

AI for Operation and Maintenance of Nuclear Reactors

Website: ai.epri.com

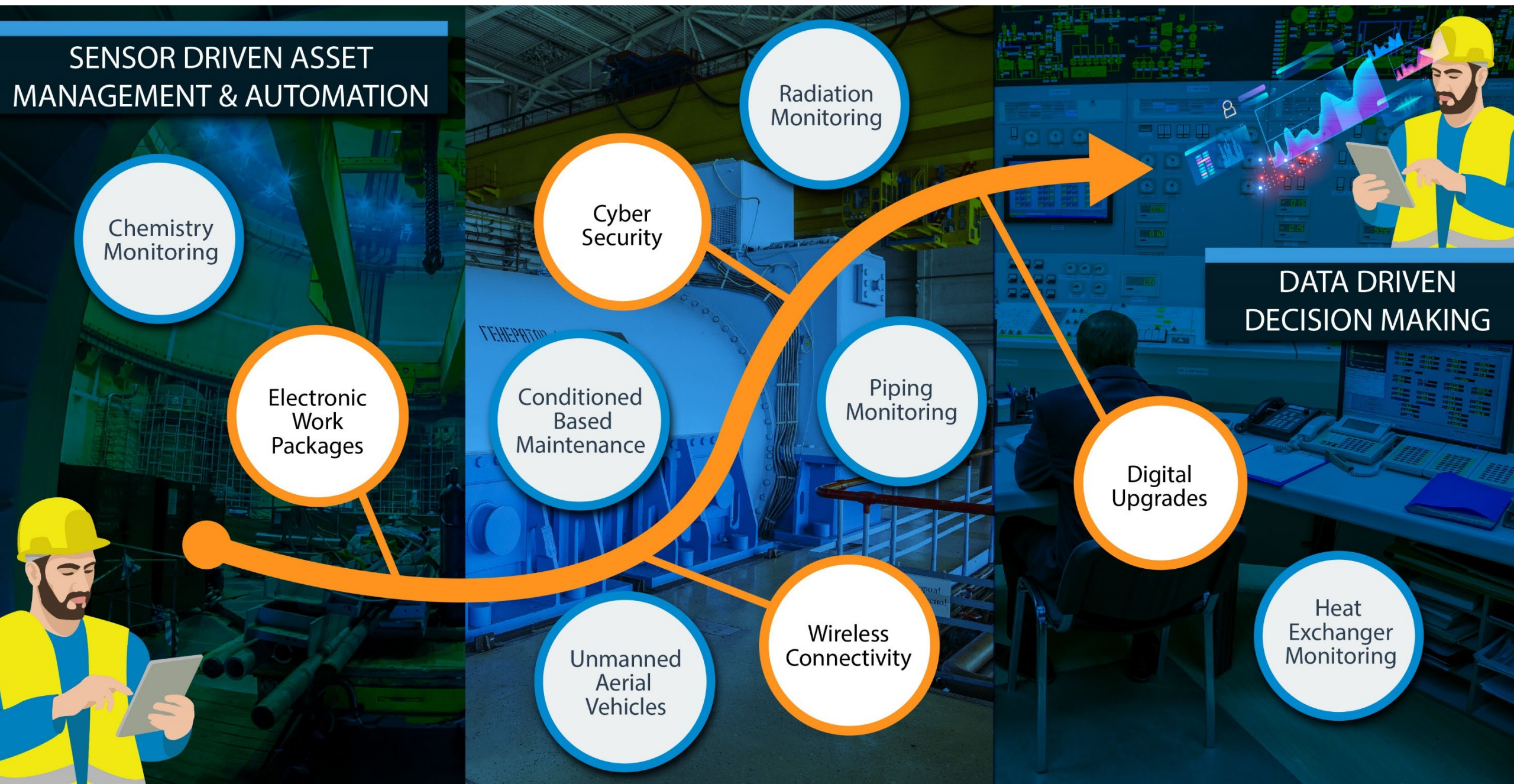
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AI for Good Webinar: AI for Nuclear Energy
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SENSOR DRIVEN ASSET MANAGEMENT & AUTOMATION



EPRI's Nuclear AI and Data PROJECTS



Insights

- ISI UT Examination Results Comparison Tool
- Event Management Response Tool (EMRT)
- Low Cycle Fatigue (LCF) Transient Monitoring
- Nuclear NLP Dictionary

Optimization

- RaDUCE: Radiation Field Source Term Optimization
- Optimizing Inventory Management Practices
- Scenario Evaluation for Decommissioning Planning
- Surrogate Machine Learning Model for Pellet-Cladding

Prognostics

- Data Mining to Support Integrated Monitoring and Diagnostics
- Machine Learning to Inform Flow Accelerated Corrosion (FAC) Programs

Automation

- Automation of Non-Destructive Evaluation Results
- Concrete Defect Detection Tool
- Adaptive Feedback Welding
- Automating Corrective Action Programs
- Automatic Monitoring of Dry Cask Vent Temperature



Our Nuclear **DATA SETS** | Power Plant Operational Data, Generation Asset Maintenance Information, & Nondestructive Evaluation data

EPRI's
AI WORK spans ...



T&D Overhead
Line Imagery

Power Plant
Operational Data



Transformer
Demographic,
Oil Analysis Data

Generation Asset
Maintenance
Information



AMI Data

Control Center
Operational
& Protection Data



Power Quality

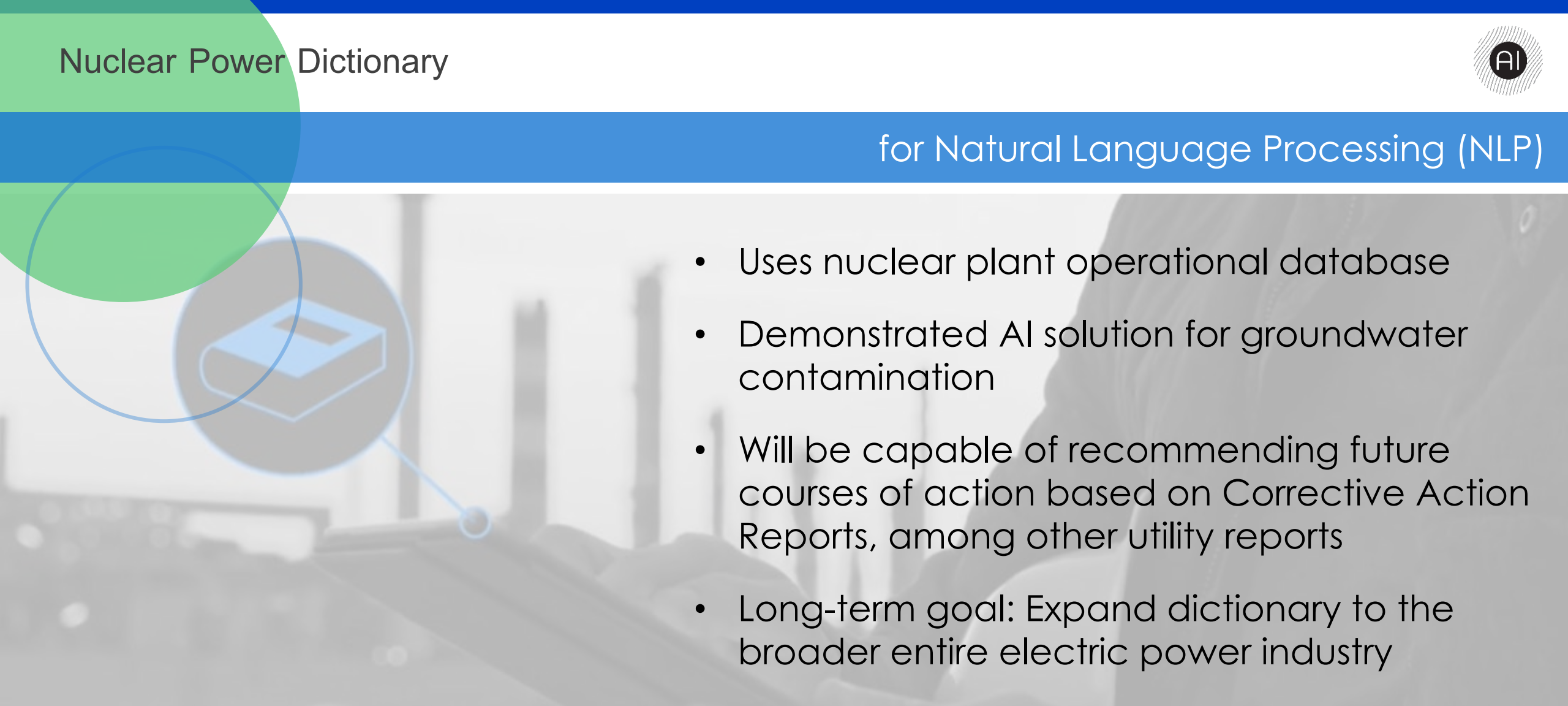
Nondestructive
Evaluation Data



Satellite Data

5G and Advanced
Network Data



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- The background of the slide features a faded image of a nuclear power plant. Overlaid on the left side is a magnifying glass icon, and inside the lens is a blue icon of a book, symbolizing the dictionary project.
- Uses nuclear plant operational database
 - Demonstrated AI solution for groundwater contamination
 - Will be capable of recommending future courses of action based on Corrective Action Reports, among other utility reports
 - Long-term goal: Expand dictionary to the broader entire electric power industry

PROJECT STATUS

- Six industry experts with 30+ years were interviewed to identify the corpus for the dictionary
- Interviews are currently being analyzed
- Technical Report to be published in mid-2022

- EPRI's AI solution will automatically process CAP data
- Could reduce 6 people's work of 2 hours a day, 5 days a week to 1 person, 1 hour a day, 5 days a week → 90% reduction
- Early detection, improved resolution time, reduced personnel time



PROJECT STATUS

- Analyzing CAP data from 2 U.S. fleets (13 reactors total) over a 3-year period
- Formed Industry Working Group, 2nd webinar on 22 September
- Technical Report expected December 2021

to Predict Flow-Accelerated Corrosion (FAC) Wear Rates

- Machine learning model improves wear rate prediction accuracy within EPRI's CHECWORKS™ software
 - Especially good for thinner components
- Optimizes number of inspections to allocate resources to the right locations

PROJECT STATUS

- Over 27,000 inspection datasets have been analyzed from 48 units
- Improved algorithm is now being evaluated using industry-proven FAC metrics
- Machine learning methodology will be applied to unmodeled, risk-ranked components

to automatically detect damage in concrete structures

- EPRI is training AI models to perform visual inspections of concrete structures. Initial results show approach is feasible and can provide value to the industry.
- Model is trained to localize corrosion, cracking, efflorescence, grease stain, and spall.
- Damage localization models show high detection rates and acceptable false call rates across all damage types considered.



PROJECT STATUS

- Real-time implementation available for field testing
- Online tool for post-inspection implementation to be released by year-end
- Coming soon in 2022: Anonymized and labeled common database for the industry



Together...Shaping the Future of Energy™

And stay tuned for more details on our 2022 AI and Electric Power Summit!

Sign up for updates [here about AI.EPRI.com](https://ai.epri.com)