



EnergyAPM

Asset Performance
Management Software
Platform for T&D Assets

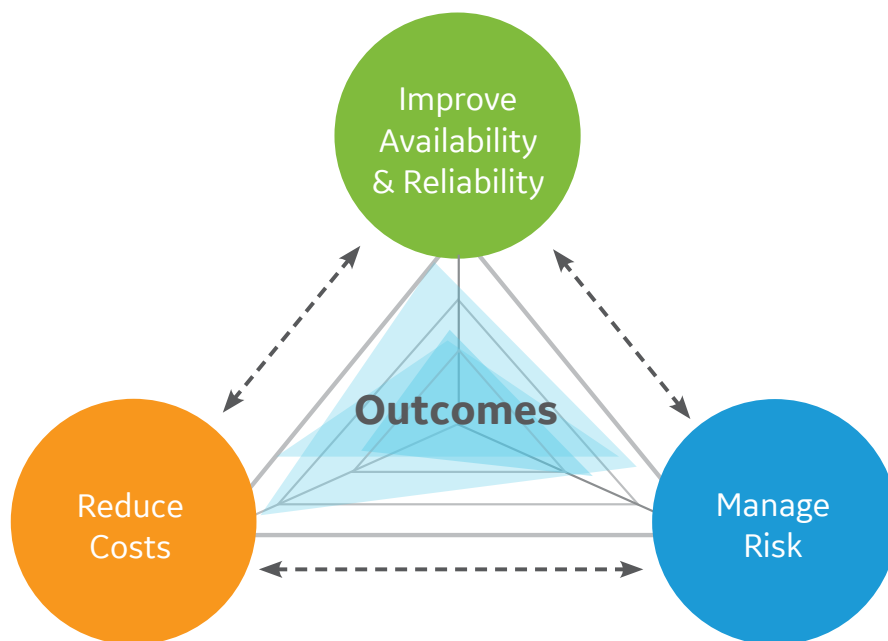


MANAGING CONFLICTING PRESSURES OF REDUCING COSTS WHILE INCREASING YOUR QUALITY OF SERVICE

In the past 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.

EnergyAPM for T&D assets

EnergyAPM is the GE data analytics software platform designed for power Transmission and Distribution assets providing an Asset Performance Management portfolio of applications. EnergyAPM combines real-time data with industry expertise, analytics and connectivity helping operators to develop an intelligent performance strategy for electrical substations.



EnergyAPM can help organizations to:

- Optimize 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

DISCOVER EnergyAPM FLEXIBILITY

Built on a microservices-based architecture, EnergyAPM offers a suite of software services and applications, each configured and running as managed and isolated container. Services can be deployed and run into a distributed cluster improving the system scalability, resiliency and performance of more demanding processing. Microservices are designed lightweight, then built, updated, and managed independently, exposing application programming interfaces (APIs) to communicate with each other, making EnergyAPM an easy platform to maintain, upgrade and integrate with client systems.

EnergyAPM is built around a set of core services and applications, complemented by optional modules, making the ecosystem versatile and scalable to meet evolving needs.

BUILDING YOUR ENERGYAPM

CHOOSE FROM A SUITE OF MICROSERVICES & MICROAPPLICATIONS



Reliability

All based on assets' failure modes

- FMEA
- Reliability analysis
- Asset Criticality management



Health

Optimize asset life and value

- Single asset health
- Location/grouping asset health
- Network health



Strategy

Focus on target outcomes

- Lifecycle cost analysis
- O&M Planning
- Return on Investment analysis



Work

Prevent failures & Optimize field work

- Recommendations
- Work Requests
- EnergyAPM FIT BackOffice
- EnergyAPM FIT Mobile



Lab

Advanced Diagnostics and Prognostics Engines

- Asset diagnostics
- Dynamic loading digital twin
- Predict failure & end of life

80+ Asset models (FMEA, Health, Recommendations, Maintenance plan)

CORE SERVICES & APPLICATIONS

DATA PROCESSING

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

CYBER SECURITY

- Logging
- Access control (ABAC, RBAC)

UI/UX

- Navigation tree & search
- Generate custom reports

MONITORING

- Asset Data
- Events

ALERTS

- Dashboard

INVENTORY

- Installed base
- Spares

MAKING YOUR OPERATIONS MORE RELIABLE WHILE ENSURING OPTIMAL PERFORMANCE AT A LOWER SUSTAINABLE COST

DESIGNED BY HV/MV PRODUCT AND SERVICES SPECIALISTS

Software requirements have been defined by GE product and service specialists leveraging decades of T&D equipment development, manufacturing and maintenance know-how to build a library of 80+ asset models including gas and air insulated switchgears, FACT and HVDC systems, transformers and lines. The EnergyAPM applications and services are designed by the experienced team of GE data scientists and software developers from the GE APM Center of Excellence.

DELIVERING RELIABLE ASSET INSIGHT

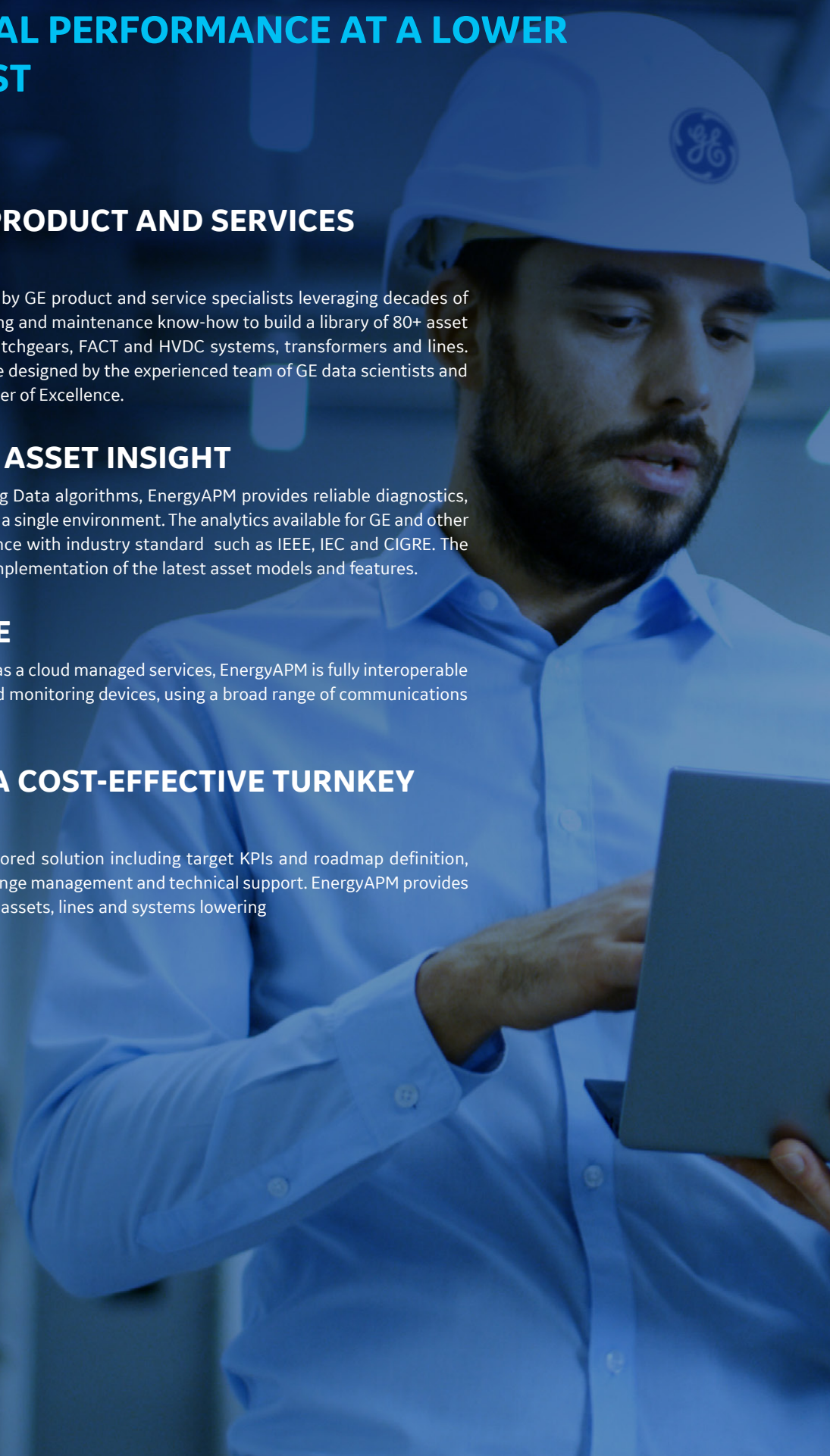
Combining artificial intelligence (AI) and Big Data algorithms, EnergyAPM provides reliable diagnostics, data visualization and health assessment in a single environment. The analytics available for GE and other OEM T&D assets are developed in compliance with industry standard such as IEEE, IEC and CIGRE. The integrated solution is supported with the implementation of the latest asset models and features.

FULLY INTEROPERABLE

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

PROVIDED THROUGH A COST-EFFECTIVE TURNKEY SOLUTION

GE partners with customers to build a tailored solution including target KPIs and roadmap definition, system design and installation, training, change management and technical support. EnergyAPM provides a single solution for primary and secondary assets, lines and systems lowering



A FLEXIBLE AND SCALABLE SOLUTION

Built with a unique & safe micro services architecture, EnergyAPM 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 anytime. The solution can be installed on premises or delivered as a cloud managed service through various contractual set up including multi-year agreement and outcome-based contract.



ASSET SCOPE

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



DATA COLLECTION METHODS

- Advanced inspections
- Remote monitoring
- Oil Ia analysis



APM APPLICATION SCHEME

- Software as a Services (SaaS)
- Customer Cloud Instance
- On Premise Instance



MODELS & INDEXES

- Inventory
- Monitoring
- Health
- FMEA
- Maintenance strategies



SUPPORT & CONSULTING

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



CONTRACTUAL SET UP

- Transaction
- Multi-year agreement
- Outcome Based

Build your EnergyAPM - Turning Data into Insights

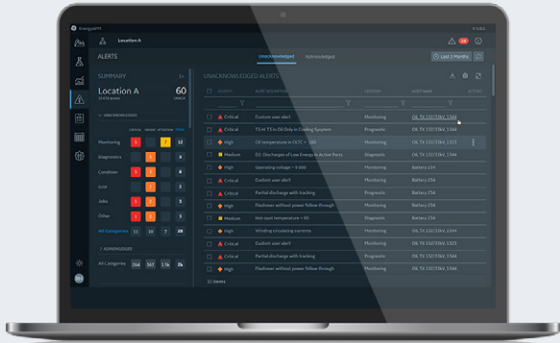
EnergyAPM is a modular, flexible and scalable microservices platform. Partnering with GE APM experts, customers can select the modules needed to achieve required business outcomes of reliability, availability and risk management.

CORE SERVICES

Providing Rich User Features

Beyond secure data connectivity, processing and storage, the core services provide rich user features such as historical data viewing, alerts, cases and policies. Core Services are seamlessly integrated into the EnergyAPM user experience and include:

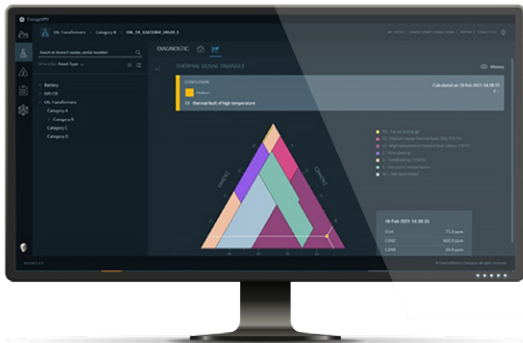
- Data Acquisition & Integration Services
- Data Storage Services
- Logging, Cyber security Services
- UI / UX Services
- Navigation, Search and filtering services
- Monitoring Services for asset, inventory and event data
- Alerts Services



LAB

Providing Advanced Diagnostics and Prognostics

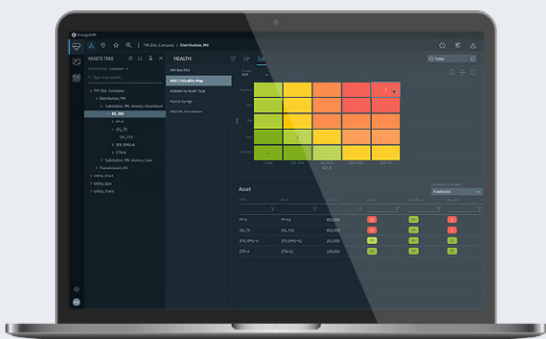
Using a library of diagnostics and prognostics tools based on industry standards, proprietary models, and a data science workbench, maintenance experts can perform custom in-depth analysis, exploiting any data from EnergyAPM or other databases.



RELIABILITY

Predicting Failures - Preventing Outages

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 EnergyAPM.





ASSET

Increasing asset availability - Optimizing replacement planning

Standardizing the collection, integration, modeling, and analysis of ubiquitous data to a single, unified view, EnergyAPM Health accelerates time-to-value. Through a single dashboard with fleetwide view, problematic equipment are 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

Prioritizing maintenance and replacement

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 EnergyAPM 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 EnergyAPM Field Inspection Tool (FIT).

CUSTOMER ENGAGEMENT PROCESS

At GE, we believe in a progressive and continuous improvement approach to managing fleets of assets and improve the overall reliability of our customers' operations to reduce total cost of ownership and improve profitability. We have developed the following step by step Agile approach to implement projects:

1

DISCOVERY WORKSHOP

Jointly discuss and draft

- Solution deep dive
- Current APM process
- ROI assessment
- Target KPIs
- Business Case



TARGET KPIS



DEFINE ROADMAP

2

PROOF OF CONCEPT

Utilize a Proof of Concept

- System set-up
- Analysis of real customer data
- Benefits evaluation
- Customization needs identification



KPI VALIDATION



DEPLOYMENT PLAN

3

DEPLOYMENT

Implement EnergyAPM

- Architecture design & system integration
- Data collection strategy and analytics customization
- Interface configuration
- Change Management



ROI CONTINUOUS IMPROVEMENT



FLEET O&M OPTIMIZATION

REQUEST A DEMO

GE APM team of specialists will demo EnergyAPM software and explore how we can help reduce your maintenance costs while extending the lifetime of your asset with EnergyAPM applications and services



REQUEST A DEMO

Let GE demonstrate how EnergyAPM can help you



GE Grid Services APM team of specialists will demo EnergyAPM software and explore how we can help reduce your maintenance costs while extending the lifetime of your asset with EnergyAPM applications and services

First Name: *

Last Name: *

Email Address: *

Company Name: *

Job Title:

Phone Number:

Country: *

Enter any additional comments

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APM INTEGRATION, CHANGE MANAGEMENT AND MAINTENANCE

CASE STUDY



Customer: T&D Utility



Application: APM



Country: Chile

Customer Challenge

Transec 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's Solution

The EnergyAPM solution implementation and support:

- EnergyAPM 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 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, 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's Solution

The solution is built around EnergyAPM software including:

- EnergyAPM 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 EnergyAPM FIT mobile tablet-based application
- EnergyAPM CORE including historian for data ingestion, storage, monitoring and reporting
- Oil sample tests and analysis in GE oil laboratory
- Supply of periodic reports and recommendations from GE's subject matter experts

Customer Benefits

- Optimizing 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's EnergyAPM visit
[GESolutions.com/EnergyAPM](https://www.gesolutions.com/EnergyAPM)

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