

PG&E EPIC Update

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Electric Operations



Together, Building
a Better California

EPIC 1 & 2 Highlights

Furthering DER Integration

- Utility-scale battery capabilities for market participation & distribution peak-shaving - (*EPIC 1.01 & 1.02*)
- Foundational DER Management System (DERMS) requirements - (*EPIC 2.02*)
- Smart Inverter (SI) demonstration and support of policy & standards development - (*EPIC 2.03A*)
- Analytical & cost-effective methods for meter phase identification - (*EPIC 2.14*)

Furthering Transportation Electrification

- Optimization tool for Direct Current Fast Charger (DCFC) placement - (*EPIC 1.25*)
- Demonstration of Vehicle to Home (V2H) technology - (*EPIC 2.03B*)
- Demonstration of EV submetering and support of CPUC's position on submetering protocol - (*EPIC 1.22*)

Enhancing Distribution Planning

- Improvements to demand forecasting - (*EPIC 2.23*)
- Optimization tool to target customers for Non-Wires Alternative (NWA) solutions - (*EPIC 2.22*)

Enhancing System Restoration

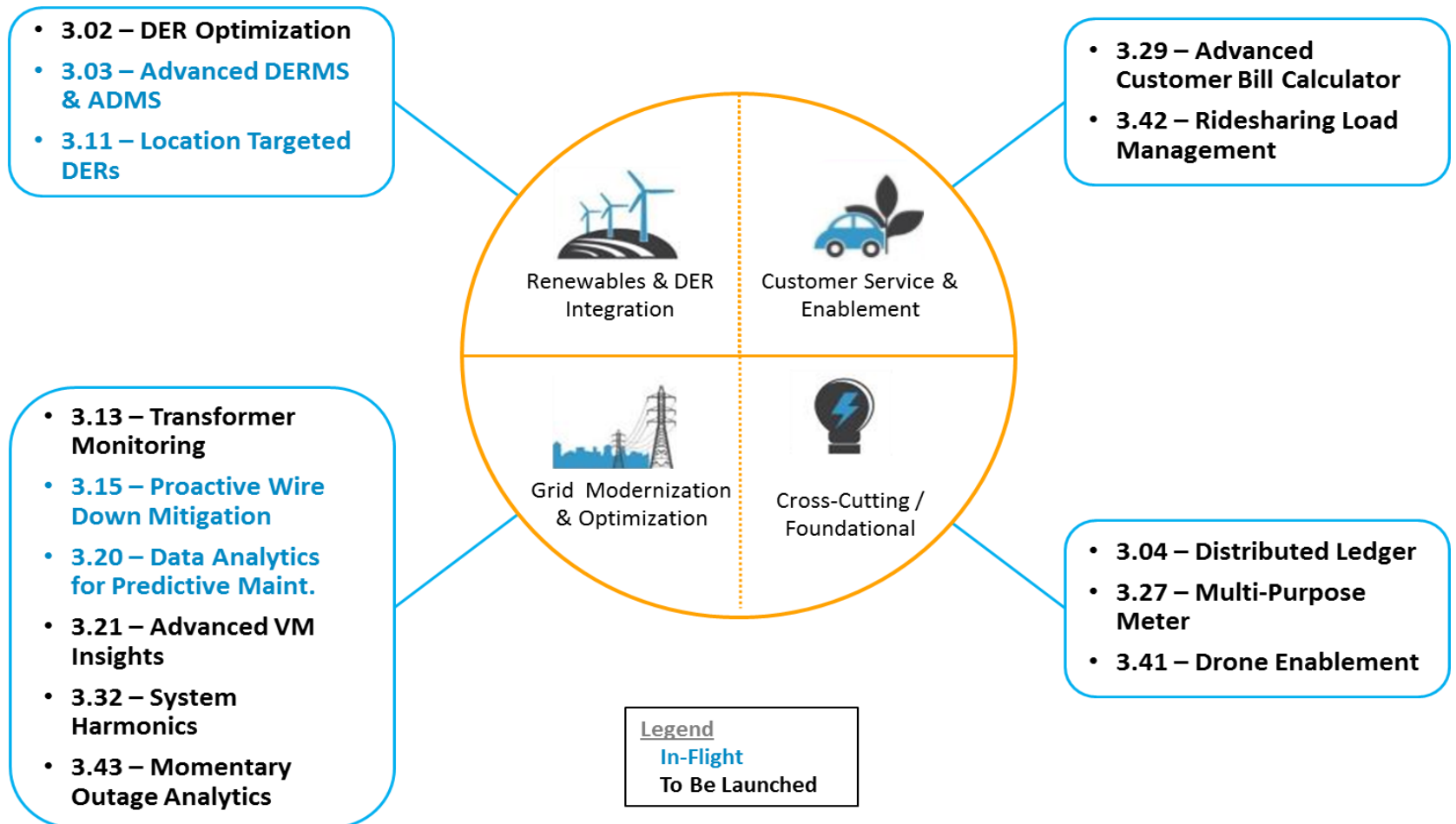
- Decision support system to improve the efficiency of restoration work plan development - (*EPIC 2.10*)

Furthering Wildfire Resiliency

- Solutions that use radio frequency data to predict asset failures - (*EPIC 2.34*)

EPIC 3 – Wave 1

- PG&E's EPIC 3 Application included 43 projects
- 14 projects were identified for the first wave of execution (details below)
- Launch of wave 1 projects began in Dec 2018; remaining wave 1 projects to be launched by Q1 2020



In-Flight EPIC 3 Projects

3.03 – Advanced DERMS & ADMS

1 Issue / Gap Addressed

As Distributed Energy Resource (DER) penetration increases, the development and deployment of a centralized DER Management System (DERMS) will be required to monitor, control and optimize the dispatch of DERs to support utility efforts to safely and efficiently manage the grid.

2 Objective

Develop a DERMS head-end system and associated interfaces for DER telemetry & control and demonstrate this system on: 1) an operational remote grid and 2) on-grid DERs participating in a Non-Wire Alternative (NWA) project.

3 Profile

Timing

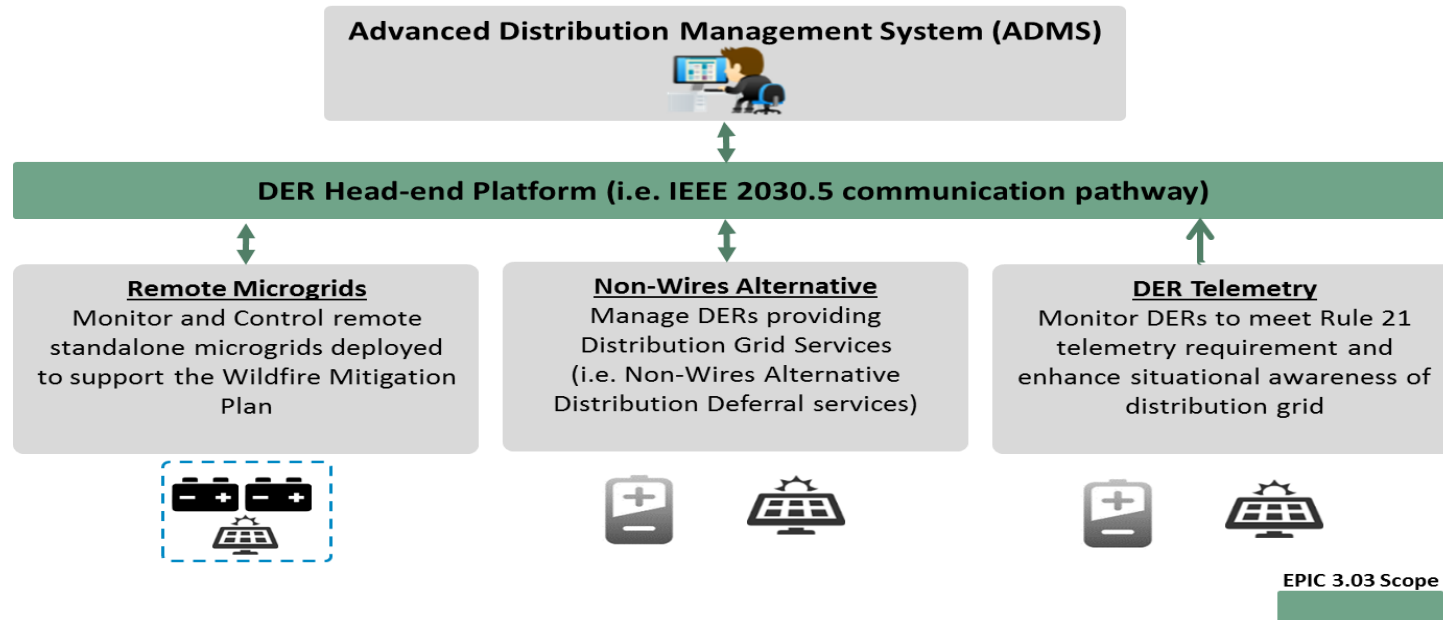
Launched Q2 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | Value Chain

Renewables & DER Integration |
Grid Operations / Market Design,
Distribution, Demand-Side Management,
Transmission



3.11 – Location Targeted DERs

1 Issue / Gap Addressed

Demand for microgrids is increasing. While Behind-the-Meter (BTM) microgrids are well-understood, there have not been Front-of-the-Meter (FTM), multi-customer microgrids enabled through PG&E-owned distribution assets. There is a need to develop standards for integrating multi-customer microgrids.

2 Objective

Configure the Arcata-Eureka airport's local microgrid controller to integrate the microgrid into PG&E's distribution network and enable Distribution Control Center visibility and control of the microgrid. Develop scalable and replicable approaches to planning, designing, deploying and operating multi-customer microgrids.

3 Profile

Timing

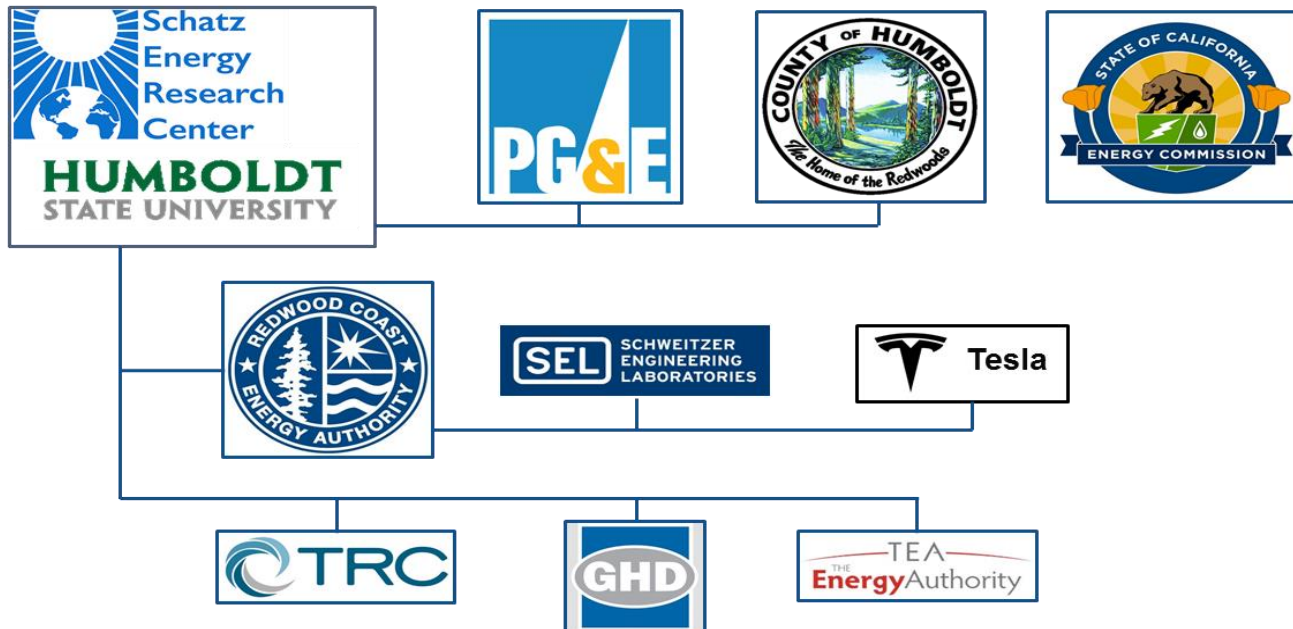
Launched Q1 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

Project Type | Value Chain

Renewables & DER Integration |
Grid Operations / Market Design,
Distribution, Demand-Side Management



3.15 – Proactive Wire Down Mitigation

1 Issue / Gap Addressed

Energized wires down events have the potential to cause fire ignition.

2 Objective

Demonstrate Rapid Earth Fault Current Limiter (REFCL) technology at a PG&E substation serving a high fire-risk area, to assess its effectiveness at automatic current reduction in wires down events, with the goal of drastically reducing the likelihood of wires down events causing wildfires.

3 Profile

Timing

Launched Q4 2018

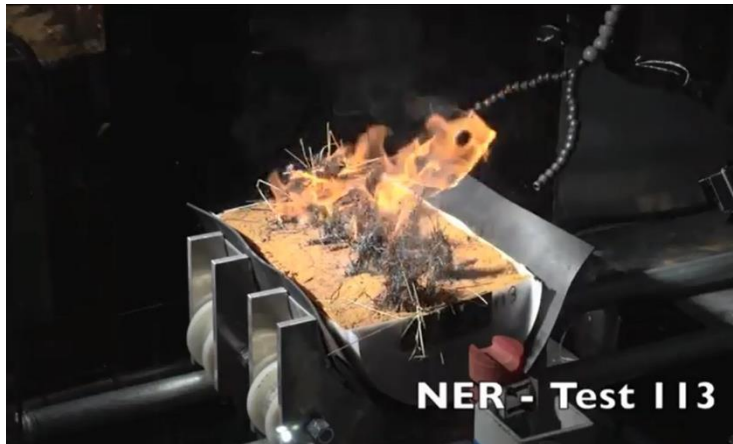
Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	

Project Type | Value Chain

Grid Modernization and Optimization |
Grid Operations / Market Design,
Distribution

Normal Ground Fault



With REFCL Technology



3.20 – Data Analytics for Predictive Maintenance

1 Issue / Gap Addressed

Assets experience wear and tear, and eventually break down. Heuristics regarding expected useful life and level of utilization are currently applied in maintenance scheduling. There is opportunity to improve current practices by leveraging existing data sources to help detect signs of near-failure equipment.

2 Objective

Leverage GIS, weather, SmartMeter™, SCADA and other data to develop and demonstrate analytical models that predict when maintenance will be needed for distribution assets.

3 Profile

Timing

Launched Q2 2019

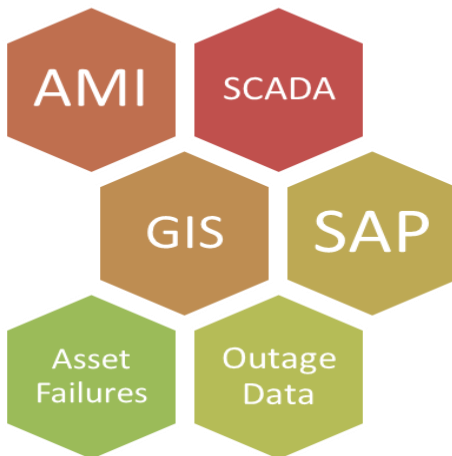
Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

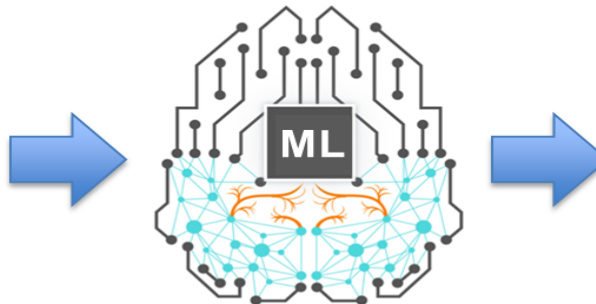
Project Type | Value Chain

Grid Modernization and Optimization |
Grid Operations / Market Design,
Distribution

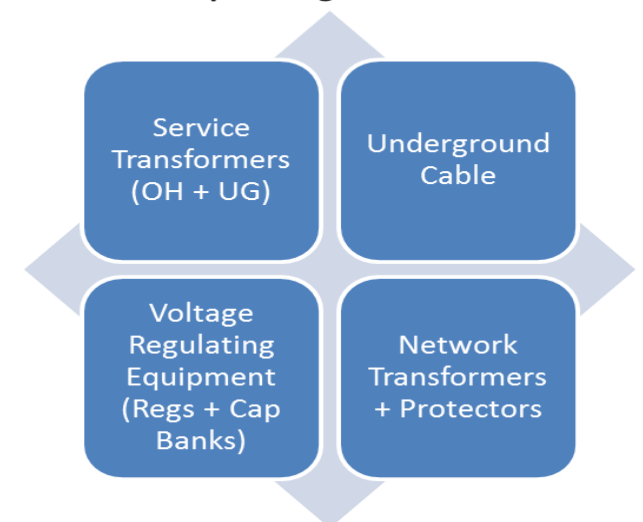
Use existing PG&E data sources



Develop predictive failure models using machine learning



Identify conditions indicative of impending asset failure



Upcoming EPIC 3 Projects

(Planned Q4 2019 Launch)

3.27 – Multi-Purpose Meter

1 Issue / Gap Addressed

PG&E has over 5 million SmartMeters™ deployed in the field and anticipates to replace 2.4M meters over the next 30 years. Existing SmartMeters™ have functional limitations for modern day applications (i.e. sub-metering) and have high replacement costs due to failure of meter components and associated truck rolls for individual meters.

2 Objective

Develop the “docking station” for PG&E’s Next Generation Meter that demonstrates the capability of modularizing hardware components and measuring energy consumption of multiple customers or multiple uses at the same premise.

3 Profile

Timing

Expected to Launch Q4 2019

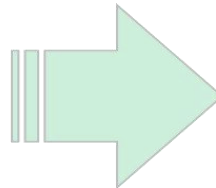
Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
	✓	✓

Project Type | Value Chain

Customer Service and Enablement |
Grid Operations / Market Design,
Distribution

Today



Future



3.29 – Advanced Customer Bill Calculator

1 Issue / Gap Addressed

As DER penetration continues to increase, more customers will become increasingly engaged and want to optimize their bills. Currently, multiple stand-alone single-purpose tools are available, and these tools are targeted towards mass-market and only allow for simple rate analyses.

2 Objective

Develop an integrated online tool with a streamlined graphical user interface to allow customers to more easily understand how behavioral changes and technology investments may affect their energy bills.

3 Profile

Timing

Expected to Launch Q4 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
		✓

Project Type | Value Chain

Customer Service and Enablement |
Grid Operations / Market Design

Current Calculators



EPIC 3.29

Customizable	Interactive	Customer Friendly	Personalized / Historical-based	Integrated	Best Rate Analysis
✓	✓	✓			✓
✓		✓			
			✓		✓
✓	✓	✓	✓	✓	✓

3.32 – System Harmonics for Power Quality Investigations

1 Issue / Gap Addressed

Harmonics issues on the grid negatively impact customer equipment operation and can also damage utility assets. Higher incidence of harmonics issues is anticipated with increased DER penetration. Currently, PG&E is notified of potential issues through customer complaints, and dispatches troubleshooters/engineers to install monitors on-site and collect data.

2 Objective

Demonstrate the use of modern SmartMeters™ to detect, investigate and mitigate harmonic issues on the distribution system.

3 Profile

Timing

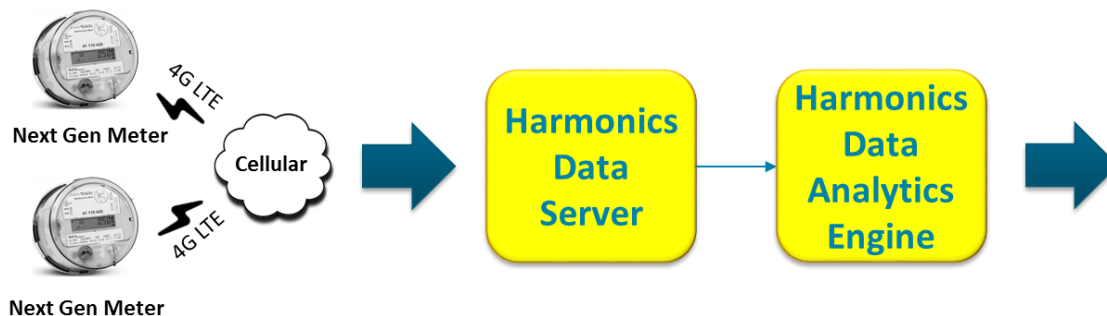
Expected to Launch Q4 2019

Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	

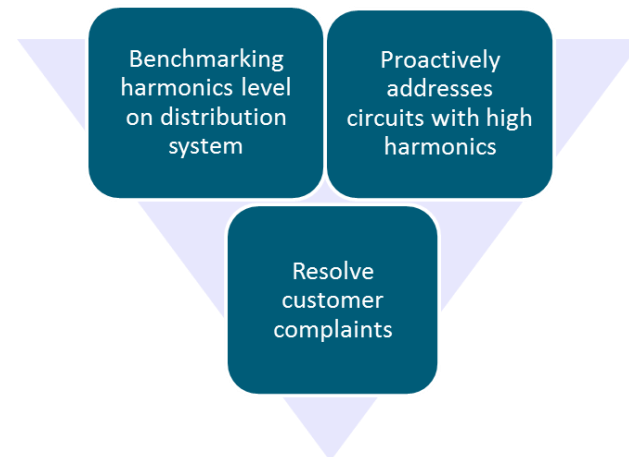
Project Type | Value Chain

Customer Service and Enablement |
Grid Operations / Market Design,
Distribution, Transmission



Next gen meters continuously monitor and transmit harmonics data

Harmonics data stored within PG&E server. Automated algorithms detect high harmonics level exceeding acceptable limits and flag meter locations for engineering review and analysis.



Harmonics data are used for investigating and resolving harmonics issues and tracking system harmonics

3.43 – Momentary Outage Analytics

1 Issue / Gap Addressed

PG&E SmartMeters™ provide alarm traps related to the meter's health and status during abnormal system conditions. This information is currently only used to troubleshoot individual meters. There is an opportunity to utilize this semi-real time data to develop algorithms that can potentially identify the sources of the momentary outages to enable predictive maintenance.

2 Objective

Develop analytical models that use AMI momentary events and trap alarms to identify issues with customer service drops, distribution equipment, and intermittent vegetation contact.

3 Profile

Timing

Expected to Launch Q4 2019

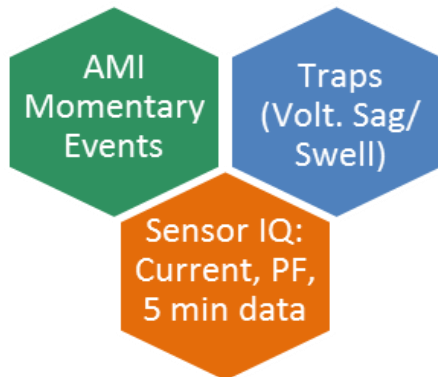
Customer Benefits

Increase Safety	Improve Reliability	Reduce Costs
✓	✓	✓

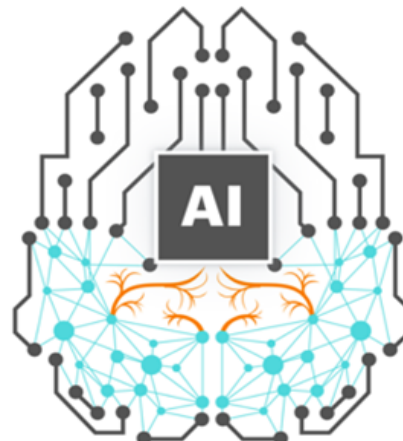
Project Type | Value Chain

Grid Modernization and Optimization |
Grid Operations / Market Design,
Distribution

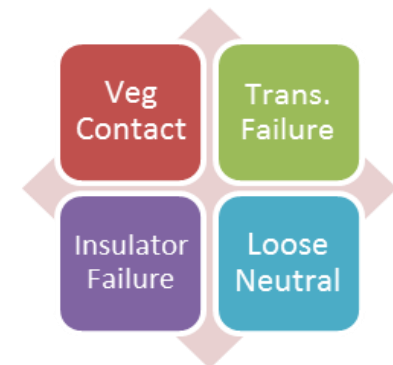
Use existing PG&E data sources



Develop predictive failure models using machine learning



Identify conditions indicative of impending asset failure



- Continue Execution of EPIC 3 Wave 1
 - Bid opportunities will be posted on PG&E's website [here](#)
- Potentially Launch EPIC 3 Wave 2
 - Launch of Wave 2 contingent on CPUC approval to access the remaining 1/3 of program funds
 - 29 projects remaining from PG&E's [EPIC 3 Investment Plan](#)
 - Short list of candidate projects will be presented at a public workshop, to gather stakeholder input and further flesh out plans before projects are selected and launched
 - ~4-6 projects will be selected

Discussion