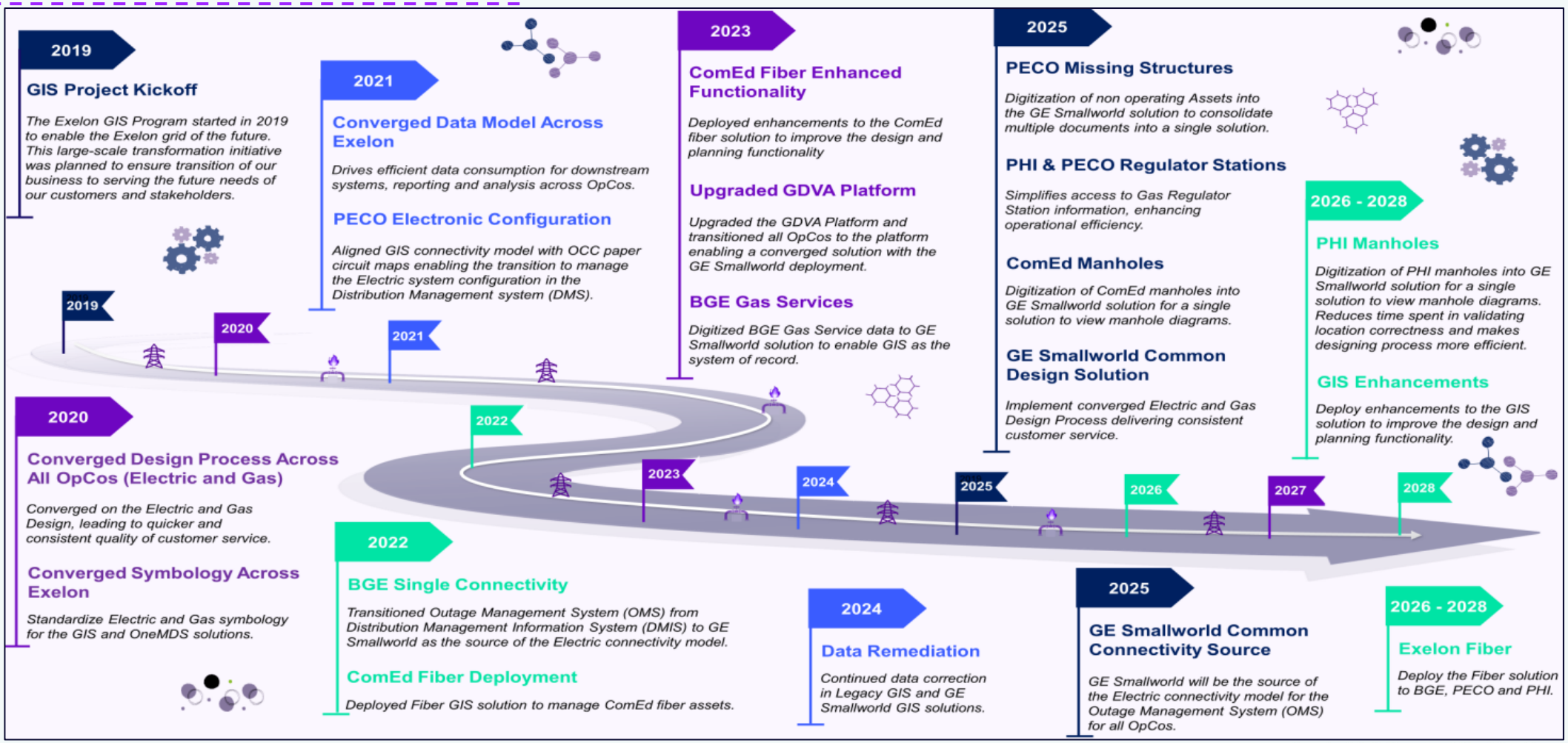
4 solutions converging into single EAM platform for Exelon

ADMS

Relies on the **accuracy of connectivity & geographical data in GIS**. ADMS advanced applications, such as voltage optimization, load flow, state estimation, and fault line indication, **require high-quality geospatial data** as well as **enhanced asset data to function**. GIS enables this key benefit of high-quality data through daily connectivity updates.

Separate OMS and OMS solutions converging to a single ADMS for Exelon

GIS Transformation Program



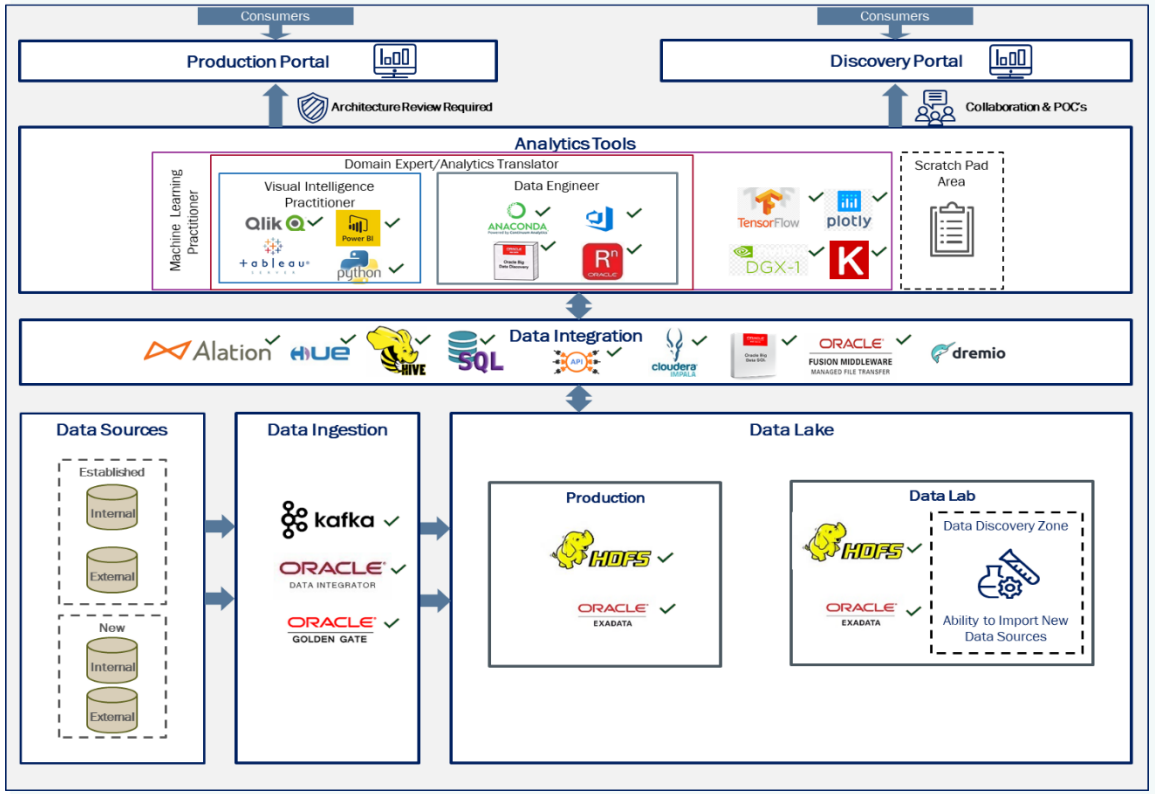
Data Quality Use Case: Meter Mismatches

Value Proposition: Meters being linked to the incorrect transformers and premises is a known issue at Exelon and contributes to a false “Power On” status within the Outage Tracker. The Network Connectivity use case estimated 225,000 meter mismatches. **18.3% of customers who have viewed the Outage tracker, have complained about a false “Power On” status, which is the biggest complaint**. This impacts several areas of the business.

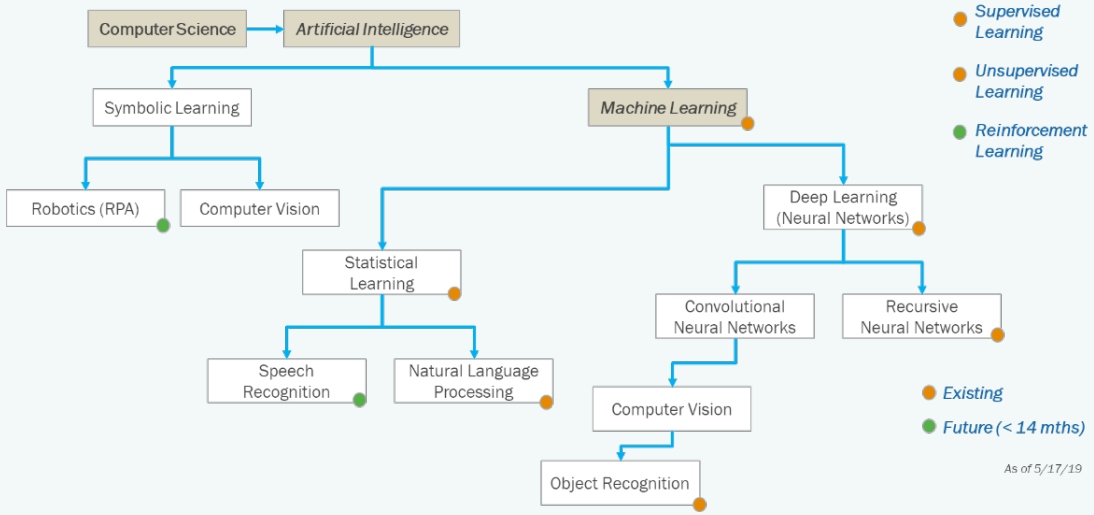
Discovery:

1. Deliver a system architecture diagram of associating meters with transformers and premises, and which applications/systems, teams, and reports use this data. This should also include a detailed “As-Is” business process document for associating meters with transformers and premises, along with gaps, risks and issues.
2. Deliver a recommended “To-Be” business process, including identifying the source of record, system architecture diagram, data governance roles and responsibilities (e.g., Data Owner, Data Steward, etc.) and any data quality tools needed.
3. Deliver a plan to identify and clean-up all meter mismatches, including what funding, timeline and resources are needed to perform a full-scale clean-up. This plan should also describe if remediation is manual, automated or hybrid and who owns the clean-up.

Our DAP Technology Environment Enables Advanced Analytics and Artificial Intelligence Applications



Aspects of Machine Learning and AI that EU Analytics Team Currently Employ Today



Definitions

Symbolic Learning: Rules and knowledge-based systems

Machine Learning: Ability to use computers to probe data for structure

Statistical Learning: Create predictions based on data

Deep Learning: Combines advances in computing power and special types of neural networks to learn complicated patterns in large amounts of data

Supervised Learning: Infer knowledge from labeled training data

Unsupervised Learning: Find hidden structure in unlabelled data

Reinforcement Learning: Find suitable action model to maximize reward for the actor, using an approach of trial and error

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Discussion, Q&A

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