

GRIDBEATS™ ASSET MANAGEMENT: APM

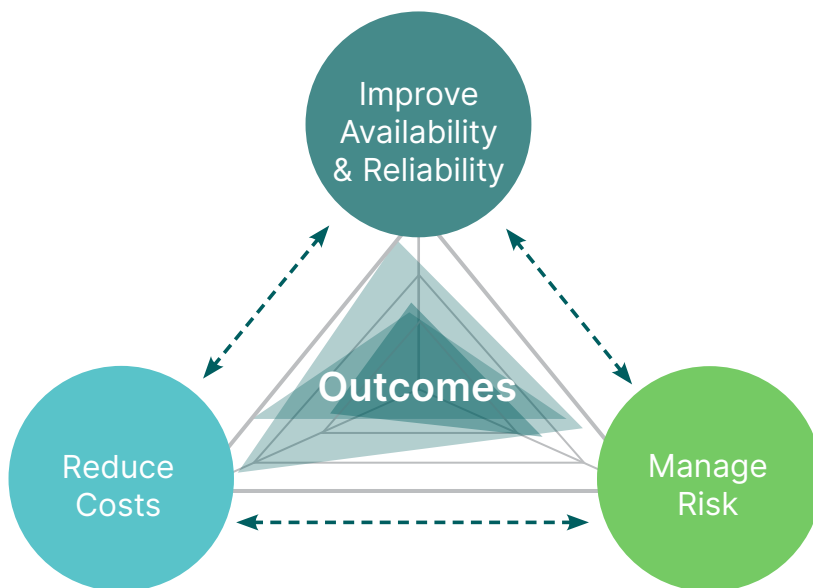
Asset Performance Management
Software for T&D Assets

Managing conflicting pressures of reducing costs while increasing your quality of service

In recent years, new technologies enabled access to an exponential amount of data on T&D assets coming from various sources such as remote sensors, cameras, and field inspections. Operators are now facing new challenges such as data accessing, processing, sorting, uniformizing and validating. And all of this before even starting to use this data for analytics to deliver insightful and actionable information.

GridBeats™ APM for T&D Assets

GridBeats™ APM is the GridBeats™ Asset Management data analytics software platform designed for power transmission and distribution assets, providing an Asset Performance Management portfolio of applications. GridBeats™ APM combines online and offline data with industry expertise, analytics and connectivity helping operators to develop an intelligent performance strategy for electrical substations.



GridBeats™ APM Can Help Organizations To:

- Improve maintenance and replacement planning
- Reduce unplanned downtime and increase availability and reliability
- Reduce costly emergency repairs
- Reduce unnecessary routine time-based preventive maintenance
- Reduce inventory costs
- Protect health and safety of employees and the environment
- Improve workforce productivity
- Maintain technical expertise
- Lower total cost of ownership
- Provide the ability to operationalize inhouse analytics
- Provide a standard way to connect machines, data and people and remove silos



GE VERNOVA

Discover Gridbeats™ APM Flexibility

Built on a microservices-based architecture, GridBeats™ APM offers a tailored suite of software services and applications.

GridBeats™ APM is built around core services and applications which provide the features, functions and conformity expected from an APM solution.

Dependant on the organizational KPI's, objectives and expected outcome, modules of features and functions can be selected from our library of Microservices & Microapplications. They have been designed to be self-contained and lightweight with an application programming interfaces (API) to communicate with each other as well as other industry applications via common API protocols.

An APM solution built using a Microservices architecture enables organizations to flex, scale, and integrate as their APM ambitions grow and expand.

Building your Gridbeats™ APM

Choose from a suite of independent microservices & microapplications



Health

Enhance asset life and value

- Single asset health
- Fleet health
- Zonal health
- Grouped asset type health
- Network health



Reliability

Based on assets' failure modes

- Detects impending failures
- Provides warnings & Urgency
- Reliability analysis
- Asset criticality management



Strategy

Focus on target outcomes

- Lifecycle cost analysis
- O&M planning
- Simulate, improve & compare project costs & risk
- Return on investment analysis



Work

Prevent failures & optimize field work

- Recommendations
- Work orders & requests
- EnergyFIT BackOffice
- EnergyFIT mobile application for data collection



Lab

Advanced diagnostics and prognostics engines

- Asset diagnostics
- Dynamic loading
- Digital twin
- Predict failure and end of life

100+ asset models (FMEA, Health, Recommendations, Maintenance Plan)

CORE FUNCTIONALITY

DATA PROCESSING

- Data integration & storage
- Online monitor integration
- Data classification, preparation, persistency
- Big data processing

CYBER SECURITY

- Logging
- Access control (ABAC, RBAC)
- Secure data at rest & in transit

ALERTS

- Critical events
- Alarms and events
- Offline alarm

INVENTORY

- Installed base
- Spares quantity (EnergyFIT)
- Spares cost



Making your operations more reliable while ensuring optimal performance at a lower sustainable cost

Designed by HVMV Product and Services Specialists

Software requirements have been defined by GE Vernova product and service specialists leveraging decades of T&D equipment development, manufacturing and maintenance know-how to build a library of 100+ asset models including gas and air insulated switchgears, FACT and HVDC systems, transformers and lines. The GridBeats™ APM applications are designed by the experienced team of GE Vernova data scientists and software developers from the GE Vernova APM Center of Excellence.

Delivering Reliable Asset Insight

GridBeats™ APM provides reliable diagnostics, data visualization, and health assessment in a single environment. The analytics available for GE Vernova and other OEM T&D assets are developed in compliance with industry guides such as IEEE and IEC as well as industry papers from CIGRE. The solution is continually updated with the latest asset models and features as data analysis techniques and available information evolve.

Fully Interoperable

Installed at customer premises or supplied as a cloud managed services, GridBeats™ APM is fully interoperable with other industry standard IT systems and monitoring devices, using a broad range of communications protocols.

Asset Investment Planning

Strategic planning features of GridBeats™ APM provide clear guidance on which assets to focus on and recommended actions. CAPEX & OPEX budgets can be automatically allocated based on asset insights and can be customized based on the organization's additional inputs. The predicted outcomes of budget allocations are calculated and displayed on dashboards to show investment impact. Multiple plans can be created, compared and tweaked to maximise return on investment of budget allocations.

Provided Through A Cost-Effective Turnkey Solution

GE Vernova partners with customers to build a tailored solution including target KPIs and roadmap definition, system design and installation, training, change management, and technical support. GridBeats™ APM provides a single solution for primary and secondary assets, as well as power lines and other auxiliary assets.

A Flexible and Scalable Solution

Built with a unique & safe microservices architecture, GridBeats™ APM can be customized to different application needs, from daily operation to strategic planning, ranging from 10 to 1M+ assets. Functionalities, processing power, and storage, can be tailored to evolving needs at any time. The solution can be installed on premises or delivered as a cloud managed service through various contractual set ups including multi-year agreements and outcome-based contracts.



Asset Scope

- Components
- Asset
- System & substation
- Network element
- Fleet



Support & Consulting

- Change management
- System architecture
- Analytics adaptation and optimization
- Data collection strategy



Data Collection Methods

- Advanced inspections
- Remote monitoring
- Oil lab analysis



Contractual Set Up

- Transaction
- Multi-year agreement
- Outcome based



APM Application Scheme

- Software as a Service (SaaS)
- Customer cloud instance
- On-premise instance

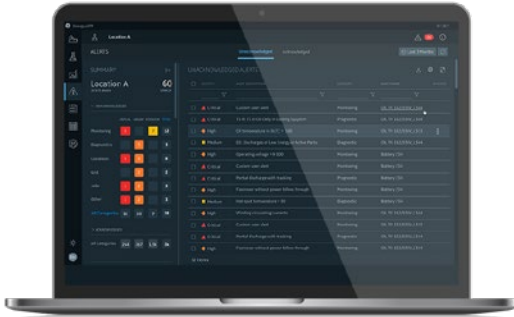


Models & Indexes

- Inventory
- Monitoring
- Health
- FMEA
- Maintenance strategies
- Diagnostics & Analytics

Build your GridBeats™ APM - Turning Data into Insights

GridBeats™ APM is a modular, flexible and scalable microservices platform. Partnering with GE Vernova APM experts, customers can select the modules needed to achieve required business outcomes of reliability, availability and risk management.

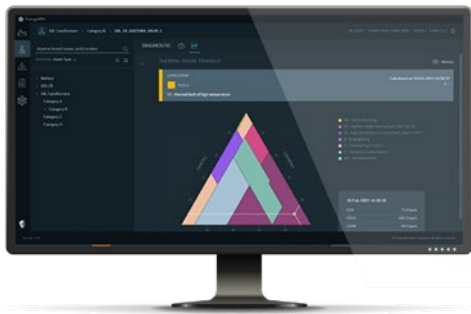


Core Services

Providing Rich User Features

Beyond secure data connectivity, processing and storage, the core services provide rich user features such as asset searching, historical data viewing, signal monitoring, alerts viewing and acknowledgment. Core services include:

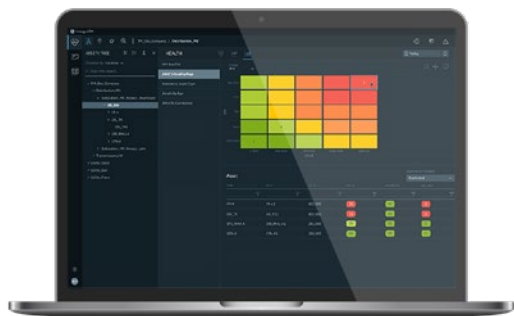
- Data Acquisition & Integration Services
- Data Storage Services
- Logging, Cyber Security Services
- UI / UX Services
- Navigation, Search and Filtering Services
- Monitoring Services for Asset, Inventory and Event Data
- Alerts Services



Lab

Providing Advanced Diagnostics and Prognostics

Using a library of diagnostics and prognostics tools based on industry standards, proprietary models, and a data science workbench, maintenance experts can perform custom in-depth analysis, exploiting any data from GridBeats™ APM or other databases.



Reliability

Predicting Failures – Preventing Outages

The asset reliability module contains the Failure Mode and Effects Analysis (FMEA) for each asset type. The failure mode associated with an asset risk can be visualized as well as the preventive and corrective actions that are integrated in other modules of GridBeats™ APM.



Asset

Prioritizing Maintenance and Replacement Actions

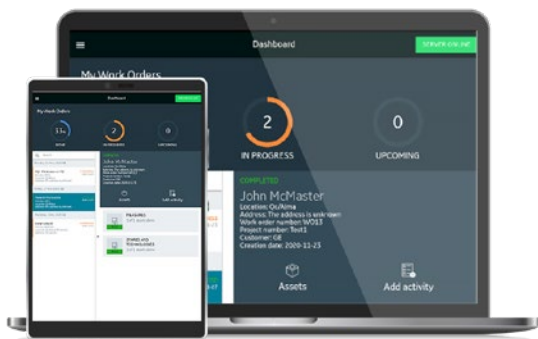
Standardizing the collection, integration, modeling, and analysis of ubiquitous data to a single, unified view, GridBeats™ APM Health accelerates time-to-value. Through a single dashboard with a fleetwide view, problematic equipment is rapidly identified, and asset replacement and maintenance priorities are proposed using a library of 80+ asset models that are manufacturer agnostic. Users can drill down from fleet view to health details for a single asset.



Strategy

Improving Replacement Planning

This module provides a common methodology to compare repair and replacement projects by using a risk-based approach to conduct analysis of individual or group of equipment considering the criticality of each asset. The analysis provided helps to prioritize replacement and maintenance jobs.



Work

Managing Maintenance Actions

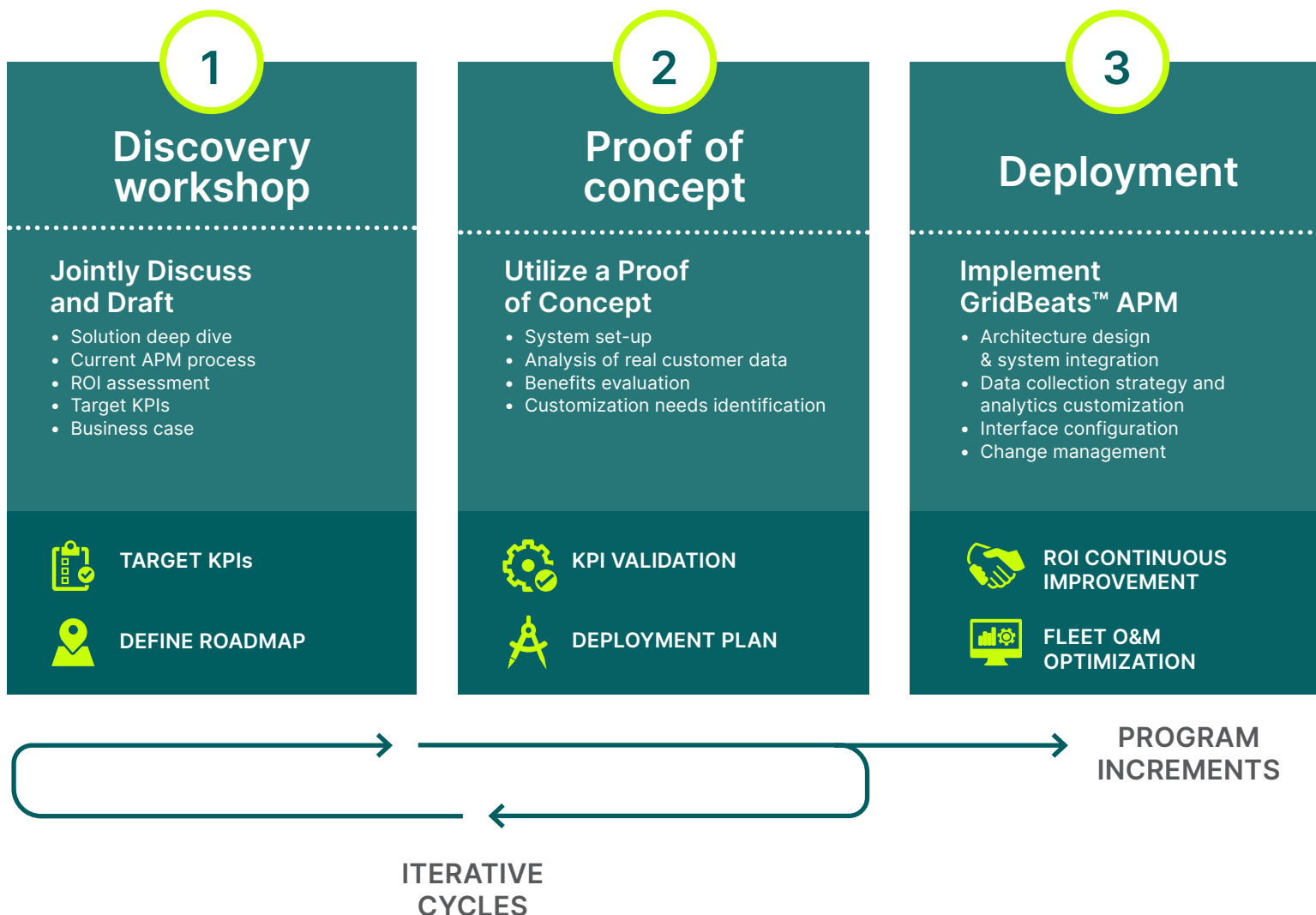
Condition-based maintenance recommendations generated automatically from different analytics in GridBeats™ APM or manually created by experts are grouped in the recommendation dashboard. Work requests can then be created and sent to workforce management applications or used to create work orders in GridBeats™ APM Field Inspection Tool (FIT).

Customer Engagement Process

At GE Vernova, we believe in a progressive and continuous improvement approach to managing fleets of assets and improving the overall reliability of our customers' operations to reduce total cost of ownership, increase power reliability and improve profitability.

We partner with customers to provide best-in-class solutions that deliver on our customers' needs.

Our already built off-the-shelf asset and data management tools, dashboards and screens ensure customers are not starting from scratch and get a head start in building a solution. The flexibility of the solution enables customers to customize and build tools, dashboards and screens to their expectations and best practices.



Request A Demo

GE Vernova's APM team of specialists will demo GridBeats™ APM software and explore how we can help reduce your maintenance costs while extending the lifetime of your asset with GridBeats™ APM applications and services.

You can request a demo from the GE Vernova APM team by visiting :
<https://pages.gegridsolutions.com/Request-a-demo-Energy-APM.html>





APM INTEGRATION, CHANGE MANAGEMENT AND MAINTENANCE

CASE STUDY

Customer: T&D Utility

Application: APM

Country: Chile

Customer Challenge

Transelec plays a critical role by providing power to over 96% of the population of Chile. To ensure an uninterrupted power supply, the operator invests in digital solutions reducing the unforeseen failure risk of electrical substation and line equipment, improving the availability of the network in the most populated area of the country.

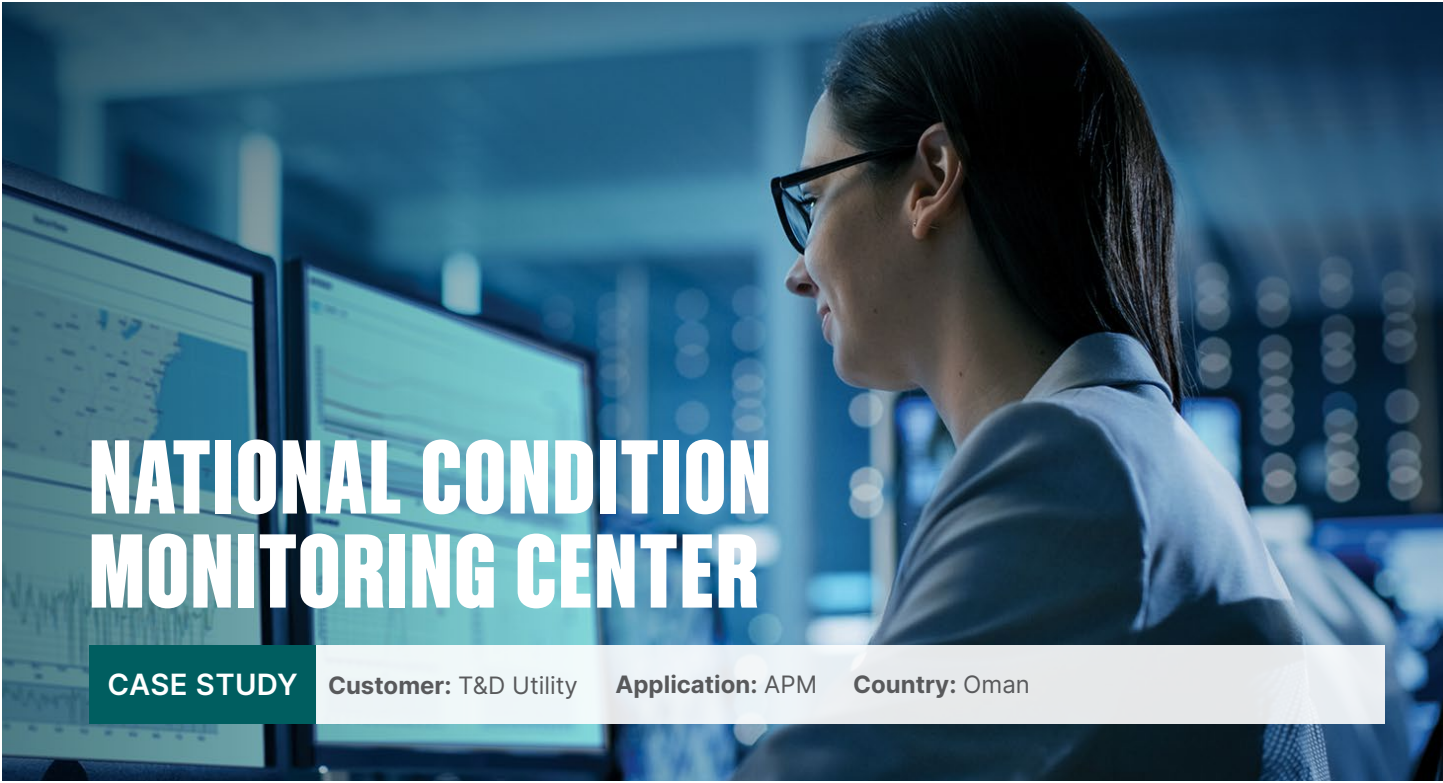
GE Vernova's Solution

The GridBeats™ APM solution implementation and support:

- GridBeats™ APM application deployed to gather operation and condition asset data
- Risk assessment and operation and maintenance planning tools
- Integration with other systems in the customer IT environment: interface with the ERP, with a maintenance planning application, line inspections database and geographic information system
- 10 years of change management and maintenance support

Customer Benefits

- The consolidation and analysis of data in a unique location will help the operators to predict the behavior of 14,800+ assets and 13,500 km of HV lines and implement an efficient maintenance and replacement strategy provided through digital technology.
- The proven health models developed by GE Vernova product and field experts cover all asset types including lines, and are further customized in partnership with the customer to ensure they are well adapted to the operational environment
- With the digital solution, the risk of failure can be reduced by up to 50%



NATIONAL CONDITION MONITORING CENTER

CASE STUDY

Customer: T&D Utility

Application: APM

Country: Oman

Customer Challenge

OETC creates a National Condition Monitoring Center for 400 kV substations located in Oman to prioritize the maintenance strategy while reducing downtime and increasing operational efficiency. OETC reliability team reorients their maintenance strategy from time-based to condition-based strategy - using automatic recommendations, asset health index, asset maintenance and risk indexes.

GE Vernova's Solution

The solution is built around GridBeats™ APM software including:

- GridBeats™ APM software that will consolidate the off-line inspections and online monitoring data into one single place and provide smart analytics
- Interconnection to customer's IT Enterprise systems: SCADA, EAM & GIS
- Substations' upgrade to connect 20 existing MS3000 transformer monitoring devices and install new ones
- Inspections of over 2000 high-voltage assets using mobile tablet-based application
- APM CORE including historian for data ingestion, storage, monitoring and reporting
- Oil sample tests and analysis in GE Vernova oil laboratory
- Supply of periodic reports and recommendations from GE Vernova's subject matter experts

Customer Benefits

- Improving operations and maintenance processes and facilitating decision making
- Performing online monitoring of critical assets and digitizing existing ISO 55 000 asset performance management process, optimizing the asset performance.
- Reaching the required levels of substations' operational efficiency and productivity, with a high-level view on the critical assets' health - anticipating asset failures before they occur and thereby proposing an efficient replacement strategy
- Achieving up to 50% failure rate reduction and 20% savings in replacement cost

For more information about
GE Vernova's GridBeats™ Asset Management: APM Solution visit:
<https://www.gevernova.com/grid-solutions/gridbeats/>



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