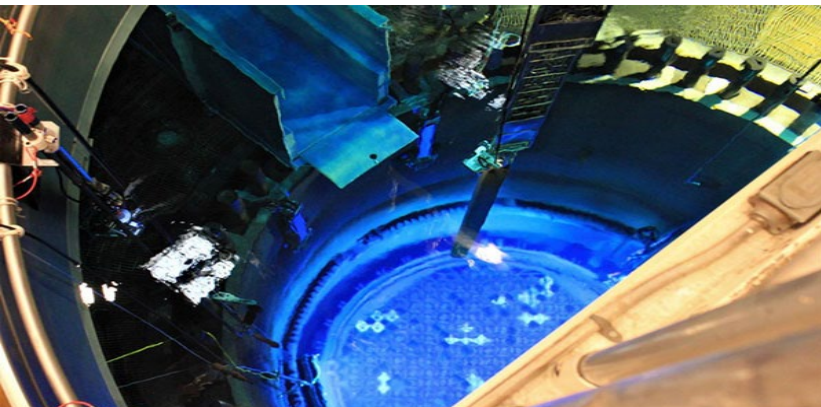




# Use of Artificial Intelligence for Power Uprate Reviews

Tony Nakanishi  
Branch Chief  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

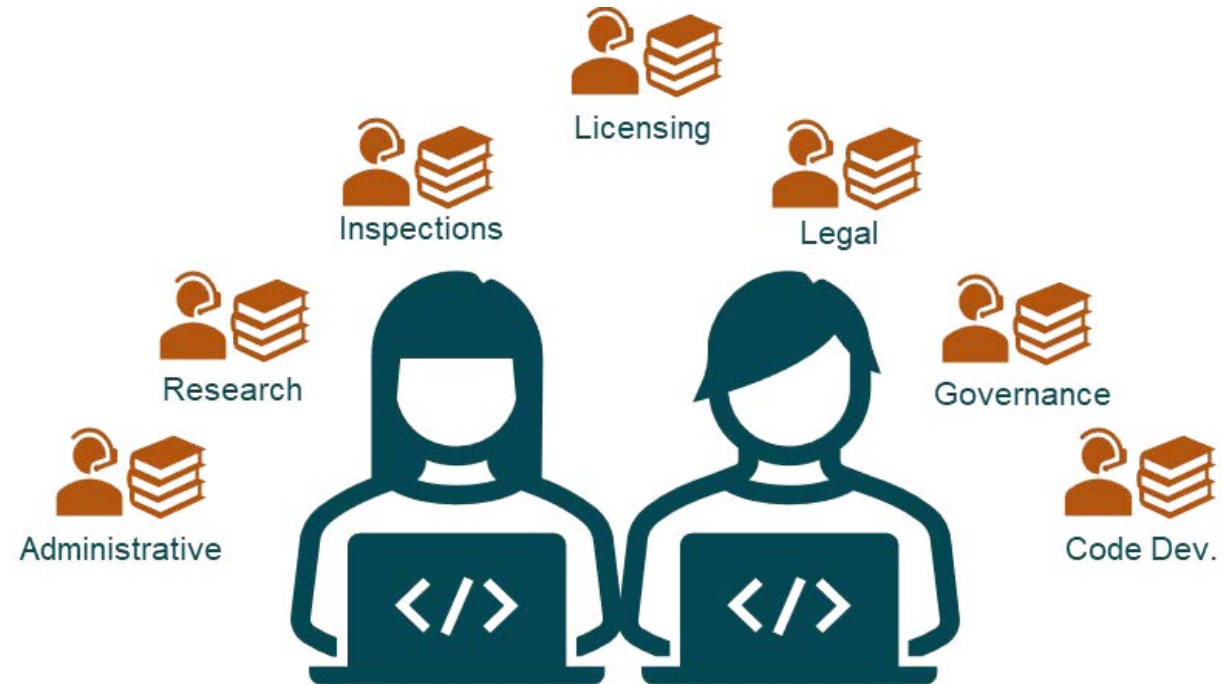


# Agenda

- Introduction to SimplifAI
- Overview of Power Uprate License Amendment Request Process
- Project Manager Companion
- Technical Review Companion
- Lessons Learned
- Path Forward

# SimplifAI

- GenAI tool specifically developed by and for NRC staff
- SimplifAI Companions—tailored for PMs and technical reviewers
- Curated documents and predefined prompts to ensure reliable, traceable outputs.
- Supporting, not replacing, professional judgment



# Simplif**AI** Companion

- Smart AI assistant for NRC staff to find answers and complete tasks faster.
- Dedicated to a specific program or outcome
- Main components of the Companion:
  - **System Message:** Sets rules and goals for how the AI helps.
  - **Groups:** Curated collections of documents for each team or project.
  - **Prompts:** Instructions or questions staff use to guide the AI.

# Power Uprate Review Process



- Guidance (RS-001) defines review scope (~120 technical areas; 17 technical branches)
- Implementing a graded review approach
- Goal: Complete reviews in less than 12-months
- Large repository of historical PUR knowledge (submittals, RAIs, safety evaluations)
- Opportunity to make knowledge readily available to staff

# Project Manager Companion

PM Companion is useful for routine, administrative tasks such as:

- Preparing for kickoff meetings
- Checking if application addresses required elements during acceptance review

## Example Summarization Prompt:

“Using current technical specifications for the plant listed in the application, and the application attached, write a plain language, one page, summary including the following information: 1. Current license information, such as type of plant, type of technical specifications, is the plant a GDC plant and any other necessary licensing basis information 2. Specific changes to the plant and technical specifications. 3. Requested completion date 4. The rationale behind the proposed changes and how they will impact the operation or conditions of the license.”

Acceptance  
Review  
(PM scope)

Acceptance  
Memo

Kickoff  
meeting  
information

Graded  
Approach  
Screening

Plant  
Summary



# Graded Approach Screening – Prompt

“Using the guidance and criteria in the LIC-112 Graded Approach document, create a table and put each numbered technical section from the [Sample] EPU, Section [x.x, title] into bins (1, 2, or 3) and provide an explanation of why each bin was chosen using the criteria in the LIC-112 Graded Approach document.

Add another column that adds the specific criteria that was selected to choose the bin.”

# Graded Approach – Screening Result

## Sample EPU Application

Section No.	Section Title	Bin	Explanation (Why This Bin)	LIC-112 Criteria Used	Quantifiable Information / Margin
2.3.4	DC Onsite   Power System	1	EPU does not materially increase DC system loads; battery sizing and duration remain sufficient.	Not affected by EPU; no change to design/licensing basis, assumptions, or regulatory requirements.	Battery loads and capacity unchanged; duration for safety loads remains as previously licensed.
2.7.6	Engineered Safety Feature Ventilation System	2	EPU increases heat and source term, but ESF ventilation system analyzed and margin to design/qualification limits confirmed.	Affected by EPU, but margin to system/design limits confirmed; NRC-accepted methods	ESF ventilation system at EPU < design limits for flow/temperature/radiological dose; margin maintained.
2.6.5	Containment Heat Removal	3	EPU increases heat load for sprays/fans/coolers; analysis must confirm containment can be cooled within design margin.	Directly affected by EPU; large reduction in margin possible; comprehensive review needed.	EPU peak heat removal demand < system capacity; margin reduced but sufficient.



# Technical Reviewer Companion

- Working with reactor and containment reviewers to systematically evaluate tech review process
- Testing prompts real-time on current applications
- Reexamining our approaches as we curate data
  - Which RAIs are necessary today?
  - What should safety evaluations look like today?

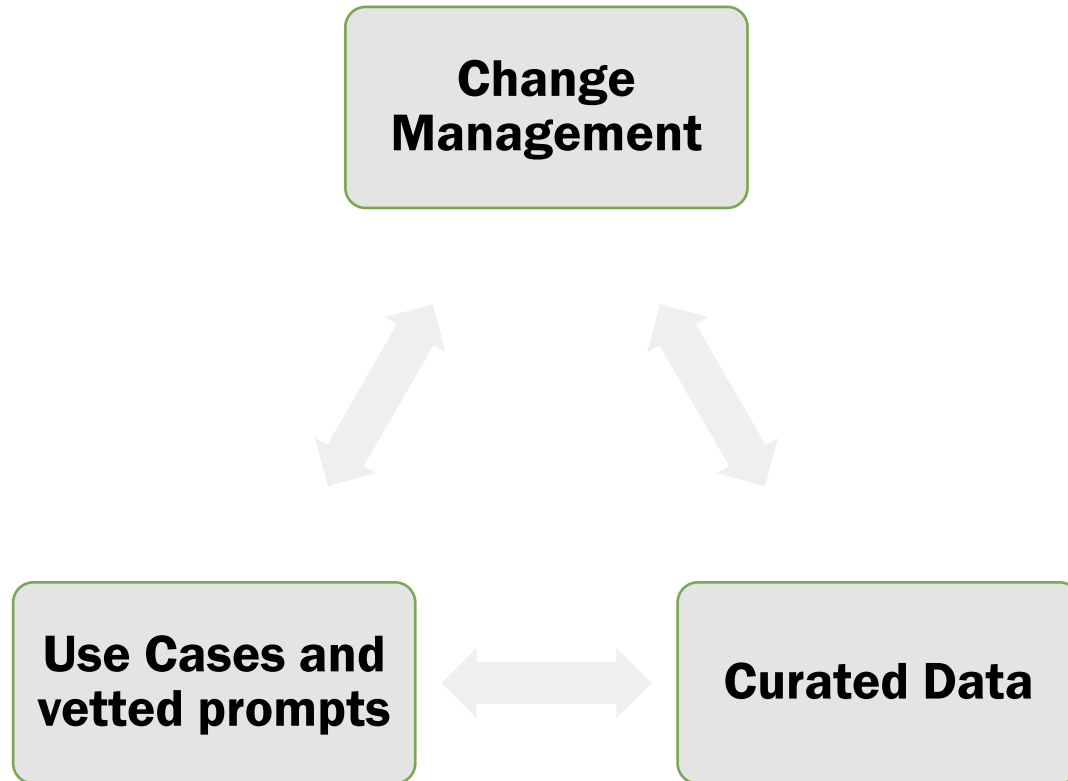
Comparing  
application with  
precedents

Checking  
application  
against past  
RAIs

Extraction of  
relevant  
licensing basis  
info

Technical  
evaluation  
templates

# Lessons Learned



- Managing and communicating expectations on how AI can help
- AI Companion must always be an assistance tool—ensuring human in the loop
- AI performs best when input is curated – NRC will not shortcut this step

# Path Forward

Continue to investigate use cases and collect lessons learned

Continue to build AI expertise and resources within NRC

Track and communicate our successes

# Thank you!

## Contacts

Tony Nakanishi – Branch Chief

[Tony.Nakanishi@nrc.gov](mailto:Tony.Nakanishi@nrc.gov)

Mike Mahoney – Senior Project Manager

[Michael.Mahoney@nrc.gov](mailto:Michael.Mahoney@nrc.gov)