Planning for Investments in Distributed Systems

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HQ Divisions

- Founded in 1944, Public
- 3 Divisions
- 63 Hydroelectric Power Stations
- 36912 Megawatts
- Total assets: 75 B$
HQ TransÉnergie (HQT)

Resources:
- Nearly 3,000 employees
- Annual investment around $2 billion

Objective: Ensure Grid Reliability and High Service Level by maintaining over than 750,000 facilities:
- Over 500 substations
- Over 30,000 km of lines
(HQT) Evolving Context

Issues:
- Substation Load Factor 81%
- Aging Assets
- Cost Increase (Contracts, Material, etc.)
- Procurement Bottlenecks (delayed deliveries)
- Labor Market
- Regulatory Requirements

What is the Strategic Asset Management Plan?
Do we have the Resources?
Do we have the tools?
(HQT) Asset Management Evolution

2004 (550M$)
- List of Projects
- Bottom-Up Approach

2008 (1100M$)
- Asset Portfolio's
- Top-Down Approach
- Long-term Planning (CAPEX & OPEX)

2012 (1900M$)
- Asset Engineering
- Risk Management
- Simulation
- Optimization

Stakeholders
Integrated CAPEX & OPEX Strategies (75% vs 25%)

Portfolios

Objectives

- Extention
- Aging
- Improvement
- Compliance

Cost
Performance
Risk
(HQT) Asset Management System

Predictive System

Inventory → Probabilistic Models (Life Data Analysis) → Asset Health and RUL (PHM Models) → Decisional Models (Norms) → Cost Models → Simulation (Monte-Carlo)

Decisional Models (Norms) → Cost Models → Asset Health and RUL (PHM Models) → Probabilistic Models (Life Data Analysis) → Inventory

Objectives → Prediction → Cost/Benefits & Risk Analysis → Planning

Comply with ISO 55000
Lessons Learned

- Successful Systems are likely to evolve (only ?) from small projects
- Data-Driven decisions means free access to data which is in conflict with Governance and Security.
- Relevant data for grid devices is hard to find even if IT systems tend to collect everything. Look for expertise.
- Electric utilities context is a moving target. Models should favor agility over performance.
- Translate statistics to ROI all the time
Lessons Learned

Data
- Asset Component
- Measures
- Asset models (PHM, etc.)

Domain Knowledge
- Asset System (the whole picture)
- Intangible Knowledge
- Human Decisions