

Integrating Real-Time, Condition-Based Findings into a Fleet Asset Management, Risk-Based World

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Presentation Overview

Generation Asset Management: View from the eyes of Nova Scotia Power at 40,000 ft (and closing!)

- ✓ **NSP Power Production Business Visioning**
- ✓ **OTPMS - FAMOS Project**
- ✓ **Generation Asset Management**
 - **Needs**
 - **Concepts**
 - **Principles**
 - **Key Elements**
 - **Status at NSP**

NSP Background

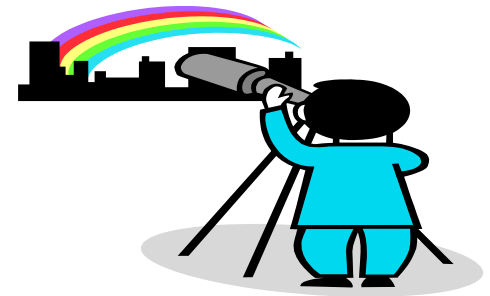
- ✓ Provides 95 per cent of the electrical generation, transmission and distribution in Province of Nova Scotia.
- ✓ Serves 486,000 residential, commercial and industrial customers.
- ✓ Employs 1,900 dedicated, safety-focused professionals.
- ✓ Manages \$3.5 billion worth of generation, transmission and distribution assets
- ✓ Produces more than 13,000 GW hours of electricity each year, with generating capacity of 2,293 megawatts.
- ✓ Has a fleet of five thermal, one tidal and 33 hydro plants, as well as four combustion turbine and two wind turbine sites.
- ✓ Uses a fuel mix including hydro, tidal, wind, coal, oil and natural gas to generate electricity.
- ✓ Delivers power with 5,000 km of transmission and 25,000 km of distribution lines.



OTPMS Background

Basis: 'Business Visioning' & Change

- ✓ OTPMS project is part of a larger, umbrella project focused on business processes related to power production
- ✓ Umbrella project assumes that these business processes need to be improved to optimize NSP generation efficiency and maximize NSP investments, i.e., generation asset management (GAM)
- ✓ Initiative includes: generation, operations, maintenance, engineering, reporting and interfaces with other business units
- ✓ Promotes standardization and transparency within the fleet
- ✓ Bottom Line: GAM establishes NSP as “due-diligence” manager of assets to regulator and shareholders





OPTMS Project Scope Highlights

- ✓ **Original thermal performance focus within a GAM environment, i.e., value proposition; evolved into FAMOS Project**
- ✓ **First principle modeling of total steam cycle for online monitoring and steady-state analysis with predictive thermal-physical modeling capability**
- ✓ **Condition-based monitoring and anomaly detection included as equipment reliability elements**
- ✓ **Unlimited local and enterprise user accessibility within the 12-unit thermal generation fleet and corporate offices**
- ✓ **Centralized Monitoring and Diagnostic System Capability**
- ✓ **Input data validation using Advanced Pattern Recognition**
- ✓ **Total cycle performance calculations for coal and combined cycle combustion turbine units**
- ✓ **Advanced alarm processing and management capability**

Sciencetech as Technology Partner

Sciencetech selected as technology partner with best technology, experience and proposition value:

FAMOS

- ✓ FAMOS – Fleet Asset Management & Optimization Solutions
- ✓ Integrated suite of technology for thermal performance and condition-based monitoring: CMAX
- ✓ PEPSE and PMAX – thermal performance optimization
- ✓ PdP and Rules Engine – equipment reliability optimization
- ✓ Staff, experience and success with over 250 projects demonstrated
- ✓ Business case established for FAMOS project investment





FAMOS Project Milestones

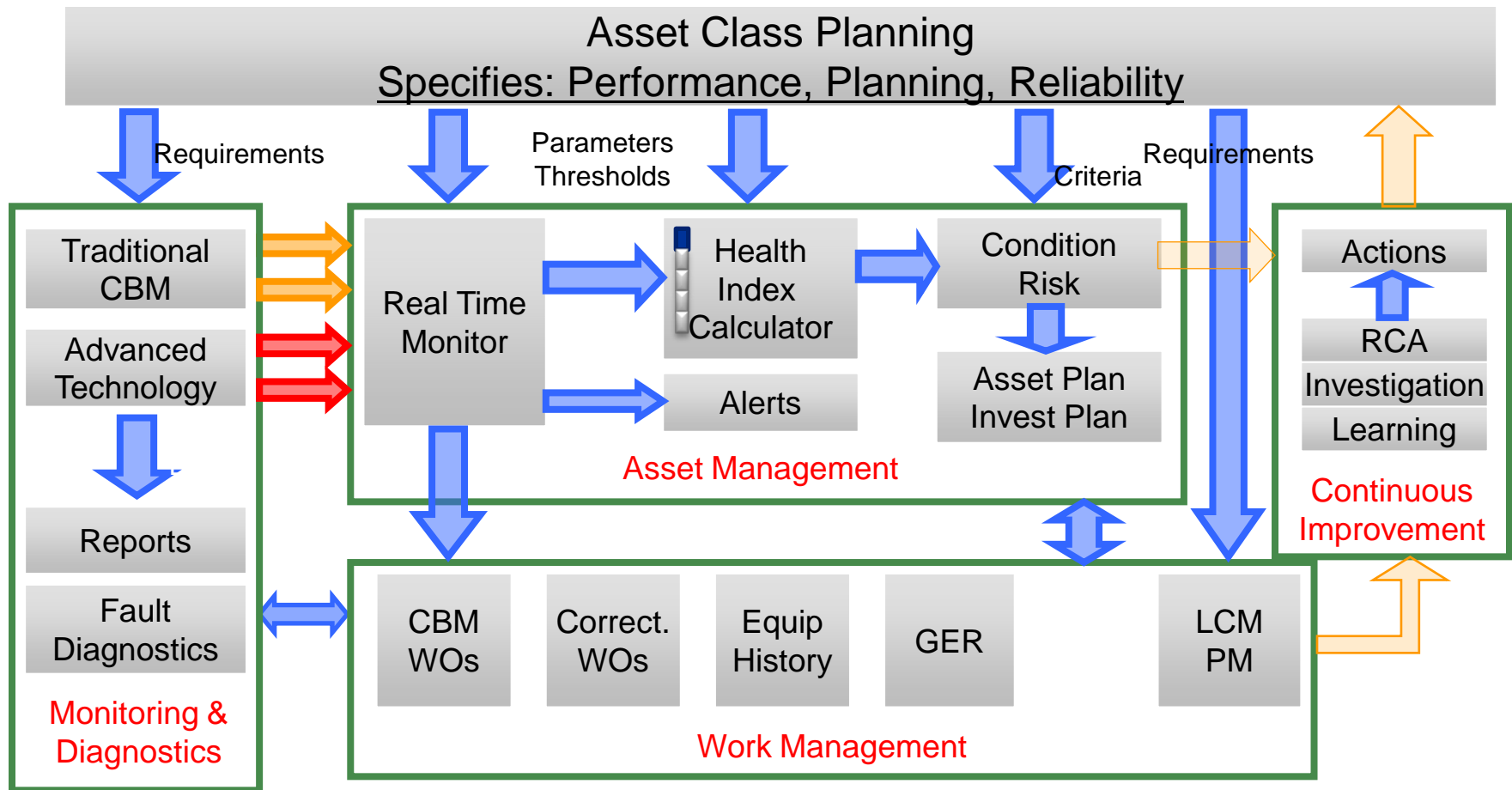
- ✓ **OTPMS RFP: October, 2009**
- ✓ **FAMOS Project Award: January, 2010**
- ✓ **Kickoff Meeting: March, 2010**
- ✓ **Lingan Delivery: Oct - Dec, 2010**
- ✓ **Balance of Fleet Implementation: January, 2011**
- ✓ **Moving ahead with development and Implementation of the GAM initiative**

Generation Asset Management Needs

- ✓ Demonstrate diligence around equipment reliability
- ✓ Demonstrate diligence around thermal performance
- ✓ Move from people knowledge based results to process based
- ✓ Aging assets and workforce
- ✓ Integration of renewable energy and distributed generation
- ✓ Regulatory considerations
- ✓ Sustaining asset improvement
- ✓ Right technology and business partners
- ✓ Establishing best practices sustainable by NSP



Generation Asset Management: Concept



Generation Asset Management Principles

✓ **GAM is a management “System” with life-cycle planning**

- Asset life is planned
- Regular condition assessment
- Long range planning (Investment, Outage)
- Integrates planning across asset classes



✓ **Leverages Advanced Condition-Based Monitoring (CBM) Technology**

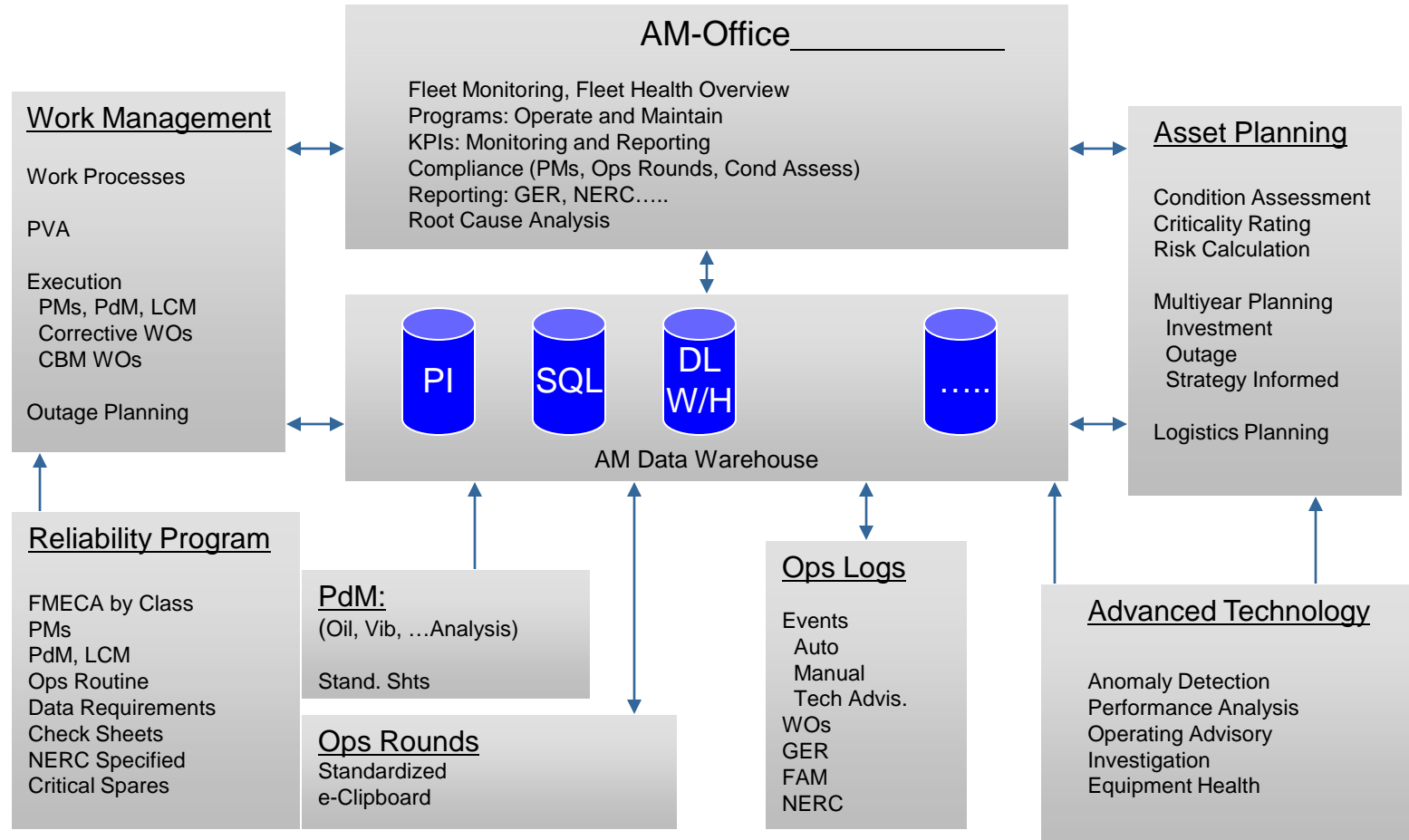
- Monitoring asset performance and condition
- Initiating work and advising Operations
- Determining asset health and risk rating
- Assisting condition assessment and risk rating

Generation Asset Management Principles

- ✓ **SME and technology integration in a reliability environment (risk informed asset management - RIAM)**
- ✓ **Focus on thermal performance and equipment reliability technology as drivers**
- ✓ **Integration of ERP and CBM management systems**
- ✓ **Determining asset health in real-time; driving maintenance planning and work processes**
- ✓ **Advanced technologies will be force multiplier**



Asset Management: Key Elements

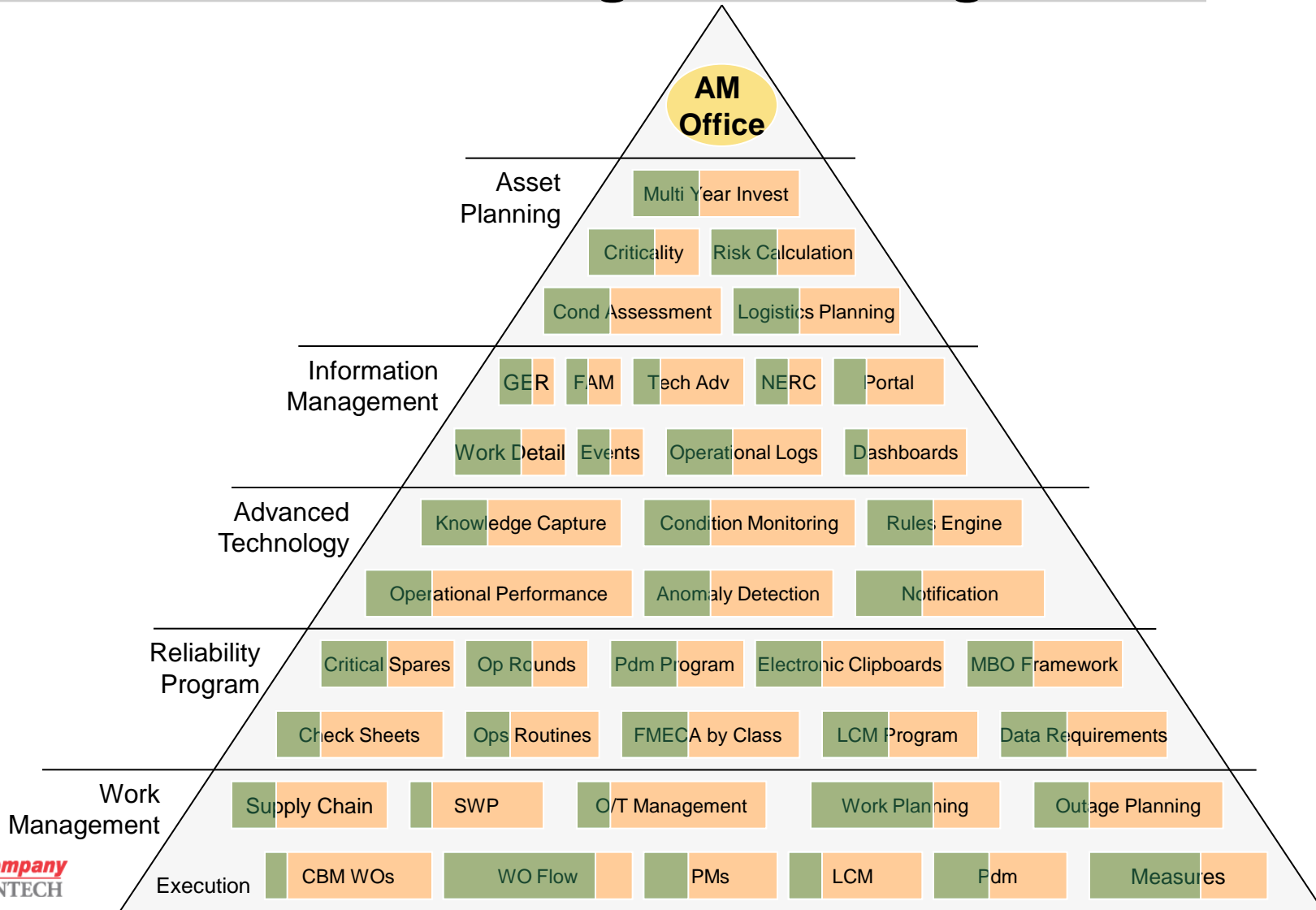




GAM Initiative (NSP Current Status)

- ✓ **GAM Program: work in progress (don't have all the answers/have vision/goals) with education planned**
- ✓ **RCM / RIAM approach: Best practices, SME's with CBM technology improving Maintenance and Ops**
 - **Business process improvement planning (personnel, technology and processes)**
 - **NSP business model is unique for competitiveness (one size does not fit all)**
 - **Implementing FAMOS technology at thermal units – Lingan initially (SME +Technology + Framework (processes) = KPI improvement**
 - **Major Equipment Assessment & Planning with risk analysis**
 - **Major KPI's Assessment of KPI's driving business model**
 - **Integration with ERP technology (CMMS, Supply Chain, Financial, Personnel, etc.)**
 - **Measure business process gaps and implement GAM program**

Generation Asset Management: Progress



GAM Objectives

- ✓ Standardization of assessment and investment across the fleet
- ✓ Demonstrate best practice sustained with world class tools
- ✓ Improves equipment reliability and plant availability through real-time monitoring and diagnostics
- ✓ Achieve capacity and efficiency improvement goals
- ✓ Reduce forced outage rate
- ✓ Capture retiring work force asset expertise
- ✓ Increase focus on continuous improvement
- ✓ Present performance and health information to the operations and engineering staff in a concise and timely manner
- ✓ Routine reports for operations and management
- ✓ Help meet new and emerging emissions regulations (burn less fuel)
- ✓ Integrate renewable energy and distributed generation resources
- ✓ Optimize staff productivity through the right tools and processes





GAM Sustaining Activities

- ✓ **Continuous measurement & reporting: KPIs, compliance, etc (quality and transparency)**
- ✓ **Condition based maintenance**
 - **less corrective & planned preventative maintenance**
 - **more PdM/outage planned with risk assessment**
- ✓ **Fleetwide Monitoring and Diagnostic Monitoring**
- ✓ **Information from all sources**
- ✓ **Communication, Education, Training**
- ✓ **Evaluating technology and business partners and their ability to support all the gaps in the NSP GAM program**





Conclusion: In Search of Operational Excellence

- ✓ **NSP dedicated to GAM across the fleet; developing a “GAM Plan”**
- ✓ **Reliability and Asset Planning**
 - **Creates buy-in**
 - **Employ industry tools**
 - **More prescriptive in engagement with plants**
 - **Asset Experts/SME’s are key**
- ✓ **Making mid-course corrections as needed**
- ✓ **Implementing a customized “GAM Plan” supporting NSP business model**
- ✓ **Establishing a Center of Excellence**





Questions

