Ontario Power Generation Update

Creative Intelligence and Innovation

April 30th, 2024 • Mo Movassat, Senior Manager, Data Analytics

OPG Proprietary

2 **Nuclear** Stations

2 Leased **Nuclear** Stations

2 **Thermal** Stations

1 **Solar** Facility

66 **Canada Hydroelectric** Stations

85 **US Hydroelectric** Stations

4 **Atura Power Gas-Fired** Stations

Labor-centric Preventive Maintenance

Labor

Paper-based

Periodic

$$$$ High Cost

Machine Learning

Visualization

Research & Development

Risk

Artificial Intelligence

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

PSEG Nuclear

INL Idaho National Laboratory

PKMJ Technical Services, Inc.

Technology-driven Predictive Maintenance

Wireless

Electronic/ Robotic Devices

Condition -based Analytics

— $ — Low Cost

from : **INL/EXT-21-64168**

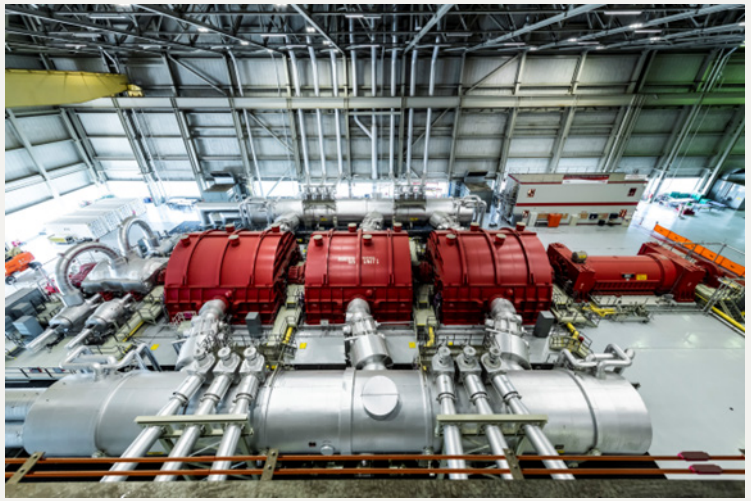
OPG


Technology,
PROCESSES &
People
Crucial for Digital Transformation

Digital Twin

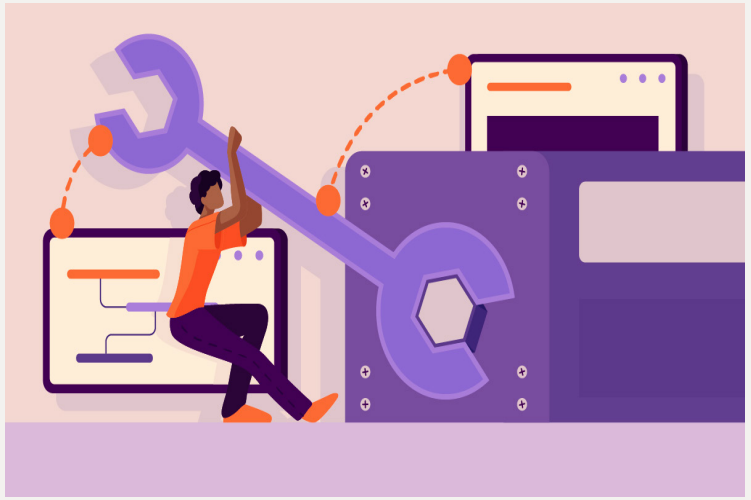
Benefits

Improve Plant Reliability



Providing Explainability and Diagnostics

PM Optimization



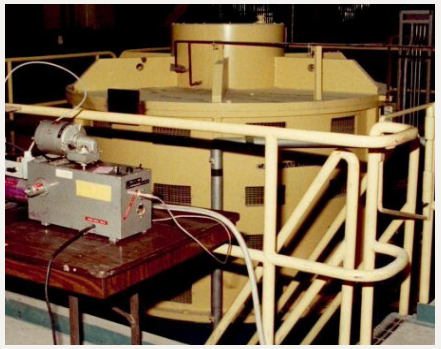
Integrating Work Management Data with Operational Data

Asset Management

Holistic view on Asset Health

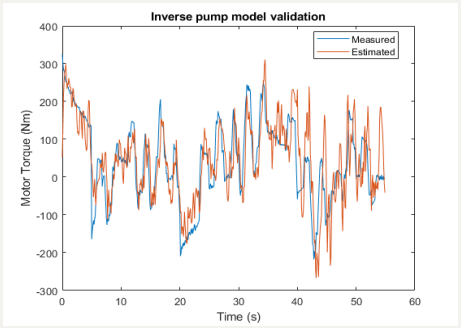
Digital Twin

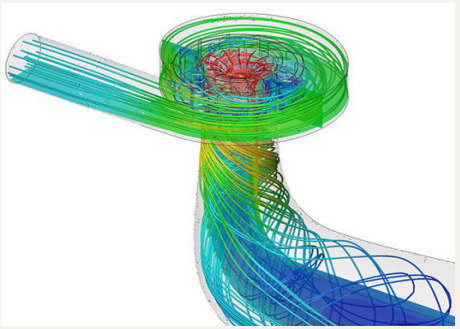
Where we are



- Collaborating with INL to adopt CWS (CCW) system model
- Existing INL model is being modified and tuned for OPG data
- Using WM data to provide explainability and diagnostics

Enhancements





- Advanced ML models for numerical analysis
- Physics-based models
- Application of Large Language Models

LLM Applications

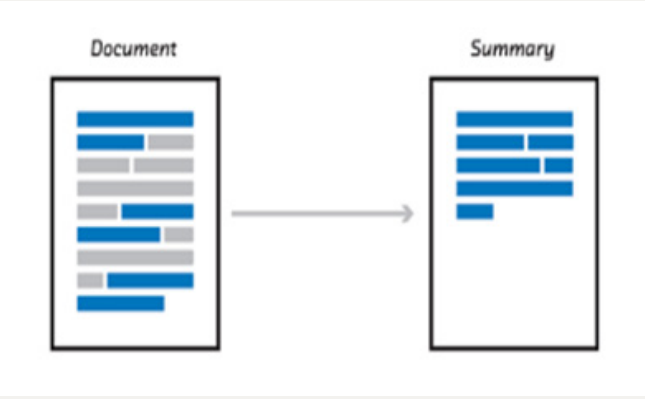
Semantic Search

To access and use text data in decision making

PM Optimization

To leverage available data about work management for PM optimization

Text Summarization



To facilitate reporting and insight extraction

Robotics

Supporting Operations and Maintenance / RP

Supporting Engineering Inspection/drone

Drones For All (m-RPAS, <250g)

- Internal guide under development using the DJI Mini 3 Pro (RC) as a reference m-RPAS
- Transport Canada does not require a drone pilot license to operate an m-RPAS
- Goal is to enable use of micro-drones as a tool, while ensuring they are operated safely

m-RPAS field checklist

Reference:
OPG- Guid-76300-0000

- **Aircraft inspection**
- **Weather conditions**
- **RTH altitude set**
- **Battery checks**
- **SD Cards**
- **Take off area clear**
- **Away from people**
- **Clear of aircrafts**

Always remember that YOU are responsible for operating the m-RPAS safely and a responsible manner.

Condition Monitoring

Gateway Receiver

Battery Monitoring System (BMS)

4-20 mA Sensor

Ambient Temperature and Vibration Sensor

External Temperature and Vibration Sensor

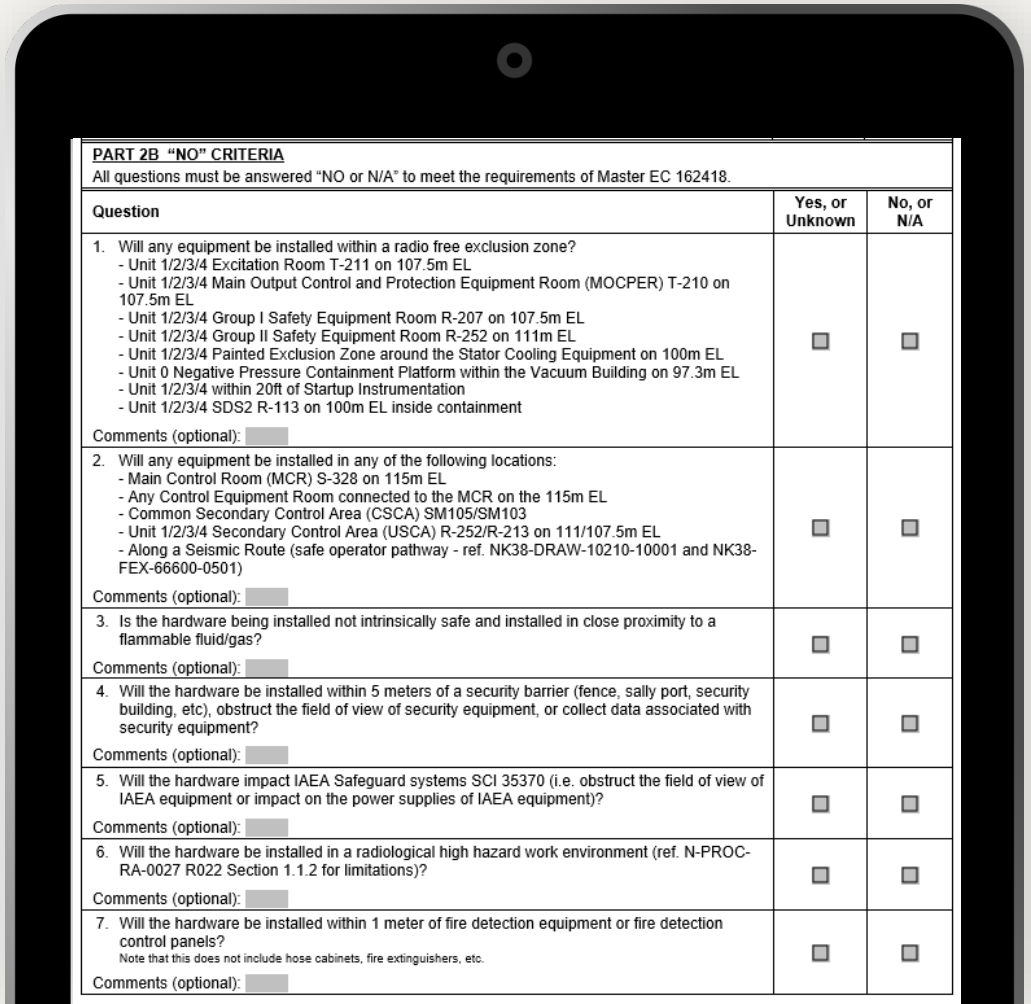
Non-Intrusive Sensor Process

Goal: Develop a process that reduces the amount of engineering rigor required to install condition monitoring sensors that do not pose any risk to station equipment or safe operation.

Boundary: Cannot replace PMs or be used for Operational decision making.

Examples: Temperature monitoring skin temperature of components, vibration monitoring, ambient temperature monitoring

Next Step: Replacing PMs, will be another process



PART 2B "NO" CRITERIA

All questions must be answered "NO or N/A" to meet the requirements of Master EC 162418.

Question	Yes, or Unknown	No, or N/A
1. Will any equipment be installed within a radio free exclusion zone? - Unit 1/2/3/4 Excitation Room T-211 on 107.5m EL - Unit 1/2/3/4 Main Output Control and Protection Equipment Room (MOCPER) T-210 on 107.5m EL - Unit 1/2/3/4 Group I Safety Equipment Room R-207 on 107.5m EL - Unit 1/2/3/4 Group II Safety Equipment Room R-252 on 111m EL - Unit 1/2/3/4 Painted Exclusion Zone around the Stator Cooling Equipment on 100m EL - Unit 0 Negative Pressure Containment Platform within the Vacuum Building on 97.3m EL - Unit 1/2/3/4 within 20ft of Startup Instrumentation - Unit 1/2/3/4 SDS2 R-113 on 100m EL inside containment Comments (optional):	☐	☐
2. Will any equipment be installed in any of the following locations: - Main Control Room (MCR) S-328 on 115m EL - Any Control Equipment Room connected to the MCR on the 115m EL - Common Secondary Control Area (CSCA) SM105/SM103 - Unit 1/2/3/4 Secondary Control Area (USCA) R-252/R-213 on 111/107.5m EL - Along a Seismic Route (safe operator pathway - ref. NK38-DRAW-10210-10001 and NK38-FEX-66600-0501) Comments (optional):	☐	☐
3. Is the hardware being installed not intrinsically safe and installed in close proximity to a flammable fluid/gas? Comments (optional):	☐	☐
4. Will the hardware be installed within 5 meters of a security barrier (fence, sally port, security building, etc), obstruct the field of view of security equipment, or collect data associated with security equipment? Comments (optional):	☐	☐
5. Will the hardware impact IAEA Safeguard systems SCI 35370 (i.e. obstruct the field of view of IAEA equipment or impact on the power supplies of IAEA equipment)? Comments (optional):	☐	☐
6. Will the hardware be installed in a radiological high hazard work environment (ref. N-PROC-RA-0027 R022 Section 1.1.2 for limitations)? Comments (optional):	☐	☐
7. Will the hardware be installed within 1 meter of fire detection equipment or fire detection control panels? Note that this does not include hose cabinets, fire extinguishers, etc. Comments (optional):	☐	☐

Thank you.

Questions?