Asset Management & Condition Monitoring in Grid Operations

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A few Asset-related questions in Grid Management

**Operations planning**
- Are all maintenance Outage requests properly covered by my **contingency plans**?
- Can I take advantage of this Outage request to **schedule other Jobs**?
- What are the impacts of the maintenance program on my **reserve** requirements? Would this result into some captive reserves?
- Day Ahead Market solution is showing a **network congestion**. Can I overdrive this HV transformer rating? Do the cost and risk impacts balance the benefits?

**Reliability analysis**
- What are the real **transfer capacity limits** on my critical corridors?
- I have an alarm on a critical GIS substation. Can I **continue operations** for one more hour in order to let me prepare an alternative topology?
- Are my Contingency plans and remedial actions in line with **actual equipment conditions**, Load & Weather forecasts?

**Financial optimization**
- How to replace the current Asset **maintenance program** by something **cheaper** and **smarter** for my grid operations?
- How to define priorities in my **Asset Replacement** Plan?
Asset Management / Condition Monitoring / Grid Operation: Breaking the Silos for combined Optimization
ALSTOM Online Asset Management/Condition Monitoring: combining the Grid View and the Assets View.

**Grid & Operation View**
- Operation data
- On-line condition data

**Assets View**
- Assets data
- Analysis tools

**Assets Condition Awareness**

**Generalized Grid Security**

**Reliability-Centered Maintenance**

**Strategic Asset Planning**
EMS and Asset Management/Condition Monitoring: A Generalized Grid Reliability Framework

Situation Awareness (Visualization)

Generalized Grid Reliability Analysis

Wide Area Security

Steady State Security

Transient Stability

Combination & Correlation

UI Navigation

WAMS Alerts

Local UI

PMU & Oscillation Analysis

Real-Time Network Security Apps

TSA Applications

Non-Operational Data

Condition data

Weather information

Measurements-based Apps

Network Model-based Apps
Maintenance Management: Moving up in the Gartner Maturity Model

Maintenance: A Strategic Road Map

- Financial Optimized
- Reliability-Centered Maintenance
- Predictive Forecasting
- Based on Condition
- Preventive — Planned on Usage
- Preventive — Planned on Time
- Run to Failure

Business Drivers: Tactical to Strategic

IT Systems: Silo to Integrated

ERPM EAM
Ex: Transformer Condition Data
ALSTOM Grid MS3000 connected to e-terra platform
Ex: GIS Substation Condition Monitoring
ALSTOM Grid Bwatch and PDwatch connected to e-terra platform
Condition-Based Maintenance: Interoperability EMS-EAM compliant with CIM 61968

Benefits:
- Optimized maintenance plan
- Coordinated Outages

Sequence:
- Tap Changes counts published to EAM
- When threshold is reached, EAM triggers request for Outage in EMS
- EMS operator performs a security study on the proposed outage
- Approval is sent back to EAM
- EAM triggers maintenance Job
- EAM updates the EMS on the progress of operations (Tags)

Technology:
- Services-based exchanges (IBM Websphere)
- CIM-based semantics (IEC 61968-6)

Ex of Use Case: Counts of Tap Changer Operations are sent from EMS to EAM.
EAM will use this information to trigger condition-based maintenance Job.
Outage is coordinated with EMS.

IEC 61968-6
Overall Integration View

- Grid Reliability
  - EMS
- Transmission Planning
- Asset Diag & Perf Center
- EAM
- Maint & Assets Construction
- ERP

Acquisition & Monitoring
Real Time & Historical Repository

IEC 61970 & IEC 61968 on Enterprise Service Bus (ESB)

Acquisition Bus (IEC 61850)

Condition Monitoring tools: GISWatch, MS3000, ...

Substation Monitoring Devices

Circuit Breakers

Transformers
Asset Management / Condition Monitoring / Grid Operation

Benefits of the Integration

• **Improved Business processes**
  – Increase data sharing & provide clear status information
  – Enforce safety rules
  – Increase consistency and integration between business processes
  – Leverage standards for Enlarged IT Enterprise integration

• **Increased Operations efficiency**
  – Reduce the number of unplanned outages and minimize the impact of all outages
  – Better anticipate Network incidents
  – Improve network reliability analysis and model accuracy
  – Operate closer to the true limits of assets

• **Reduced costs: OPEX, cost of Inventories, CAPEX**
  – Plan Maintenance adjusted on actual condition and not postulated age
  – Facts & Data for Asset Replacement program
  – Auditable decisions