



# Radiation Protection and ALARA Program Highlights at Ontario Power Generation

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**ONTARIO****POWER**  
GENERATION



# Ontario Power Generation

- 10 Operating Nuclear Stations at 2 sites
- 2 Shut Down Nuclear Stations in Safe Storage
- 3 Dry Fuel Storage Sites
- 1 Nuclear Waste Facility
- 65 Hydroelectric Stations
- 3 Thermal Generating Stations
- 2 Wind Power Turbines
- 1 Solar Power Site
- Generating Capacity >16,000 MW







# OPG Nuclear

- Pickering Nuclear Generating Station
- Darlington Nuclear Generating Station
- Health Physics Laboratories
- Western Waste Management Facility



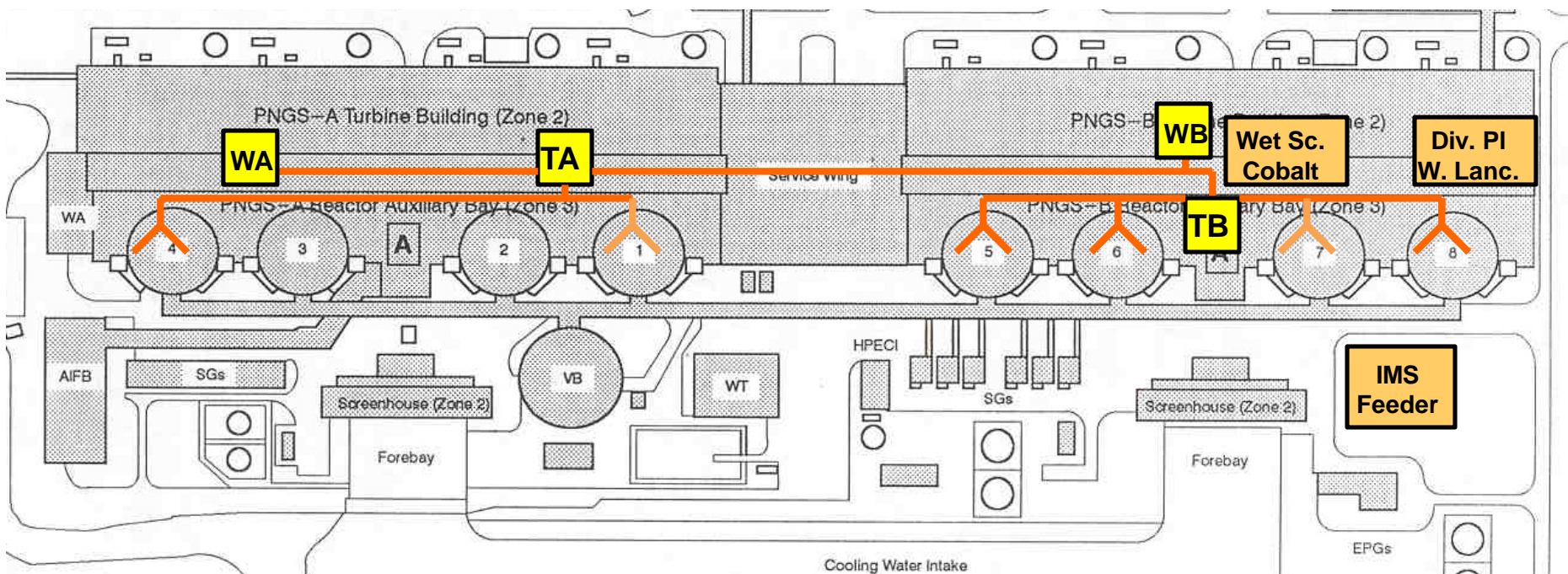
- Pickering Extension of Commercial Operations
- Safe Storage & Decommissioning Planning
- Deep Geological Repository
- Darlington Refurbishment



# Remote Monitoring - Pickering

## ■ Network

- Fiber
- LAN
- Zinwave Distributed Antenna System







# Remote Monitoring

## ■ Remote Monitoring Set-Up (PNGS)

- 8 Control Consoles
- 5 Server Cabinets
- Stand Alone Fiber Network
- I.T. Controlled Connection to Network
- Real-Time Hazard Display
- PoE Compliant Network Components
- Archived Hazard Information
- 600+ Teledosimeters (iPAM/PAM TRX)
- 500+ Transmitting Devices
- 50+ separate audio partly lines accommodating more than 200 users
- 90% wireless coverage in radiological zones.





## Challenge from the Management Team

- Routine radiation surveys to be fully automated
- Ability to perform non-routine radiological surveys remotely
- Limit the requirement for Radiation Technicians to be in radiologically controlled areas



## Currently Implemented

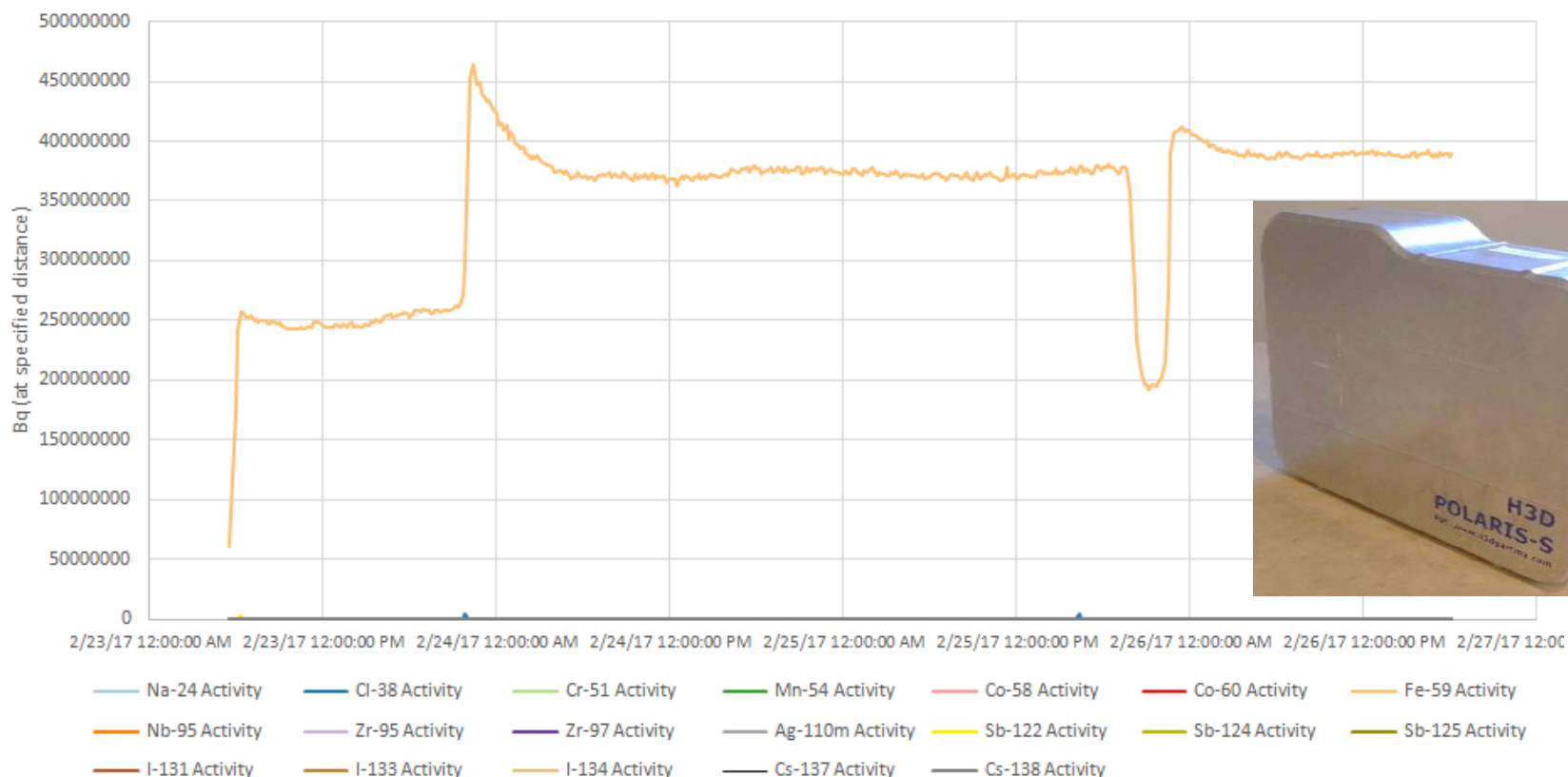
- Real-Time Routine Surveys
  - Gamma, tritium, beta airborne, alpha airborne, radioiodine, gamma spectroscopy
- Emergency Preparedness
  - Source Term / Near Boundary
  - Assembly Areas
- Non-Radiological Monitoring
  - iCAM filter head counter
  - HEPA vacuum on/off
  - Temperature & Humidity
  - Vibration Monitoring
  - Drum level monitoring
  - Video for Operations / Fire Protection / OCC





# Real-Time Gamma Spectroscopy

## • Polaris-S – Source Term Monitoring & System Component Troubleshooting

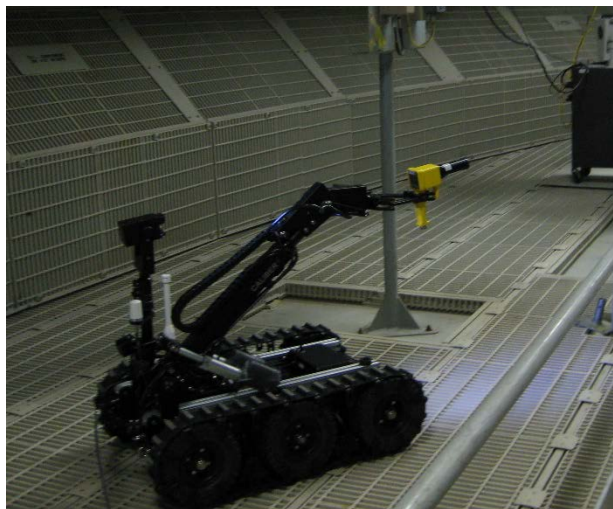






# Robotics

- Perform radiological surveys
- Visual / thermal inspections
- Leak searches
- Perform tasks in high radiation areas
- Remove High Activity debris





# Automated Reactor Face Survey Initiative

## ■ Current Method:

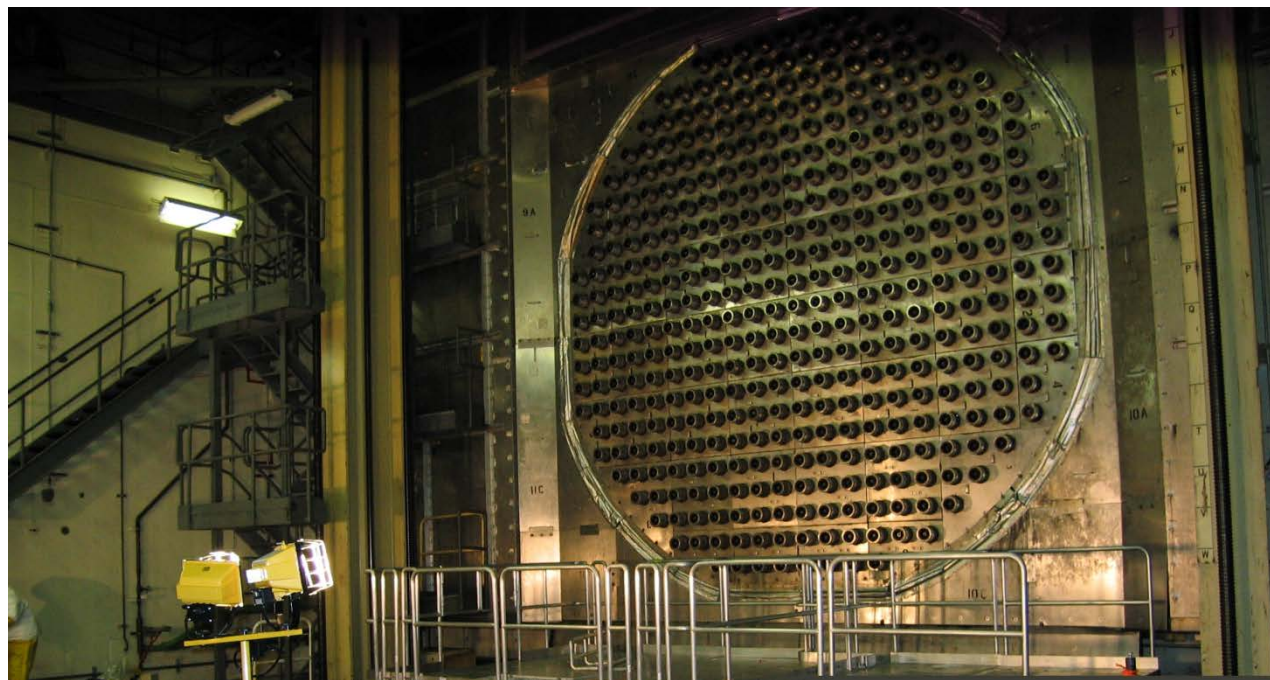
- Remote monitors on F/M Bridge
- 2-3 hours of critical path

## ■ Proposed Method:

- Unmanned Automated Vehicles (UAVs) off critical path

## ■ Challenges

- Time required to measure up to 390 channels, with current battery limitations of drones
- Positioning of drone without GPS
- Additional weight of gamma detector and transmitter







# We Are All RP

## Self Protection and Service Protection Model







## Dose Goal's

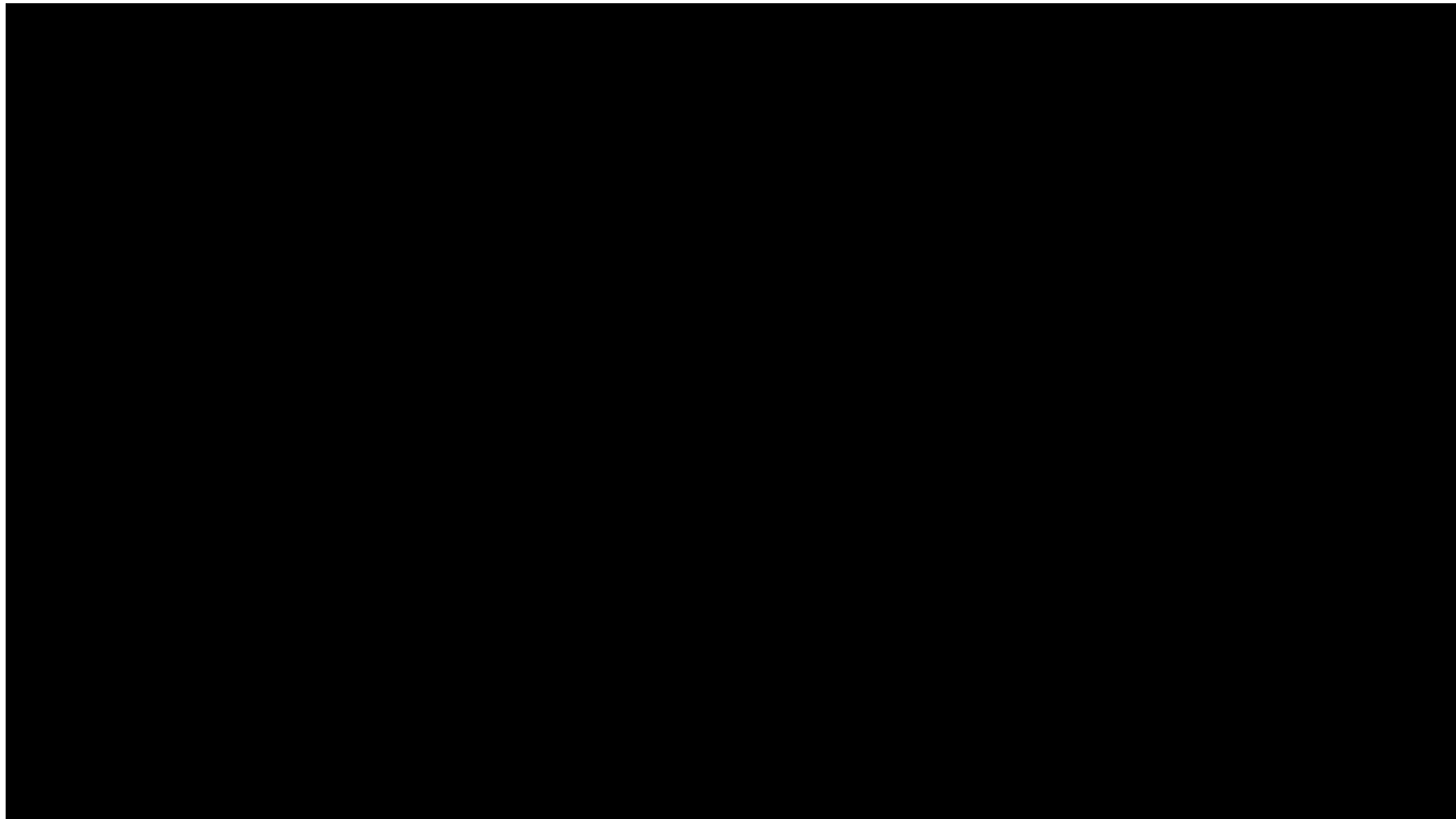


- Annually, more than 100,000 entries into the Reactor Buildings at Pickering
- Significant potential for dose savings if every individual saved a mrem (10 uSv).





# OPG X-Labs





# Google Glasses

Pickering RP is assisting OPG's X-Lab with the development of safety glasses that provide users with a "Heads Up Display" (HUD).

The HUD will display real-time information of the users dose and current dose rates at the jobsite. Users will receive warnings when approaching REP limits and allow them to respond to changing conditions in a more efficient and safe manner.

The Google Glasses will also record and stream video, as well as take a photo when users blink their eyes quickly twice.

OPG is exploring how to implement the glasses HUD in other areas such as Confined Space entries.







# Virtual Reality Training





# Technology Implementation

Remote Monitoring Technologies support implementation of the RP program, they do not replace it.

For these technologies to be effectively implemented:

1. Staff need to understand limitations of technology.
2. Need to find practical uses for the technology that can be implemented in the field (i.e. it is more important how it is used, as opposed to how cutting edge the technology is).



# Questions?

