



Innovation in Nuclear Energy: A Daily Pursuit

Shannon Rafferty-Czincila

VP, Fleet Support - Constellation

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Why Innovation?

- New technologies are driving digital transformation across the world and at our nuclear plants.
- Innovation is **crucial** for the future of nuclear energy.
- Digital transformation will improve safety, efficiency, and sustainability of our 24/7 clean, safe and reliable nuclear fleet.



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Innovation in Training

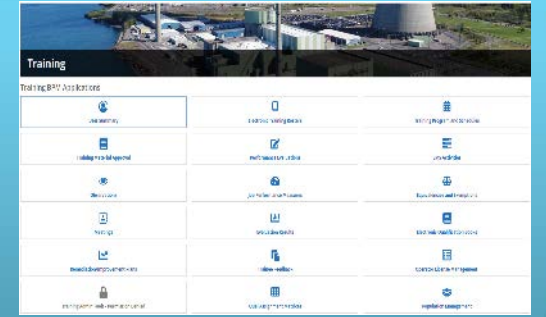
On-Demand Equipment Operator Training

- Increases hands-on training
- Reduces cost of over-hiring
- Increases diversity



Digital Training Processes

- Paperless automated workflows
- Over 30 Software Apps
- Electronic Qualification Books, Labs and Scenarios



Virtual Reality & Digital Plant Viewer

- Augments classroom training with in-plant experiences
- Hazard Free / Dose Free



Learning Anytime Anywhere

- On demand video learning
- Proficiency & Just in Time Training
- Knowledge Transfer & Retention



Distance Learning Technology

- Efficiently train fleetwide
- Reduces travel and cost
- Expands subject matter expertise to the fleet



Glasstop Simulators

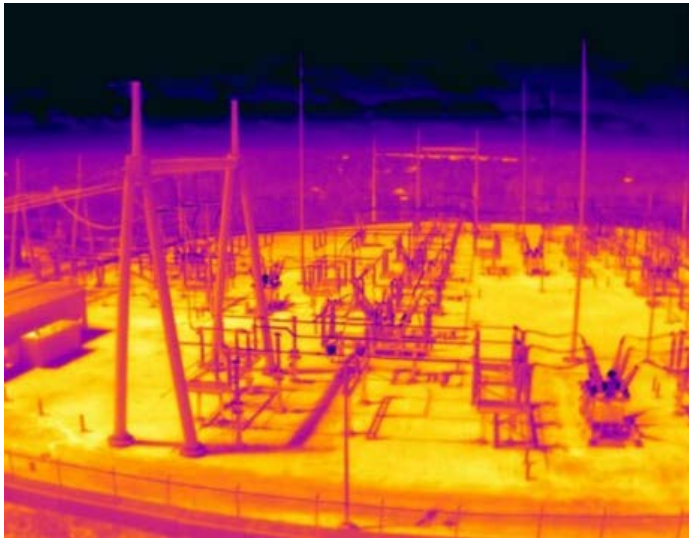
- Increases Simulator Availability
- Crane simulators
- Practice for proficiency



Remote Inspections and Maintenance



- Remote inspections and maintenance reduce radiation exposure for workers
- Drones and robots are being used to inspect nuclear plants
- Virtual and augmented reality technologies are being utilized for remote inspection and maintenance

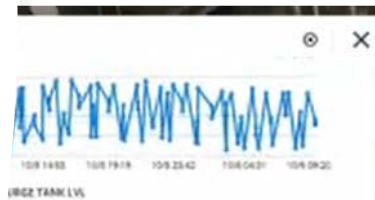


One Plant Example:

- 200 drone inspections
- 3,000 person hours of work saved
- 18-person Rem of dose saved
- Mitigated industrial safety risks
- Integrated videos into digital plant viewer

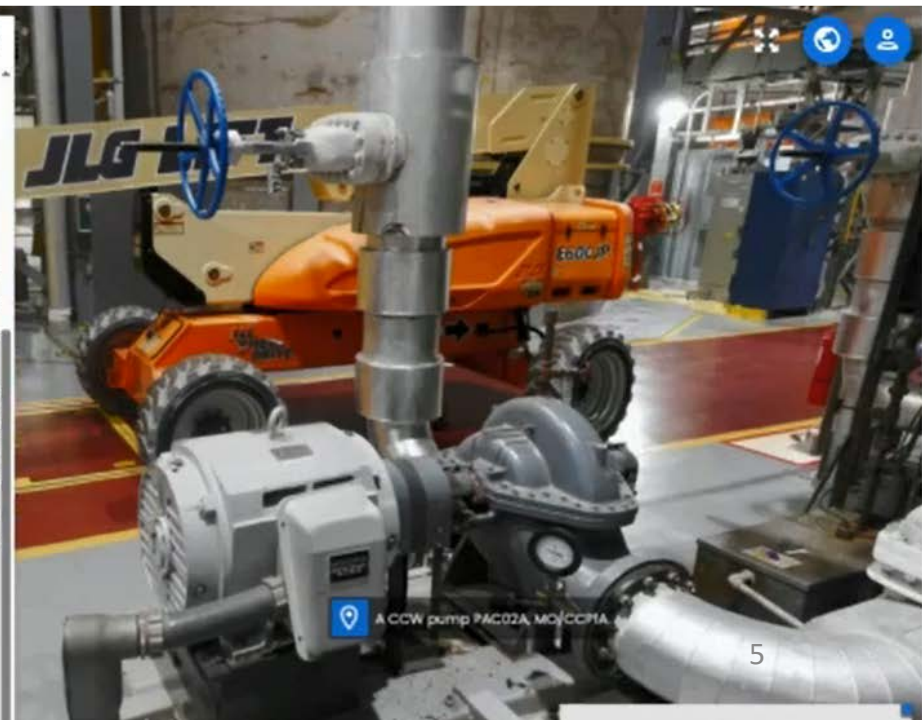
Digital Monitoring

- New Wi-Fi technology to easily support connecting wireless sensor equipment allowing for separation between business network and sensor data
- Upgrades to plant historian software to support more robust visualization of data on more devices (PI Vision vs Process book)
- 3D Visualization with data overlays – Digital Twin View
- PRISM provides analytic models for real time data and enables alerts for condition-based monitoring
- Mobile fire cart technology reducing Operations workload, by providing easily deployable fire sensors where **needed**
- DAS Backbone allows for easy installation and configuration of wireless sensors utilizing radio technology
- AI Smart camera technology to detect hazardous conditions
- Robotic technology for monitoring hazardous or hard to reach areas



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Artificial Intelligence in Nuclear Energy



- Artificial intelligence is transforming the nuclear sector
- AI can optimize nuclear power plant operations
- AI can improve safety and reduce the risk of accidents

The Future of AI Across Generation

The following features practical examples of how AI can be implemented across segments of Generation. These examples represent only a fraction of the possibilities that can be made possible through this foundational investment.



Operations

- ✓ **Automated generation of management status reports**
- ✓ Convenient access to **detailed equipment information** in the field
- ✓ **Efficient field information access across** multiple systems enabled by CoPilot search



Maintenance

- ✓ **Automated work order planning**
- ✓ **Predictive analytics** foresee and prevent potential failures
- ✓ **Condition-based maintenance** reduces scheduled preventative maintenance.
- ✓ AI-driven searches **expedite troubleshooting** with swift access to manuals, prints, and documents



Engineering

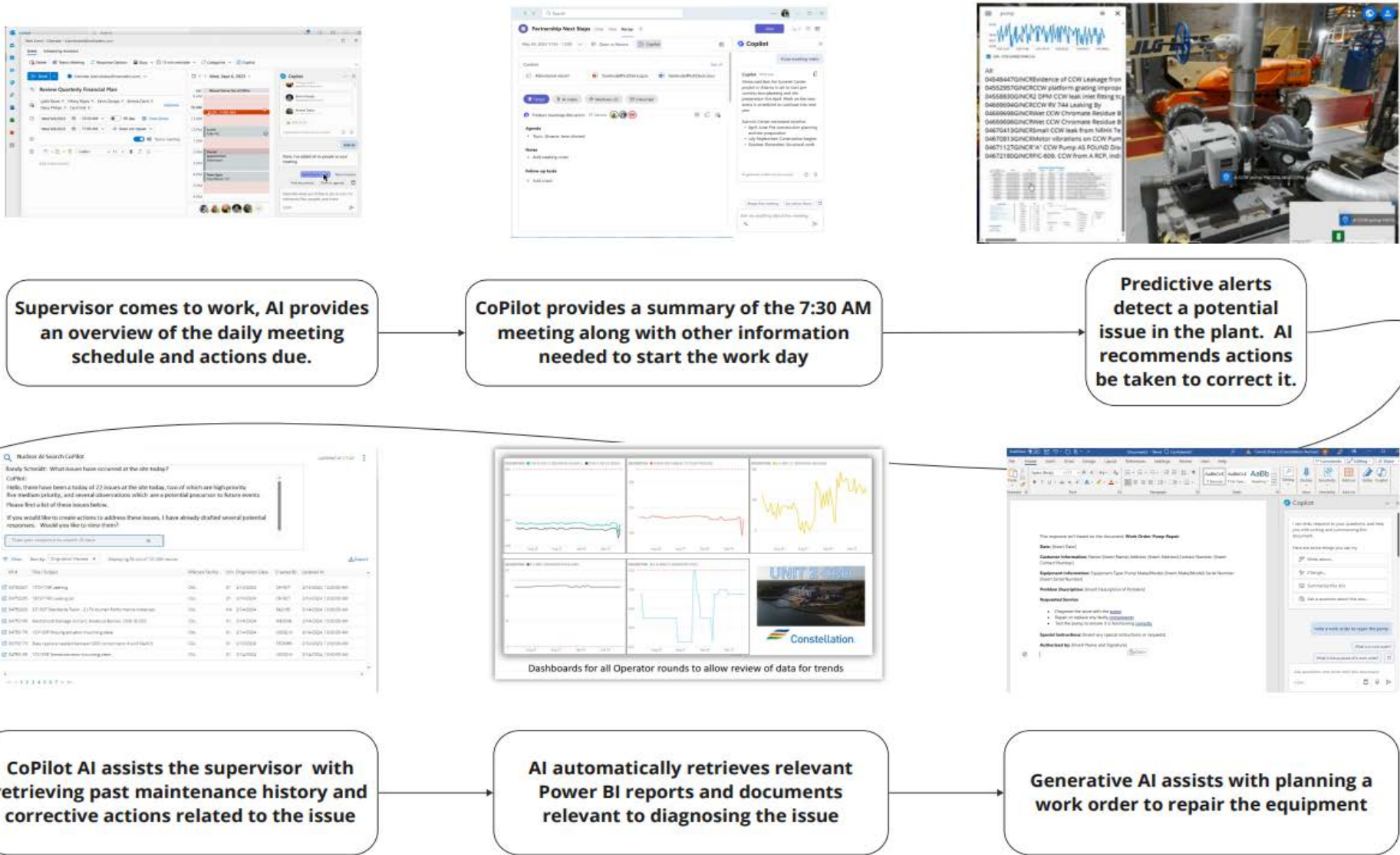
- ✓ **Engineering documents** generated by AI
- ✓ AI-powered search for **swift document retrieval**
- ✓ **Holistic equipment health assessment** across diverse digital systems
- ✓ **Enhanced accuracy in AI equipment health monitoring** through real-time data, corrective actions, observations, and scheduled tasks



Corporate

- ✓ **Streamlined data access** and simplified reporting throughout the fleet
- ✓ **Enhance meeting efficiency** with AI-generated summaries and automated scheduling
- ✓ Automatic performance data compilation from all sites, **offering a comprehensive fleet view** from multiple digital systems

Improved Employee Experience enabled by Artificial Intelligence



Digital Modernization Overview

- Partnership with the Department of Energy (DOE) LWR Sustainability Program & Idaho National Labs (INL)
- Upgrade of Safety systems from 1960's analog technology to state-of-the-art digital
- Update Main Control Room (MCR) to digital controls and display
- Single outage installation
- Leverage Advanced Regulatory & Design Processes
 - ISG-06 Alternate Review Process
 - EPRI Digital Engineering Guide
 - EPRI Digital Design Process
- Improved plant safety, reliability and operating costs
 - High-reliability digital system
 - Elimination of parts obsolescence issues
 - Improved control room operator interface
 - Reduced labor requirements enabled by automation

Current Main Control Room Layout



Future Main Control Room Layout



Challenges to Innovation

- Cyber and Physical Security
- Integration into existing plant instrumentation and infrastructure
- Knowledge and qualifications
- Cost
- Regulatory
- Change Management