Smart TS

: Digital Maintenance Platform

Nanthasak Doungtong

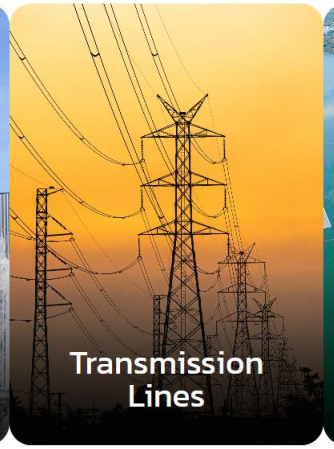
Transmission System Asset Analysis Section

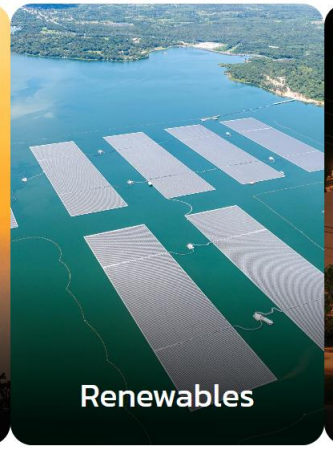
Transmission System Asset Management Division

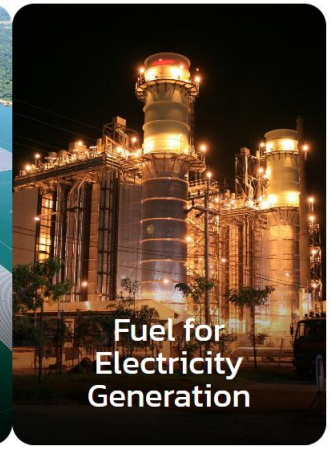
Electricity Generating Authority of Thailand

EGAT

About EGAT



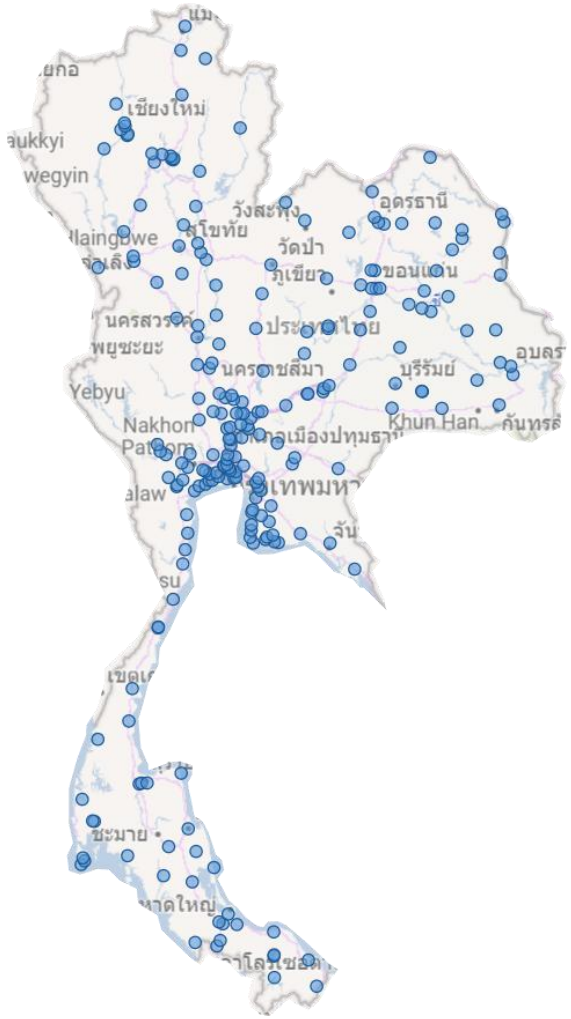




- Electricity Generating Authority of Thailand
  - State-owned enterprise under Ministry of Energy and Ministry of Finance
  - Principal Mission: Electricity generation, acquisition, Transmission and sales
  - Key Customers: Metropolitan Electricity Authority (MEA), Provincial Electricity Authority (PEA), and direct customers
  - Supervision: Energy Regulatory Commission (ERC)
  - Commitment: Efficient power supply and environmental management

Current Challenges

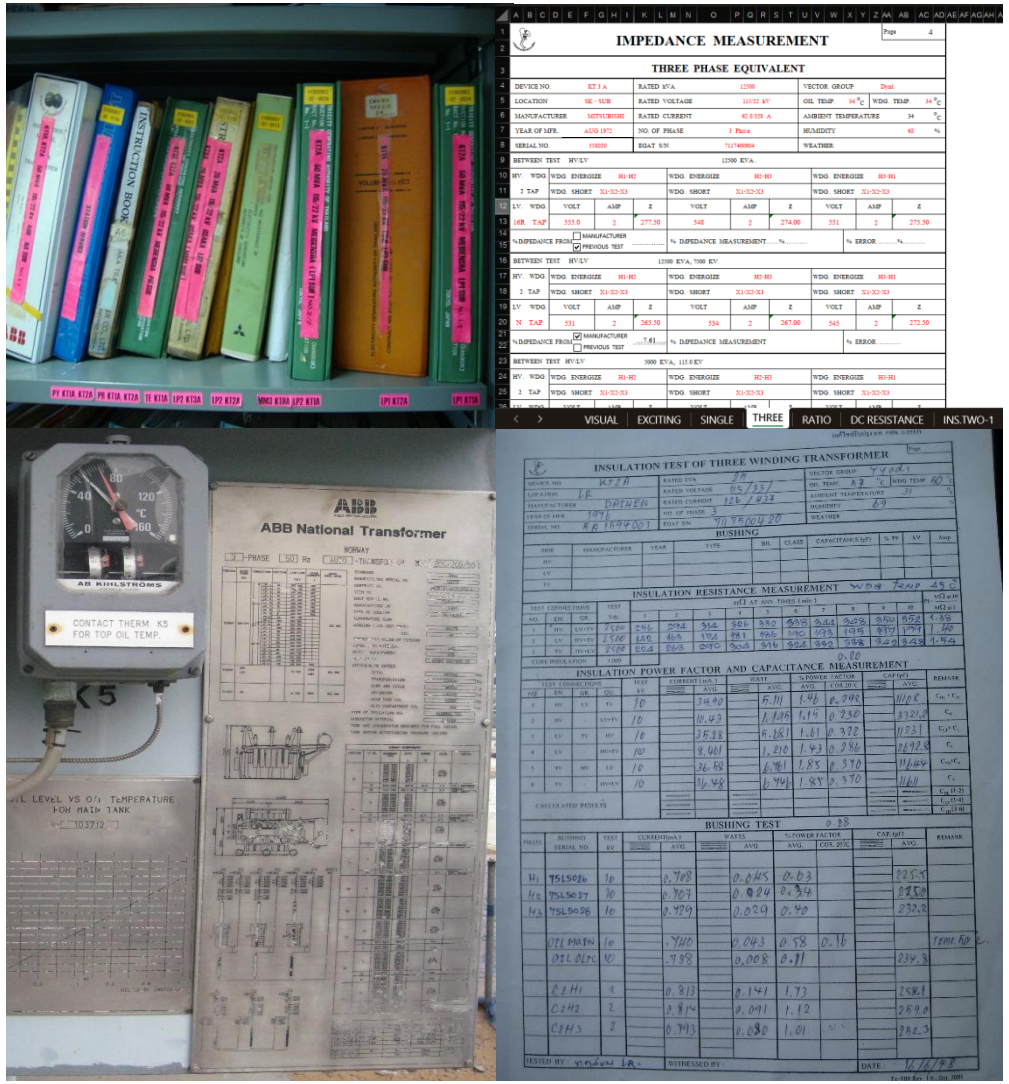
in Transmission System Maintenance Management



- **High Volume of Assets & Maintenance Orders**
  - • 239 Substations, 40,000+ Primary Equipment
  - • 10,000+ Maintenance Orders/Year

- **Data Management Issues**
  - • Incomplete and outdated records
  - • Scattered data across multiple systems
  - • Time-consuming searches and duplicate records

Limitations of Traditional Maintenance



- **Fragmented Data Storage**
  - Inspection results stored in varied formats (Paper, PDF, Spreadsheets) across different regional units.
- **Coordination Hurdles**
  - Retrieving complete asset history requires significant time and cross-departmental coordination.
- **High Risk of Error**
  - Manual data transfer between systems leads to duplicated work and potential human error.

EGAT

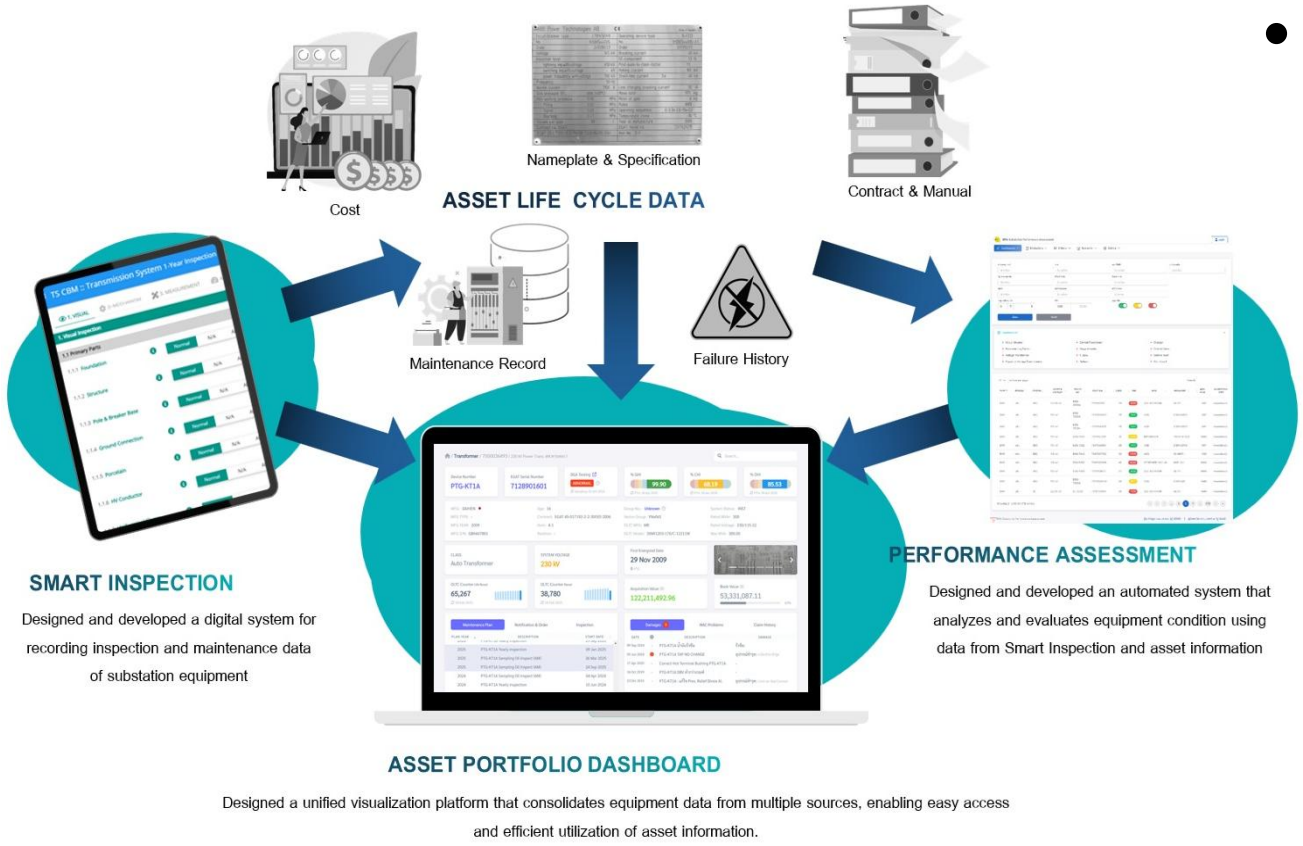
Smart TS

Digital Maintenance Platform

A digital platform for maintenance and asset management of high-voltage substation equipment,
supporting inspection and testing activities through integration with corporate systems (ERP) and relevant maintenance standards.

The platform enables automated assessment of equipment readiness and performance, while providing centralized online access to all equipment information and historical records in one place,
enhancing efficiency, reliability, and data-driven decision-making in asset management.

System Overview: Smart TS

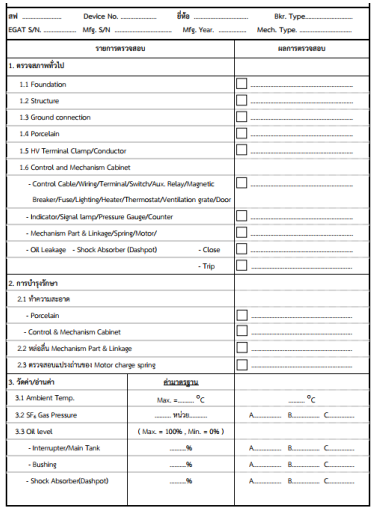


- Three Core Modules for Digital Transformation:
  - 1. Smart Inspection
    - - Digital data collection via mobile/tablet
  - 2. Performance Assessment
    - - Automated condition analysis
  - 3. Asset Portfolio Dashboard
    - - Centralized data visualization

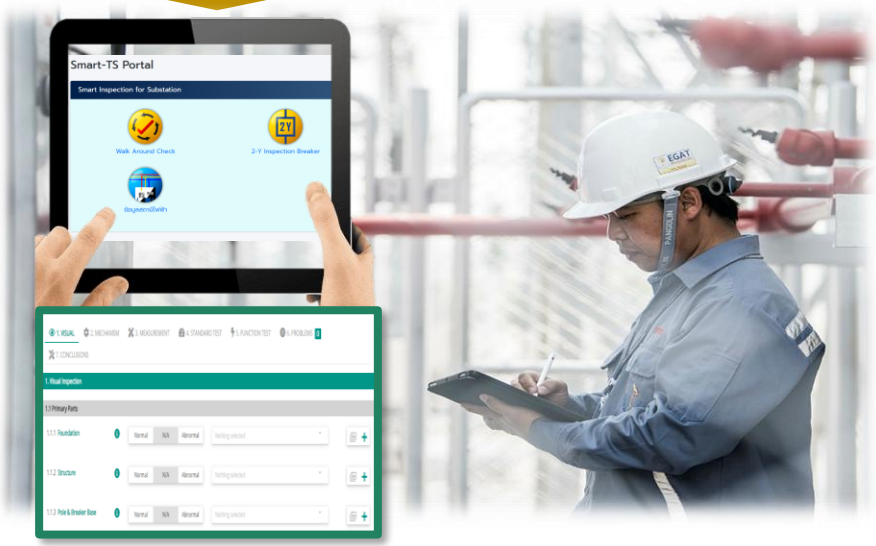
1. Smart Inspection

- Key Features:
  - • **Paperless Operation**: Replaces paper/Excel with digital forms
  - • **Mobile Accessibility**: Supports mobile and tablet devices
  - • **Data Accuracy**: Reduces manual data-entry errors
  - • **Efficiency**: Standardized storage and instant searchability

1. Smart Inspection



รายการตรวจสอบ	ผลการตรวจสอบ
1. ตรวจสภาพทั่วไป	
1.1 Foundation	☐ .....
1.2 Structure	☐ .....
1.3 Ground connection	☐ .....
1.4 Porcelain	☐ .....
1.5 HV Terminal Clamp/Conductor	☐ .....
1.6 Control and Mechanism Cabinet	
- Control Cable/Wiring/Terminal/Switch/Aux. Relay/Magnetic Breaker/Fuse/Lighting/Heater/Thermostat/Ventilation grate/Door	☐ .....
- Indicator/Signal lamp/Pressure Gauge/Counter	☐ .....
- Mechanism Part & Linkage/Spring/Motor/	☐ .....
- Oil Leakage - Shock Absorber (Dashpot) - Close	☐ .....
- Trip	☐ .....
2. การบำรุงรักษา	
2.1 ทำความสะอาด	
- Porcelain	☐ .....
- Control & Mechanism Cabinet	☐ .....
2.2 หล่อลื่น Mechanism Part & Linkage	☐ .....
2.3 ตรวจสอบ/ประจำประชิด Motor charge spring	☐ .....
3. วัดค่าทำค่า	ค่ามาตรฐาน
3.1 Ambient Temp.	Max. =..... °C ..... °C
3.2 SF_6 Gas Pressure	..... หน่วย..... A..... B..... C.....
3.3 Oil level	(Max. = 100% , Min. = 0%)
- Interrupter/Main Tank	.....% A..... B..... C.....
- Bushing	.....% A..... B..... C.....
- Shock Absorber(Dashpot)	.....% A..... B..... C.....



- Primary Equipment Coverage
  - Supports routine inspections for Power Transformers, Reactors, Circuit Breakers, Disconnecting Switches, and Instrument Transformers.
- Standardized Digital Forms
  - Based strictly on EGAT's maintenance standards to ensure consistent data format.
- Instant Notification
  - Immediate alerts to responsible personnel when abnormal conditions

2. Performance Assessment

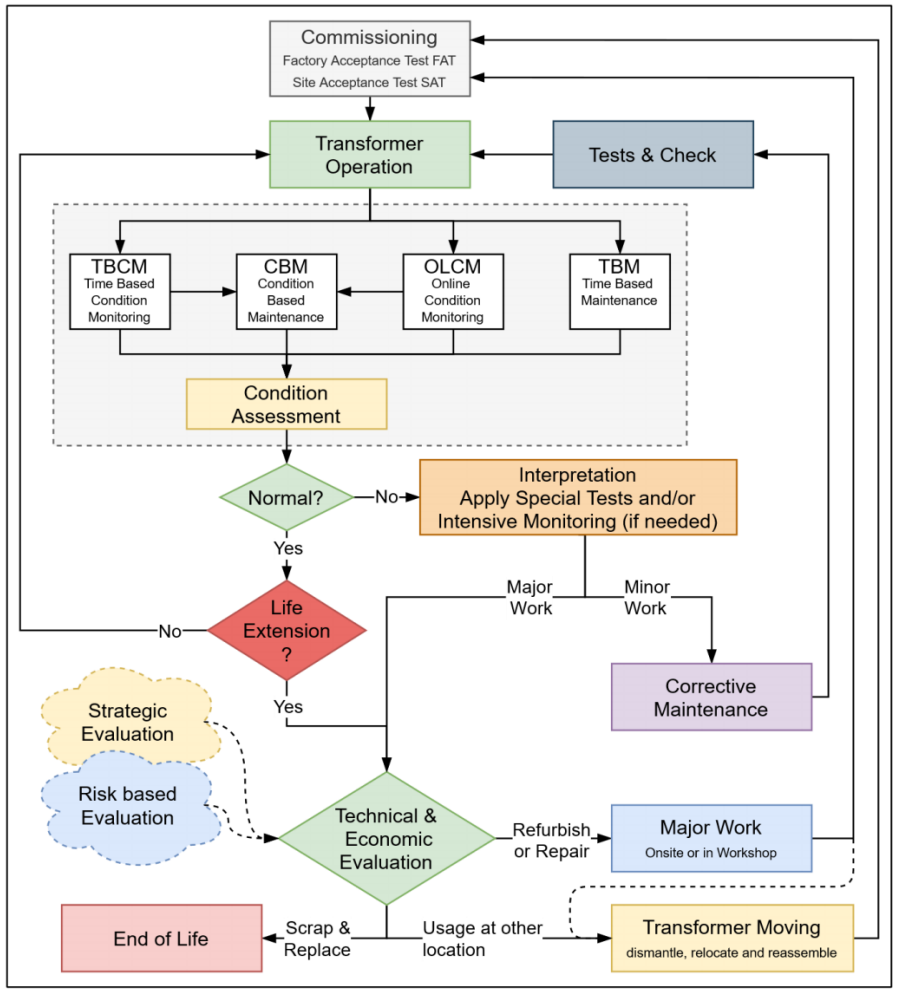
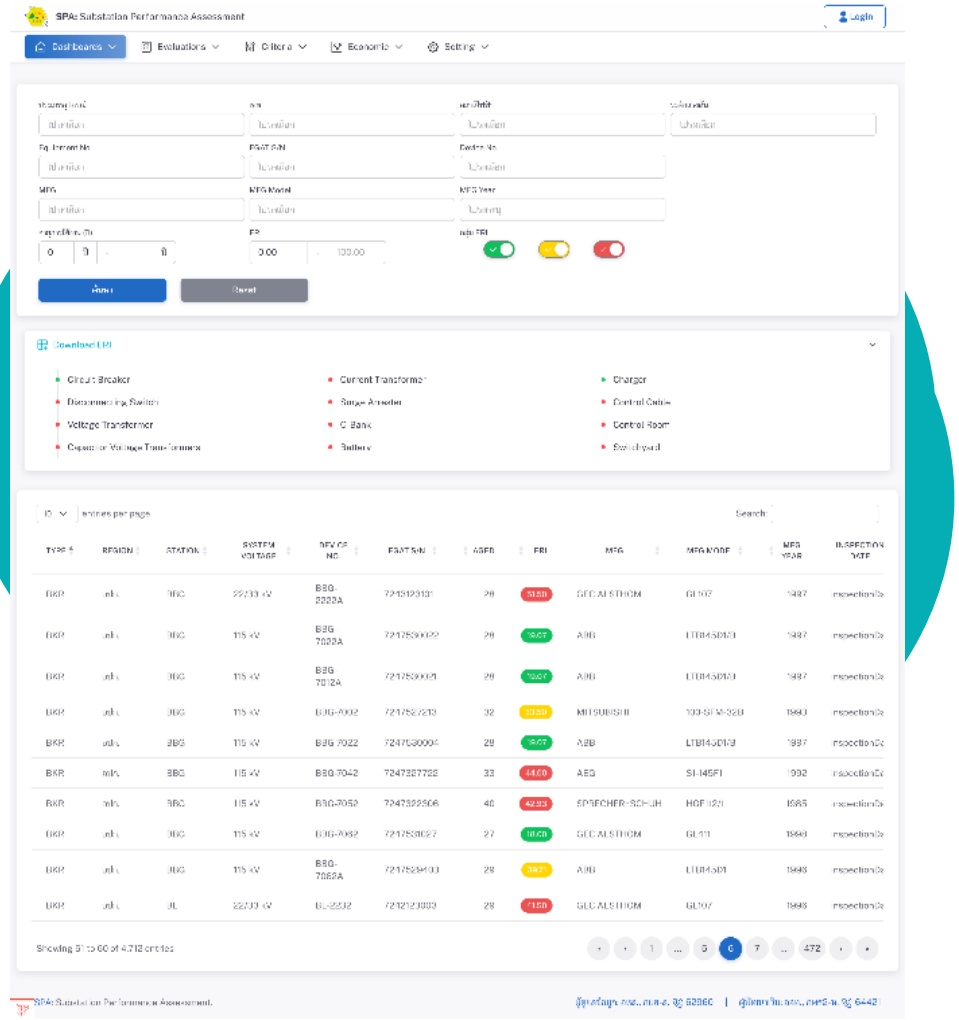


Figure 1.1: Flowchart of maintenance process

- **Data Integration**
- Integrates inputs from Time-Based (TBM) and Condition-Based (CBM) maintenance into a unified 'Condition Assessment'.
- **Decision Support**
  - Normal Condition: Supports 'Life Extension' analysis via Strategic evaluations.
  - Abnormal Condition: Triggers alerts for 'Interpretation & Special Tests'.

2. Performance Assessment



- Automated Analysis System:
  - • Real-time Evaluation: Auto-analyzes equipment health using inspection data
  - • Workload Reduction: Eliminates manual entry into separate analysis tools
  - • Proactive Maintenance: visualizes performance trends for better planning

2. Performance Assessment

Time Based Condition Data

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Health & Importance Evaluation

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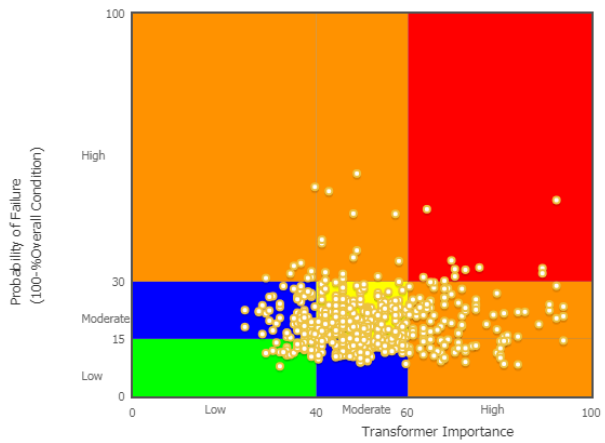
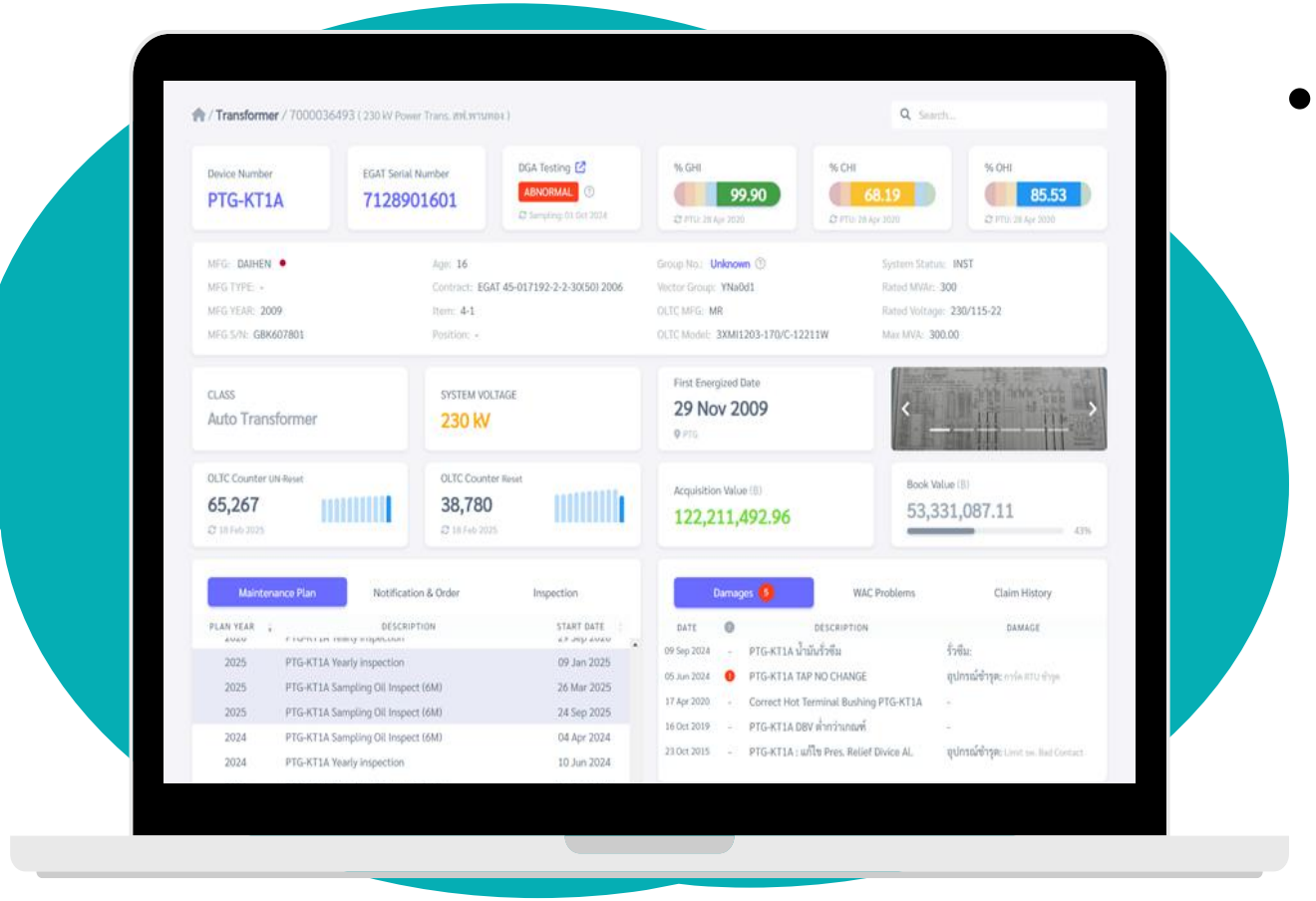
Risk Management



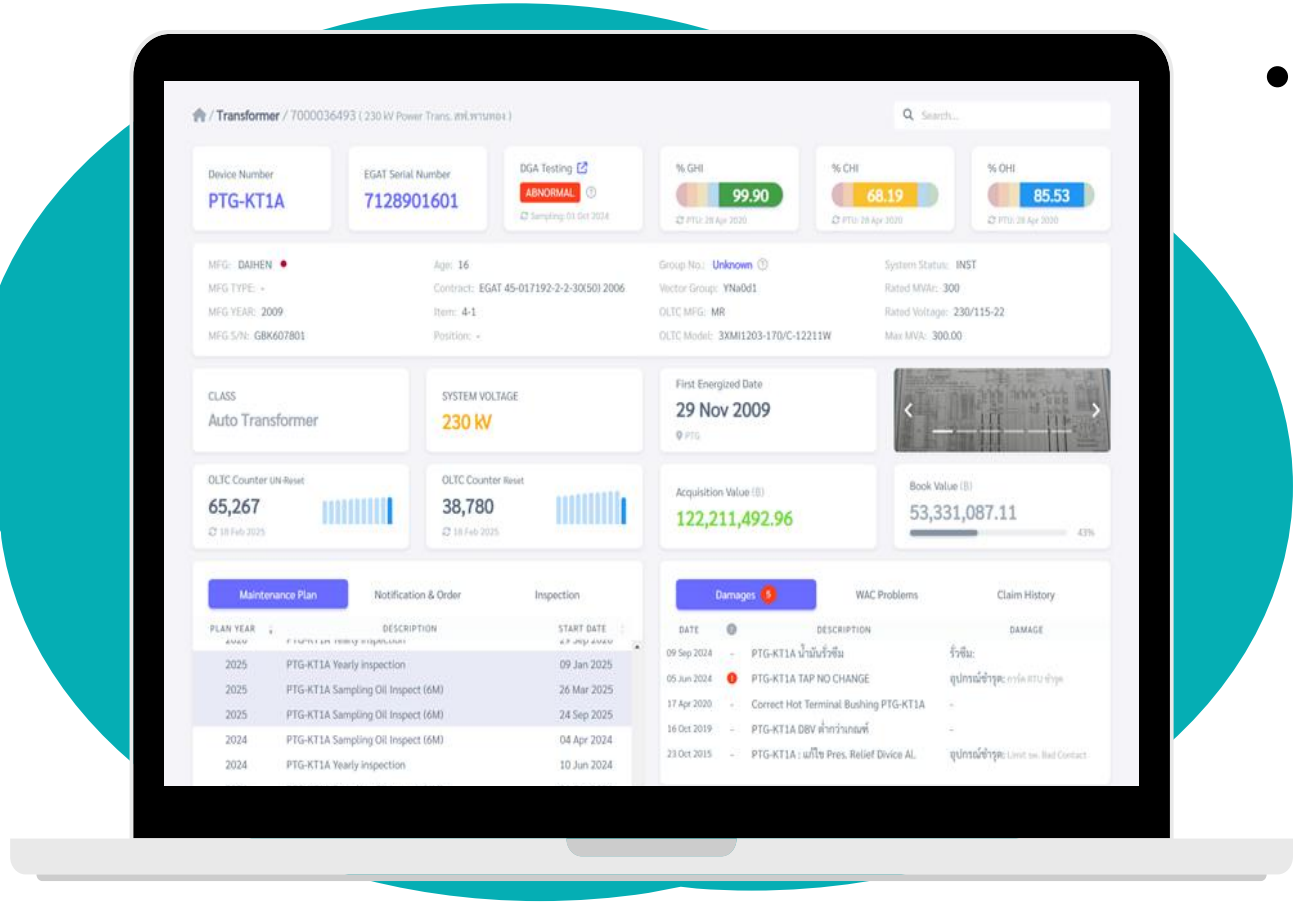
- From Time-Based to Data-Driven
  - Transitioning from fixed-schedule maintenance to a risk-based approach.
- Asset Life Extension
  - Improves data reliability to optimize planning and extend asset service life.
- Resilient Operation
  - Contributes to lower lifecycle costs and a more resilient transmission system.

3. Asset Portfolio Dashboard



- Centralized Command Center:
  - • Unified Interface: Consolidates all asset info in one place
  - • Interactive: Easy exploration of detailed data
  - • Decision Support: Enhances speed and accuracy in management

Comprehensive Data Integration



- Integrates Data Sources:
  - • ERP (Equipment details, Work orders)
  - • Smart Inspection & Test Reports
  - • Equipment Documents & Photos
  - • Failure History & Warranty Records
  - • Maintenance Cost & Relocation History

Results & Benefits

Smart TS

Smart TS: Unlocking Efficiency and Cost Savings

Quantifiable Benefits Comparison: **Before vs. After** Implementation

BEFORE Smart TS (Manual & Disconnected)

Manual Inspection Recording
12 min/Order (10,000 Orders/Yr)
= 2,000 Hrs/Yr

Substation Performance Assessment
10 min/Order (5,000 Orders/Yr)
= 833 Hrs/Yr

Asset Data Search
30 min/Search (1,250 Searches/Yr)
= 625 Hrs/Yr

Total Annual Time: **3,458 Hrs**

AFTER Smart TS (Automated & Integrated)

Smart Inspection
2 min/Order = 333 Hrs/Yr

Automated Substation Assessment
0 min/Order (Automated)
= 0 Hrs/Yr

Asset Portfolio Dashboard
15 min/Search = 313 Hrs/Yr

Total Annual Time: **646 Hrs**

TIME SAVED: 2,812 Hrs/Yr

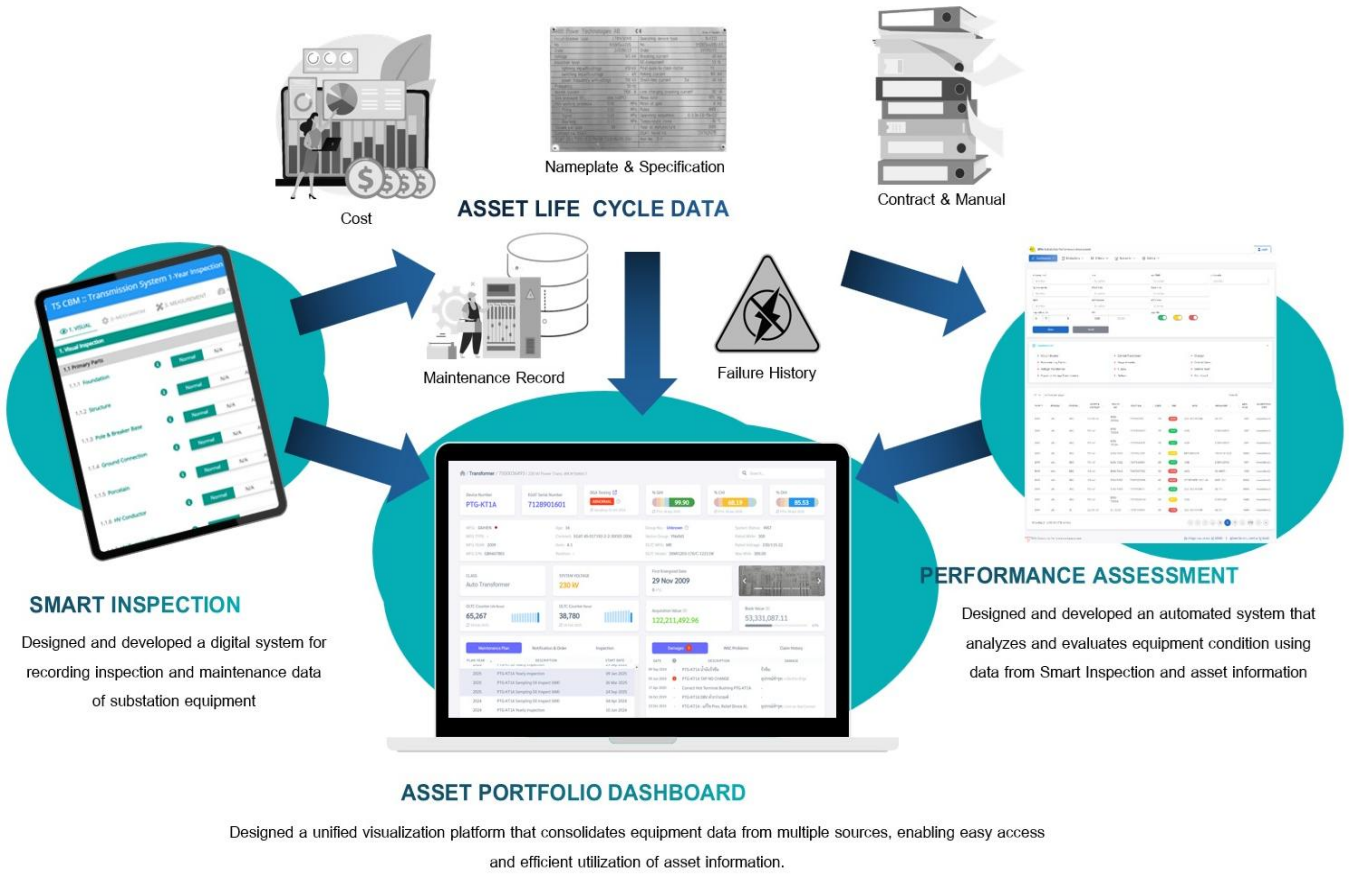
BENEFITS REALIZED

Annual Cost Savings: **395,000 THB**

Efficiency Gain: **79%**

Cost Savings = Time Saved × Direct Labor Rate

Conclusion



- **Smart TS** Impact:
  - • Key driver for Digital Transformation
  - • Enhances Grid Reliability & Safety
  - • Supports Cost-effectiveness
  - • Vital for Grid Modernization

Thank You

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