Palantir [+] PG&E

Improve Grid Resiliency by Connecting Analytics & Operations

Palantir

PG&E

Utility Analytics Week 2022

Speakers

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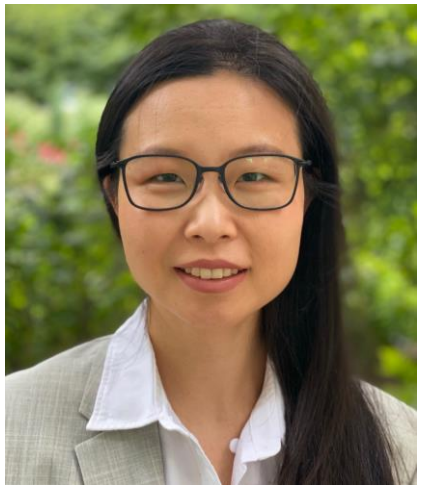
PG&E



Yi Xue

Commercial Lead

Palantir

Topics

- → Introduction
- → Partnership
- → Use Cases
- → Demo

PG&E provides natural gas and electricity to 16+ million people across Northern and Central California.

Service Area 70,000 square miles	Overhead Distribution Line Miles (Total) 108,000	Overhead Transmission Line Miles (Total) 18,900
Solar Customers > 650,000	Overhead Distribution Line Miles (Wildfire) 28,100	Overhead Transmission Line Miles (Wildfire) 5,800

COMPANY PROFILE

- One of the largest combined natural gas and electric companies in the US
- Service area spans large geographically diverse territory
- 5.5 million electric customer accounts
- 4.5 million natural gas customer accounts
- 9 billion points of data daily

PG&E's Data Challenges

OVERVIEW

There is an increasing need for integration of trusted, verifiable and traceable datasets to support critical analytics and insights.

→ Key Wildfire Risk Mitigation Initiatives
→ 10K Undergrounding
→ Public Safety Power Shutoff Program
→ Enhanced Power Safety Settings

DATA CHALLENGES

Critical data resides in 150+ purpose-built systems deployed over 50 years

→ System-specific access rights for data
→ Data integration on a case-by-case basis (often manual)
→ Unclear lineage of data used in analysis
→ Core data replicated in ungoverned systems
→ Derived data and insights stored locally

Challenges to transition from R&D projects to operations

HYPOTHESIS

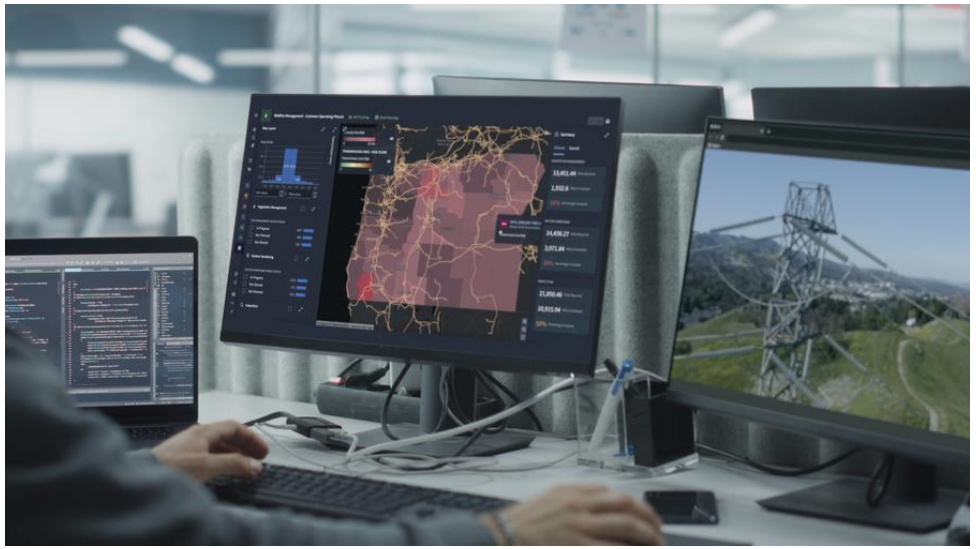
Enterprise Data & Analytics Platform provides:

→ Improved Speed-to-Value
→ Increased sophistication of analytic models
→ Increased trust in data (traceability)
→ Ability to store derived insights as data objects
→ Integration of data from separate systems to create high-value, reusable datasets
→ Increased "Joy at Work" analysts to focus on deriving insights rather than IT

Partnership Overview

Since March 2020, PG&E and Palantir have partnered to develop a common operating picture for targeted capabilities that provides end-users with data access, insights and capabilities to manage our most critical programs.

- → Situational Intelligence
- → Wildfire Risk Quantification
- → Wildfire Mitigation Program Management
- → Predictive Asset Maintenance
- → Work Planning
- → Regulatory Reporting
- → Source System Data Quality Management



- → Data Systems Connected: **60+**
- → Products Deployed: **20+**
- → Data Objects Created: **400+**

Tech: Data Architecture Overview

The Challenge

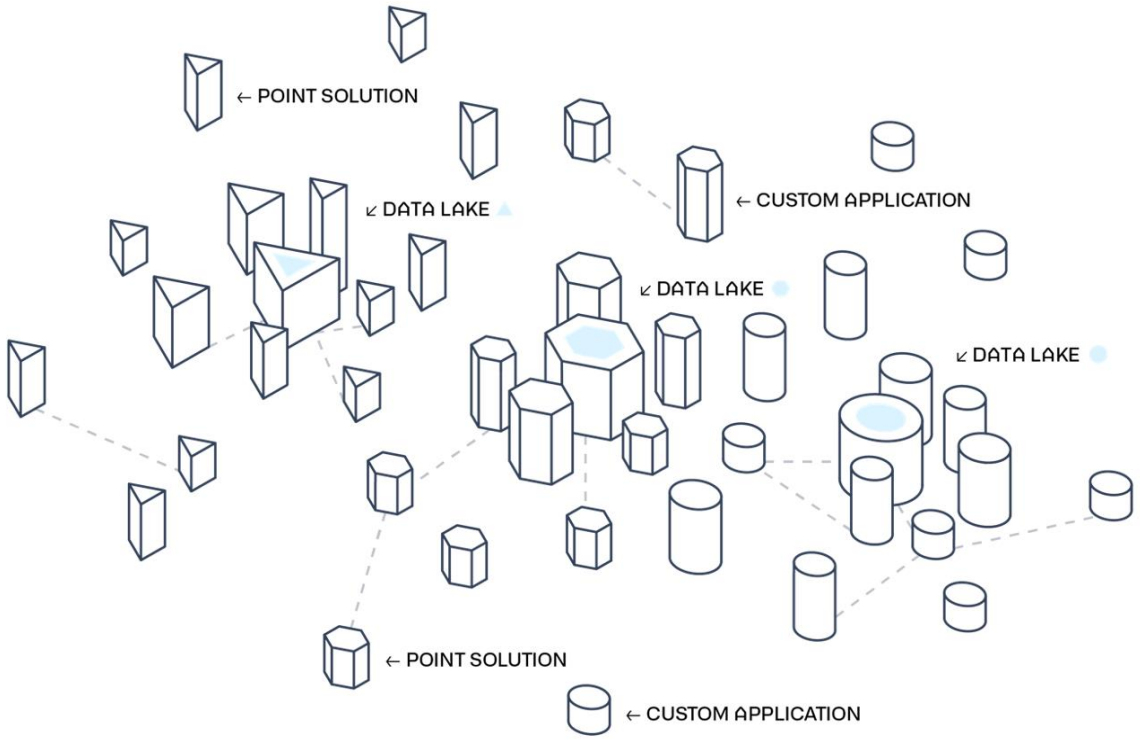
Digital Transformation of PG&E's Data Architecture

Historically, many institutions like PG&E have built their data assets on a use-case centric project model, which created a set of purpose-built systems and point-to-point data connections.

- → Highly fragmented data architecture
- → Excessive data replication
- → Lack of basic data inventory
- → Inconsistent and ineffective security controls

User comments:

- → *I spend so much time getting data, and getting it ready, I have no time left for finding insights.*
- → *With the same data in so many places, how do I know which to use?*
- → *I always need to bring disparate datasets together, why is that so hard?*

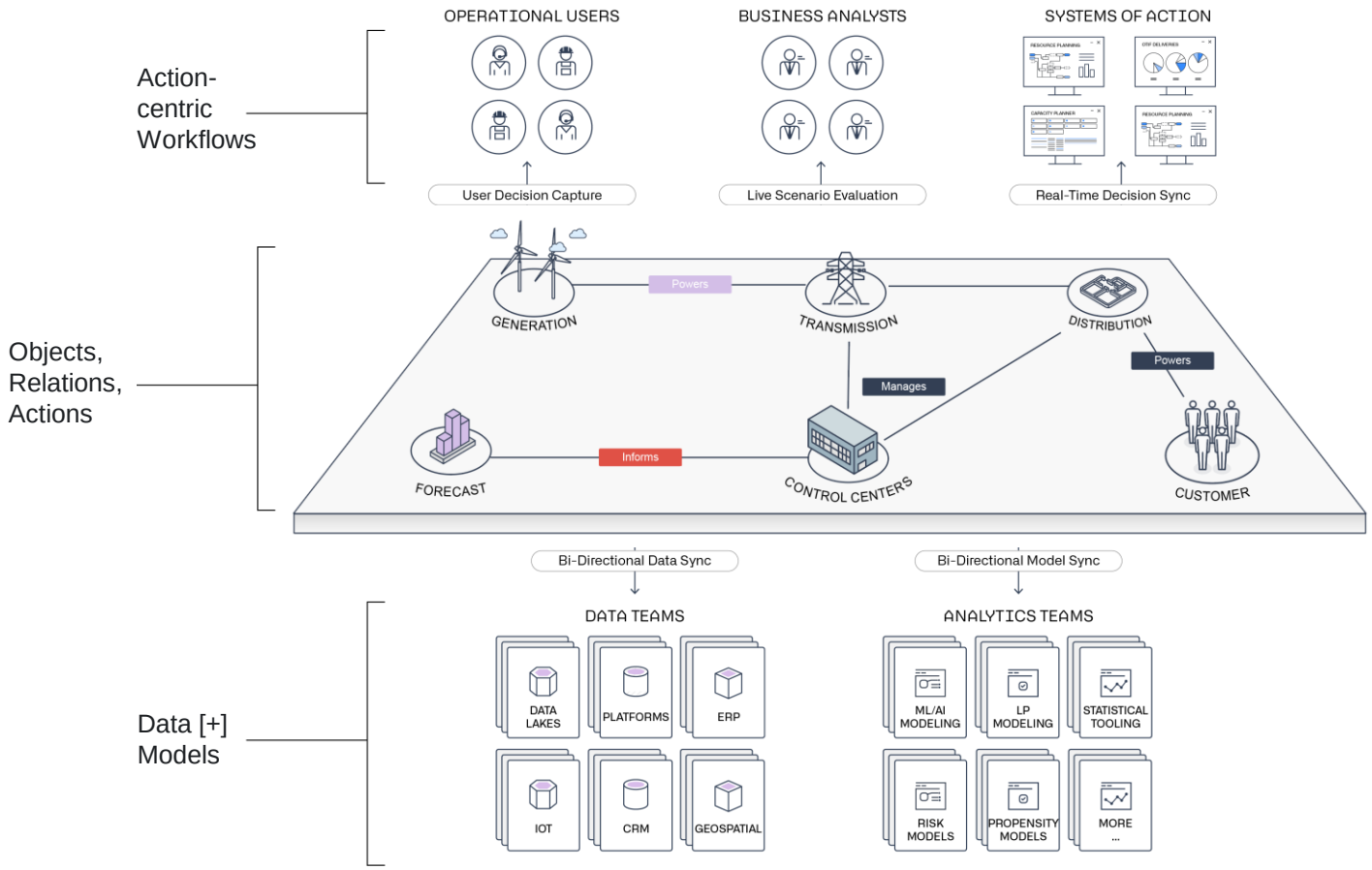


Palantir Foundry

Open Architecture

Palantir Foundry is an operating system that amplifies and extends the power of data integration by closing the loop between operations and analytics.

- → Flexibility to connect to brownfield data landscapes: SAP, GIS, SCADA, etc.
- → Native integration with analytics, closing the loop with model builders / AI, enabling data-driven decision-making
- → Rapid, compounding use case delivery at scale
- → Connects data, analytics, and business teams to a common foundation

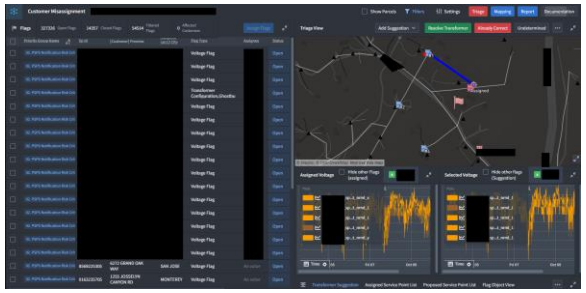


PG&E Workflows

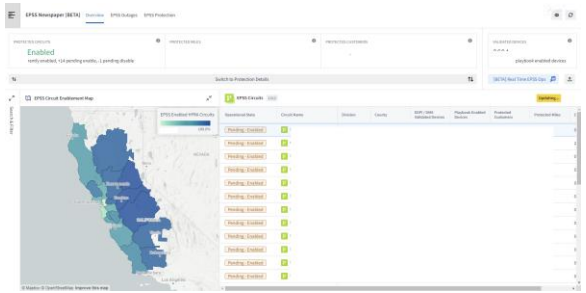
Foundry in Practice

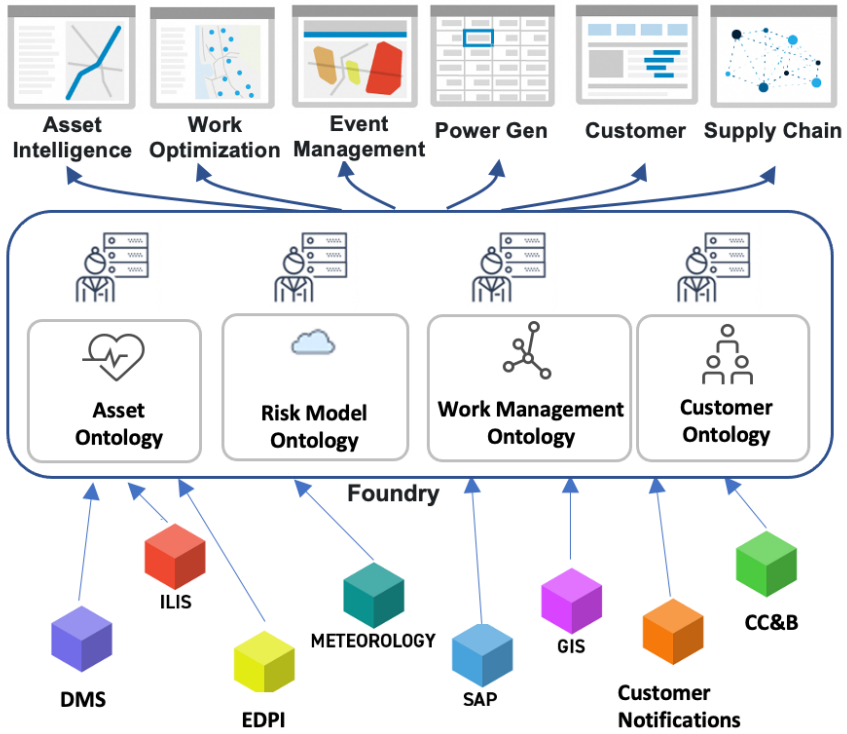
Integrating data into a central operating platform has enabled the data to be leveraged by dozens of use cases and self-service analytics.

- → Customer mis-assignment to validate the connectivity model
  GIS, AMI
- → Preventative maintenance (identifying distribution transformer malfunction)
  GIS, AMI, SAP
- → Operational decision-making for advanced safety settings for the grid – EPSS
  GIS, AMI, SAP, SCADA, Meteorology



Notional screenshots for connectivity validation and EPSS

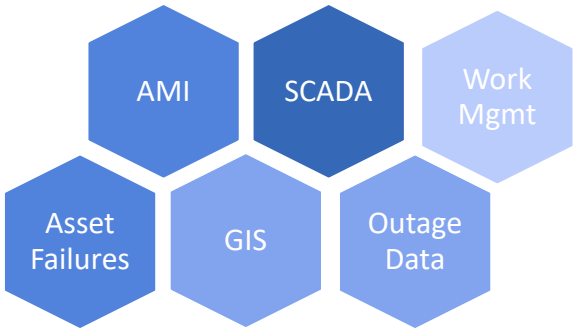




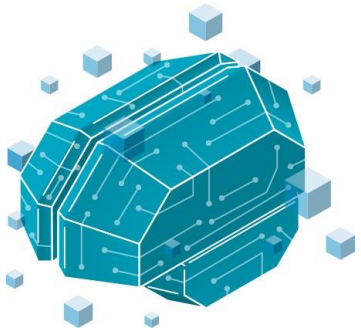
Deep Dive: Identifying Transformer Malfunctions

Predicting Asset Failure

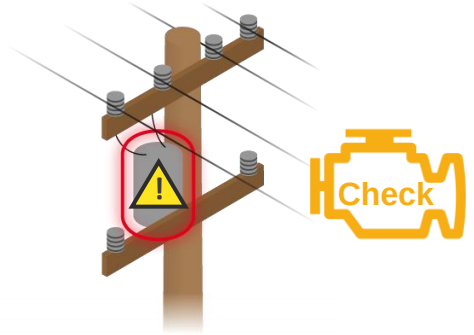
Use Existing PG&E Data Sources



Develop Predictive Failure Models Using Machine Learning



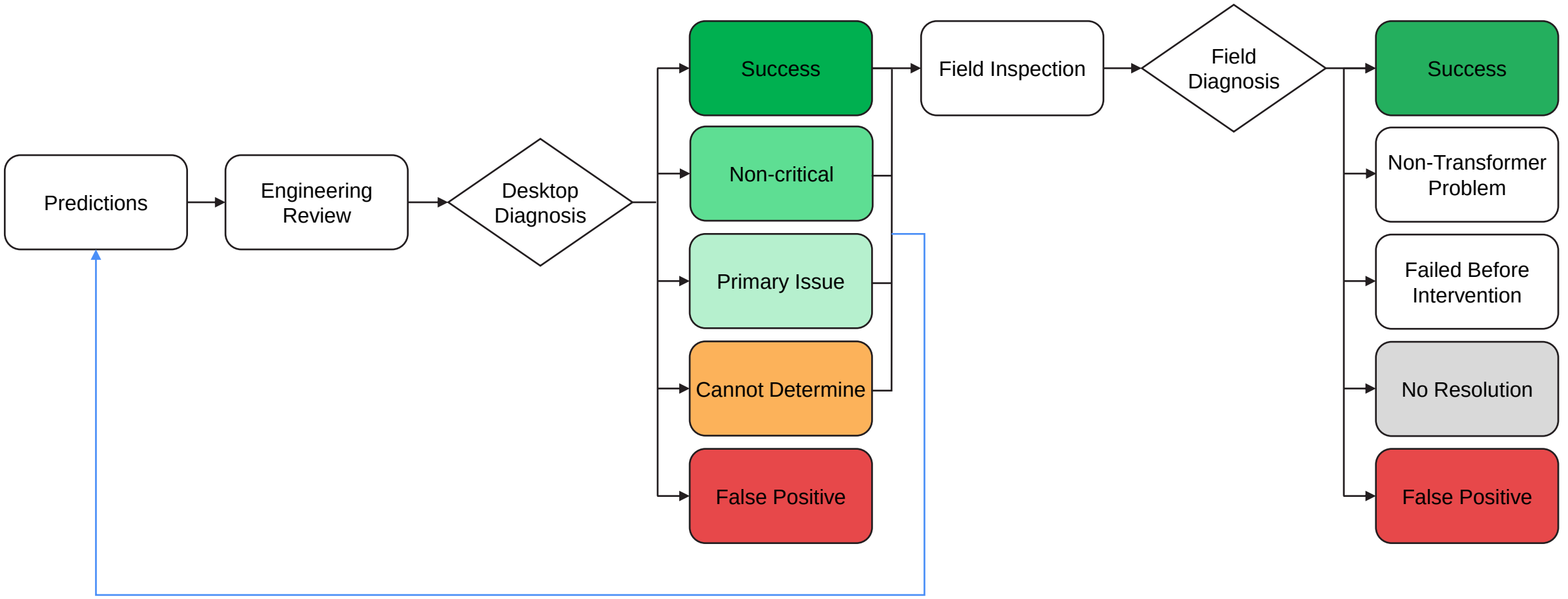
Identify Conditions Indicative of Impending Asset Failure



DISTRIBUTION TRANSFORMERS

- Foundry enables data scientists to use existing PG&E data sources to develop machine learning algorithms that can predict with confidence when an electric asset will fail.
- You can think about this product like a car's check engine light. When your check engine light turns on, your car still works but may be functioning outside of the standard operating parameters and is at risk of failure.

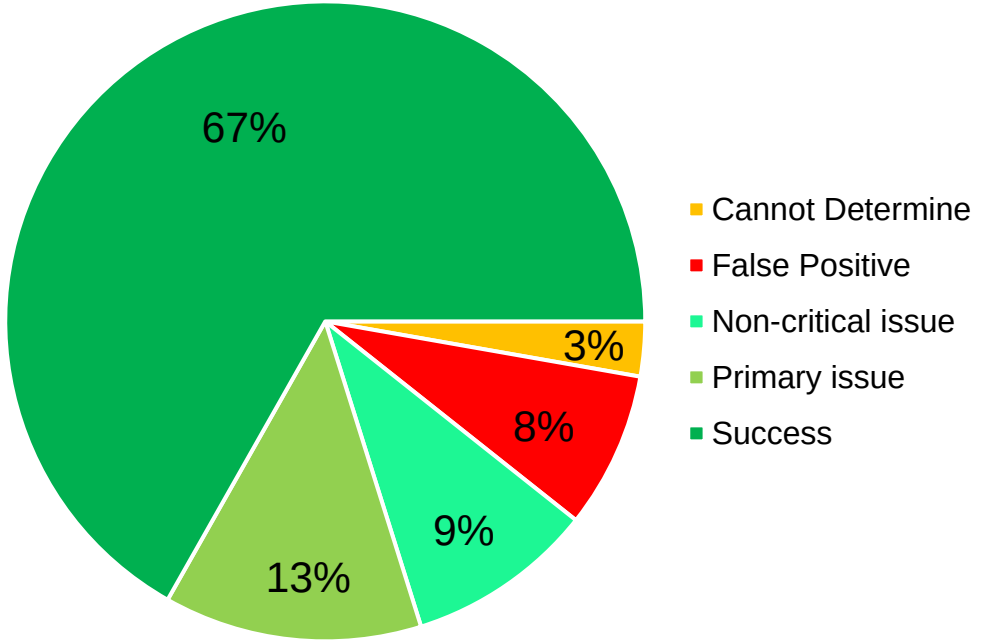
Analytics Workflow Process



Desktop Review Outcomes

Current results to date

- **Success** - Engineer found anomalies with the transformer after reviewing the available data
- **Cannot Determine** - Engineer is not certain whether a prediction is accurate
- **False Positive** - Engineer didn't see any data or information that showed any signs of incipient failure or anomaly

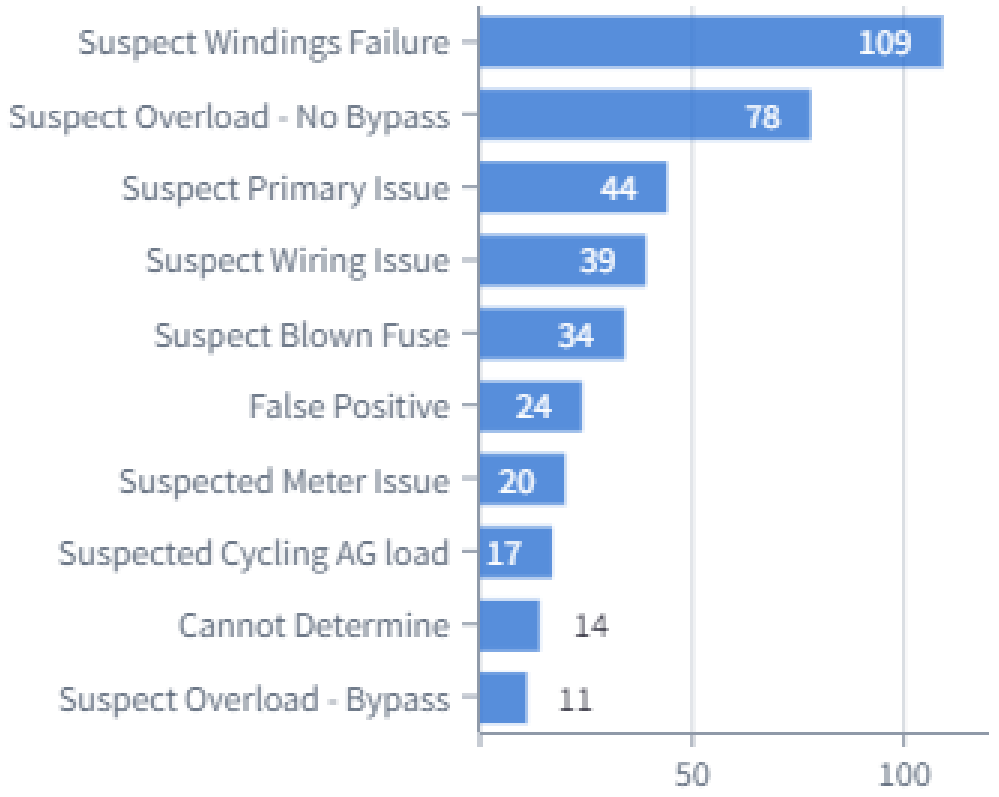


Over 100 engineering reviews have been completed, and the majority of predictions were confirmed to be relevant transformer anomalies. On multiple occasions assets have been proactively replaced based on the model's recommendations, in doing so reducing wildfire risk and improving reliability for customers.

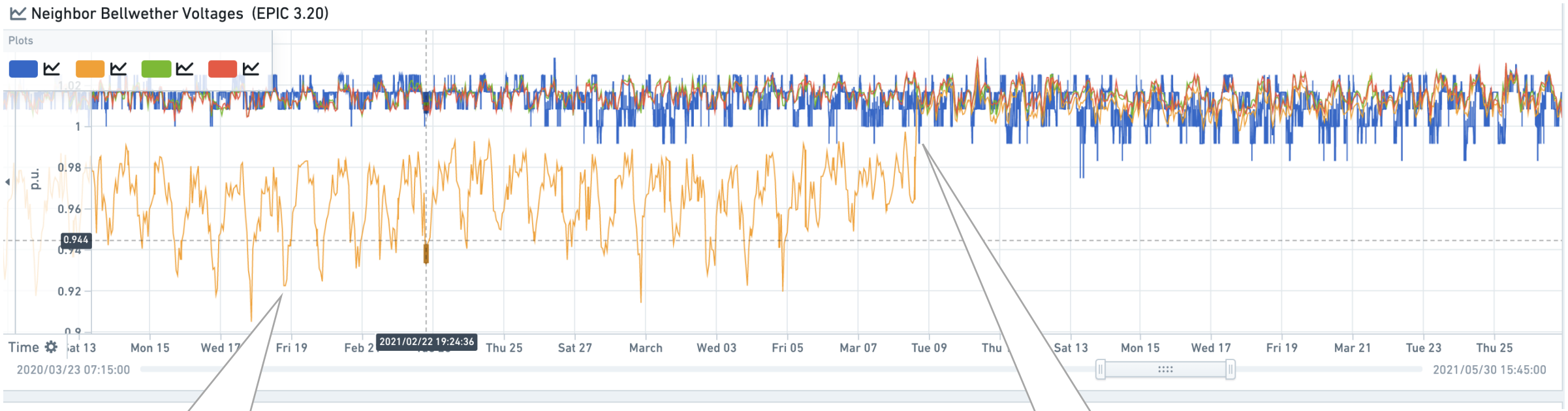
Desktop Review Outcomes

Current results to date

- → Identification of anomalies related primarily to windings failures and overloading
- → Issues resolved included a situation where an overloaded secondary was visibly smoldering.



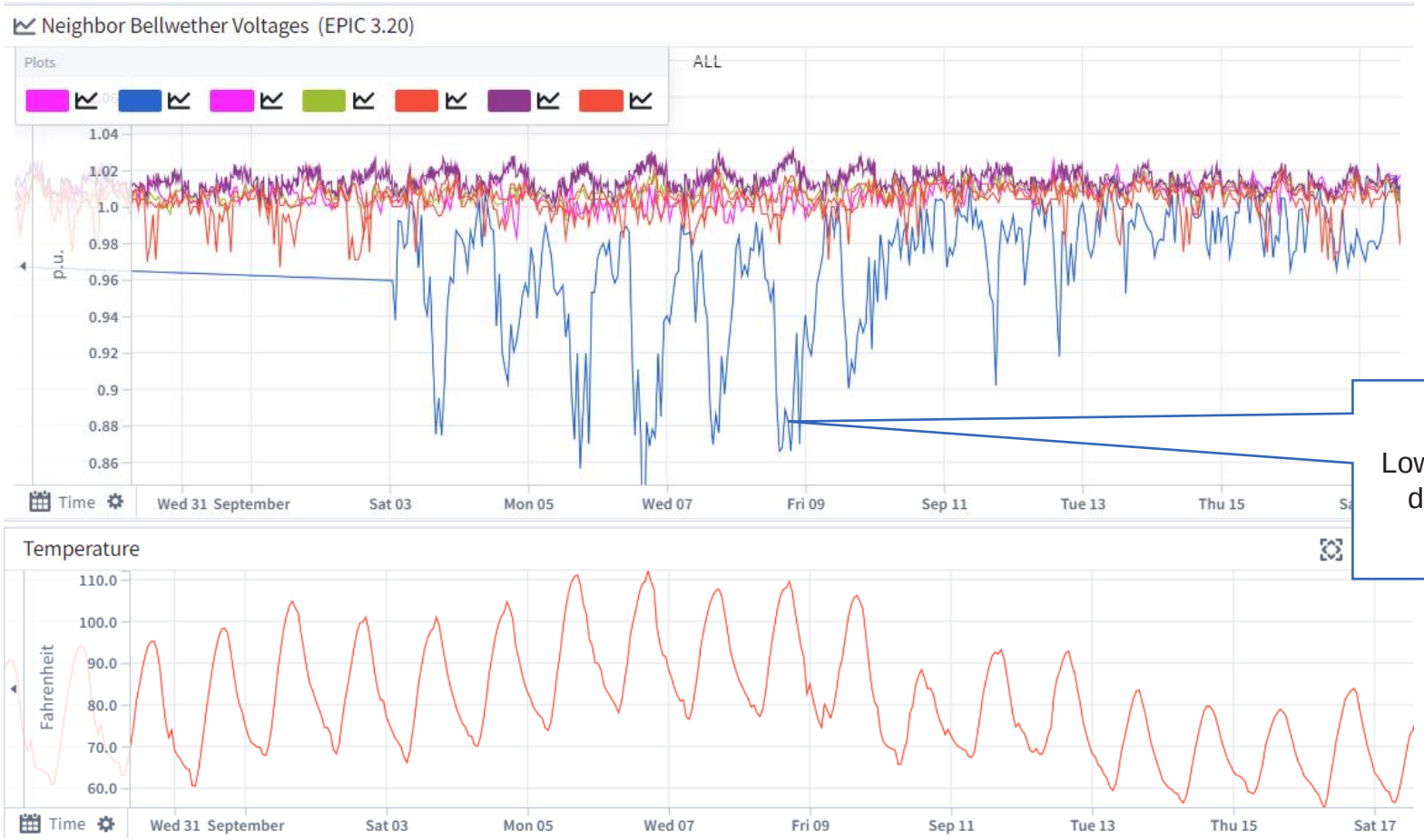
Non-Technical Losses and Overloading



Transformer voltage sagging relative to neighbors indicates overloading of transformer and service

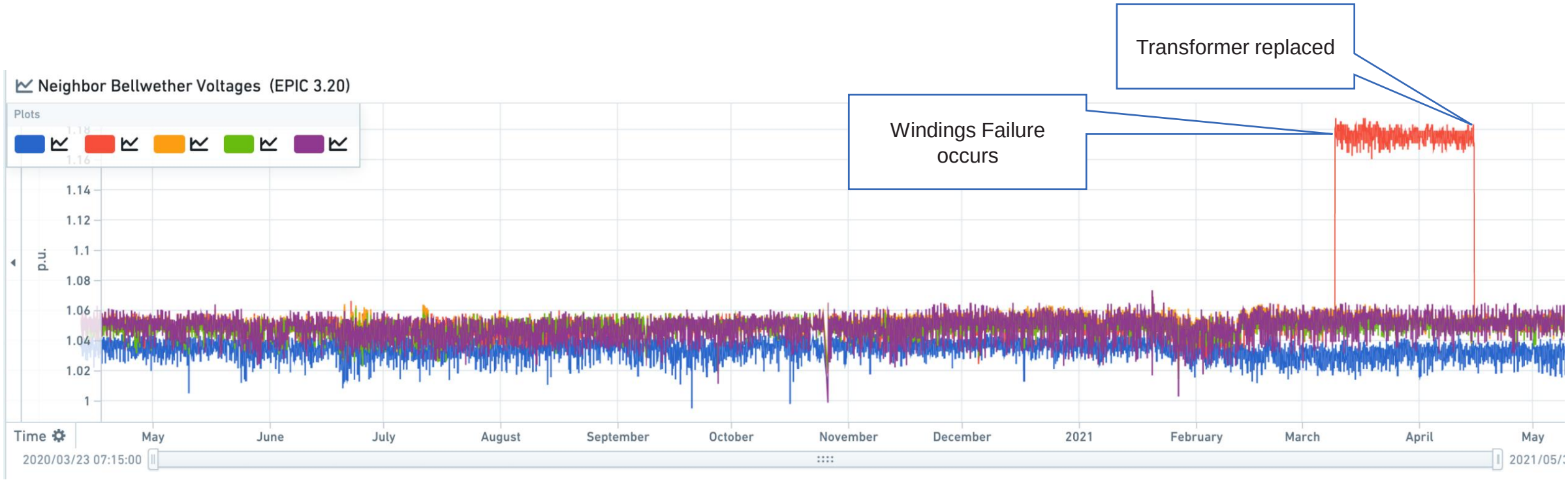
Trouble-man arrives and disconnects overloaded service

Overloading During the Sept 2022 Heat Storm



Low voltage behavior during heat wave

Potential Windings Failure: Lightning Event



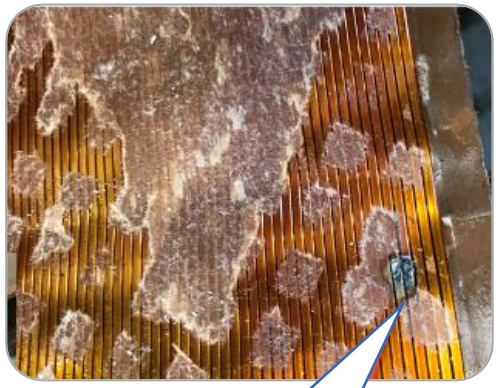
Transformer Teardown

Testing & Teardown

Should read + 100.00

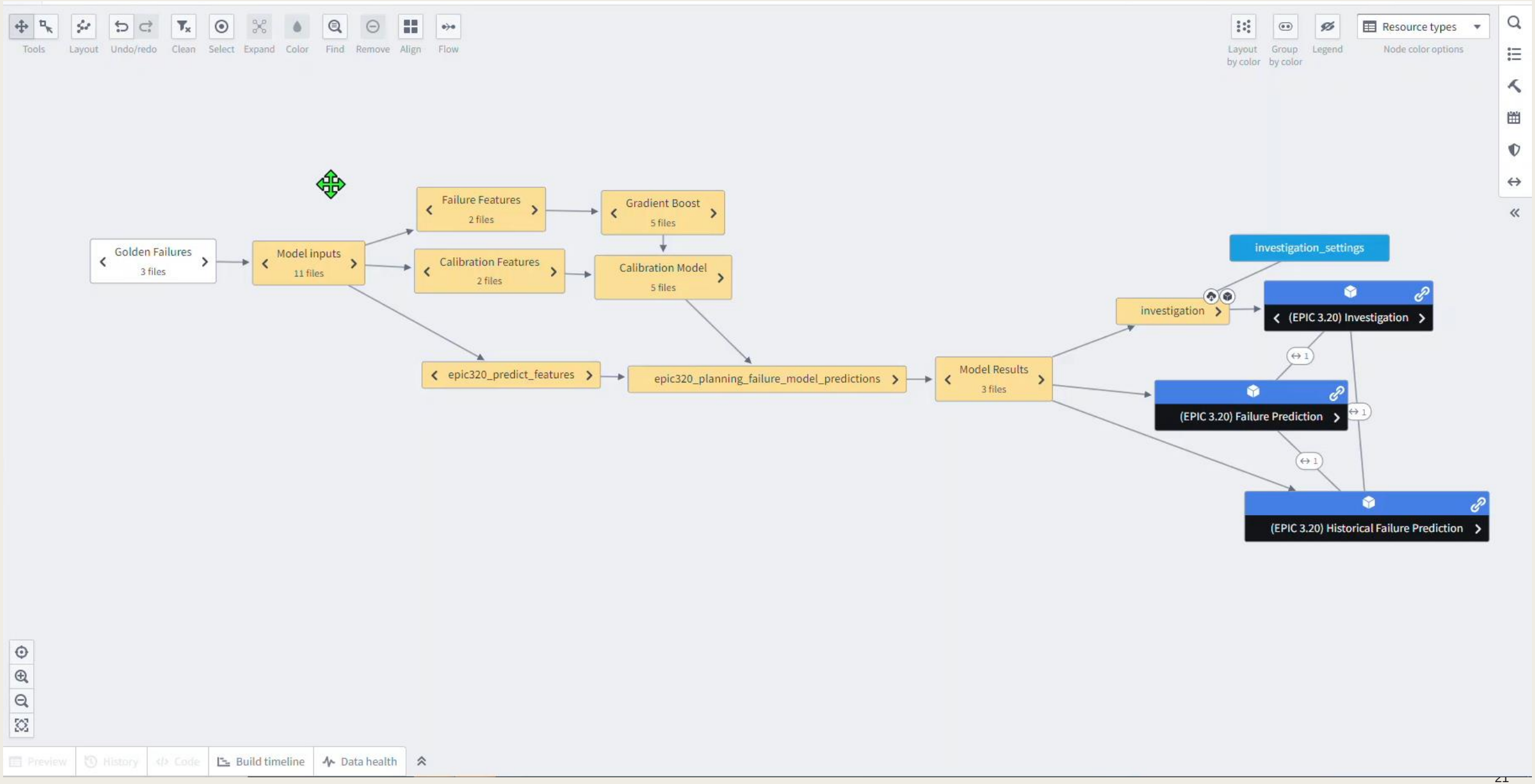
Burn through of paper (layer to lay failure)

Primary winding (circled): Design is outer secondary / primary / inner / secondary (Primary has 1600 Windings with approximately 80 windings/layer – Secondary has 16 layers each (one sheet per layer)



Winding to Winding failure with Kraft paper removed from Layer, exposing individual windings

Use Case Demo


Tools
Layout
Undo/redo
Clean
Select
Expand
Color
Find
Remove
Align
Flow
Layout by color
Group by color
Legend
Resource types
Node color options
Golden Failures
3 files
Model inputs
11 files
Failure Features
2 files
Gradient Boost
5 files
Calibration Features
2 files
Calibration Model
5 files
epic320_predict_features
epic320_planning_failure_model_predictions
Model Results
3 files
investigation_settings
investigation
(EPIC 3.20) Investigation
(EPIC 3.20) Failure Prediction
(EPIC 3.20) Historical Failure Prediction
Preview
History
Code
Build timeline
Data health

Filter | Analyze | Review | Dispatch | Complete Investigation | Summary | Edit

Calculation Date Time	Probability Of Failure	kVA and Phase	Loading %	HFTD
Jun 25, 2022	26.3%	15/25 3Ø	158	No

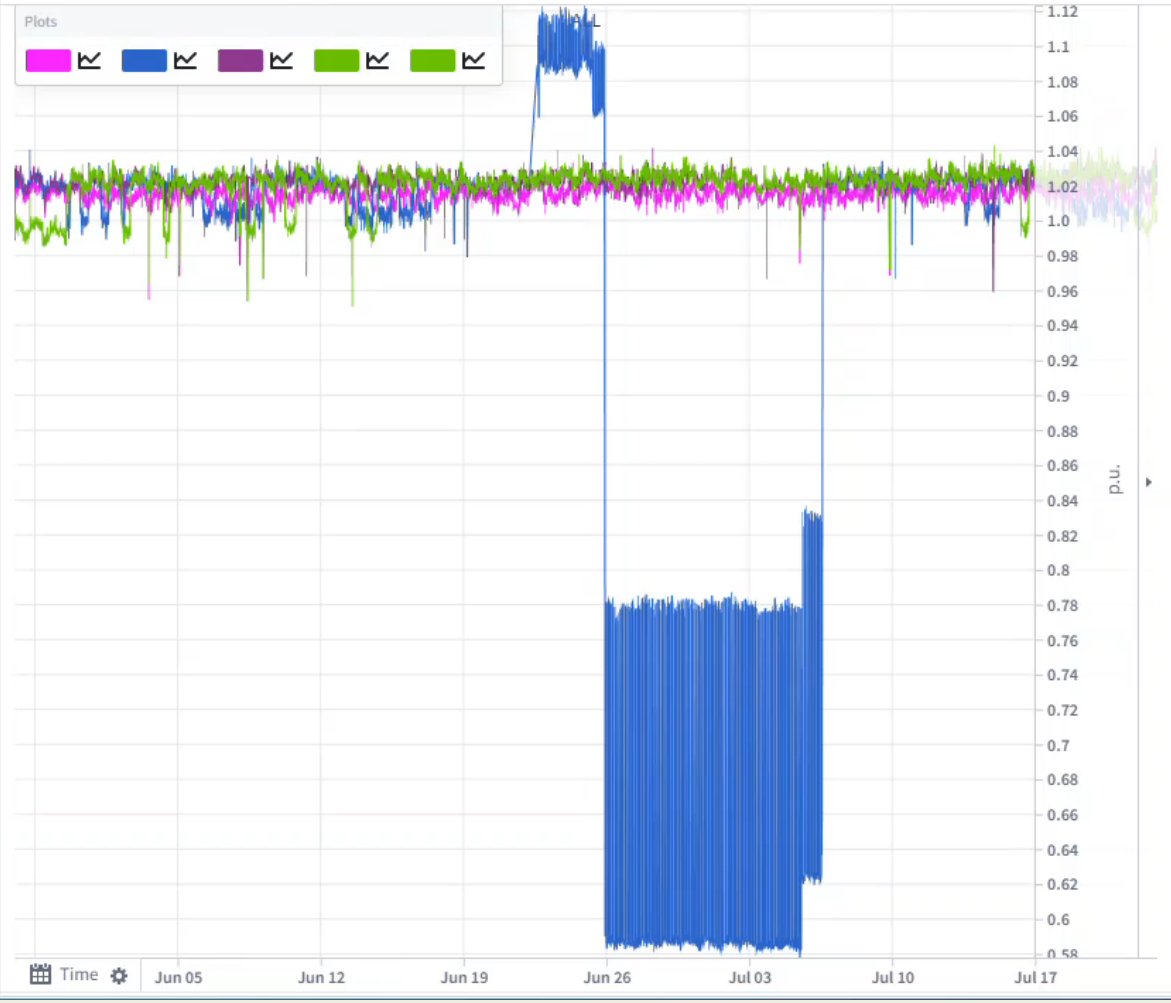
Filters

Investigation Table

Circuit Name	Probability Of Failure	Priority Group	Review Phase	Review Outcome
SAN ARDO 1102	53%	2. Planning Scope	AHPC Review	Suspect Overload - No
RIO BRAVO 1106	41%	2. Planning Scope	AHPC Review	Suspected Cycling AG load
SANTA RITA 1102	30%	2. Planning Scope	Not Initiated	*No value*
BRUNSWICK 1106	30%	2. Planning Scope	Not Initiated	*No value*
KANAKA 1101	30%	2. Planning Scope	AHPC Review	Suspect Primary Issue
DIAMOND SPRINGS 1105	30%	2. Planning Scope	AHPC Review	Suspect Windings
POINT ARENA 1101	30%	2. Planning Scope	AHPC Review	Suspect Overload - No
SAN LEANDRO U 1110	30%	2. Planning Scope	AHPC Review	Suspect Overload - No
TEJON 1102	30%	2. Planning Scope	AHPC Review	Suspect Overload - No
WHEATLAND 1102	29%	2. Planning Scope	AHPC Review	Suspect Overload - No
HIGGINS 1104	28%	2. Planning Scope	AHPC Review	Suspect Overload - No
DIXON 1103	26%	2. Planning Scope	AHPC Review	Suspect Overload - No
PARLIER 1104	26%	2. Planning Scope	Not Initiated	*No value*
ELECTRA 1101	26%	2. Planning Scope	AHPC Review	Suspect Overload - No
CLEAR LAKE 1101	25%	2. Planning Scope	AHPC Review	Suspect Overload - No
SAN LEANDRO U 1110	25%	2. Planning Scope	AHPC Review	Suspect Overload - No
PLEASANT GROVE 2104	22%	2. Planning Scope	AHPC Review	Suspect Overload - No

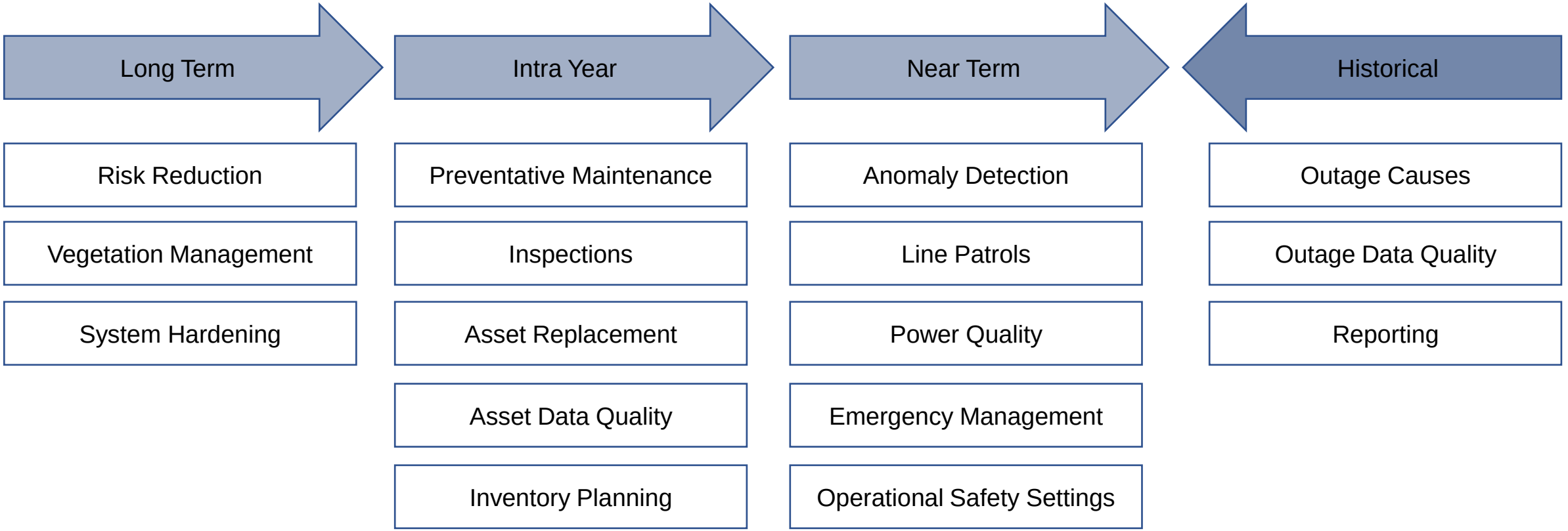
Bellwether Voltages | Weather | Scatter Plot | Transformer | Historical Predictions | Investigation | Prediction View

Neighbor Bellwether Voltages (EPIC 3.20)



Comments

Analytics Opportunities



Questions?