NukeML.AI: On-Prem Nuclear AI

Smarter, safer, more efficient and built exclusively for the nuclear industry



Illustrative scenario, synthetic data

Executive Summary

What it is, where it helps, why now

What it is

On-premises AI platform:

A safer and more efficient digital solution for nuclear O&M

Where it helps

Assist Engineer with AI in Document Digitalization, Compliance Drafting, Intelligent Drawings, Training, Data Cleaning, and Asset Intelligence

Why now

Amidst the global nuclear renaissance and surging power demands, proven AI capabilities meet nuclear-grade security and governance requirements, while enhancing safety and efficiency.

Pain & Opportunity

Manual Search:

- **70%** of plant operations still depend on **massive, static, fragmented** documents (e.g., P&IDs), trapping safety-critical information and causing:
  - Difficult retrieval and inefficient cross-referencing
  - High barriers to cross-discipline collaboration
- **Digital management** of these documents, **with AI-driven deep understanding (e.g., Vision)**, is both necessary and highly impactful.

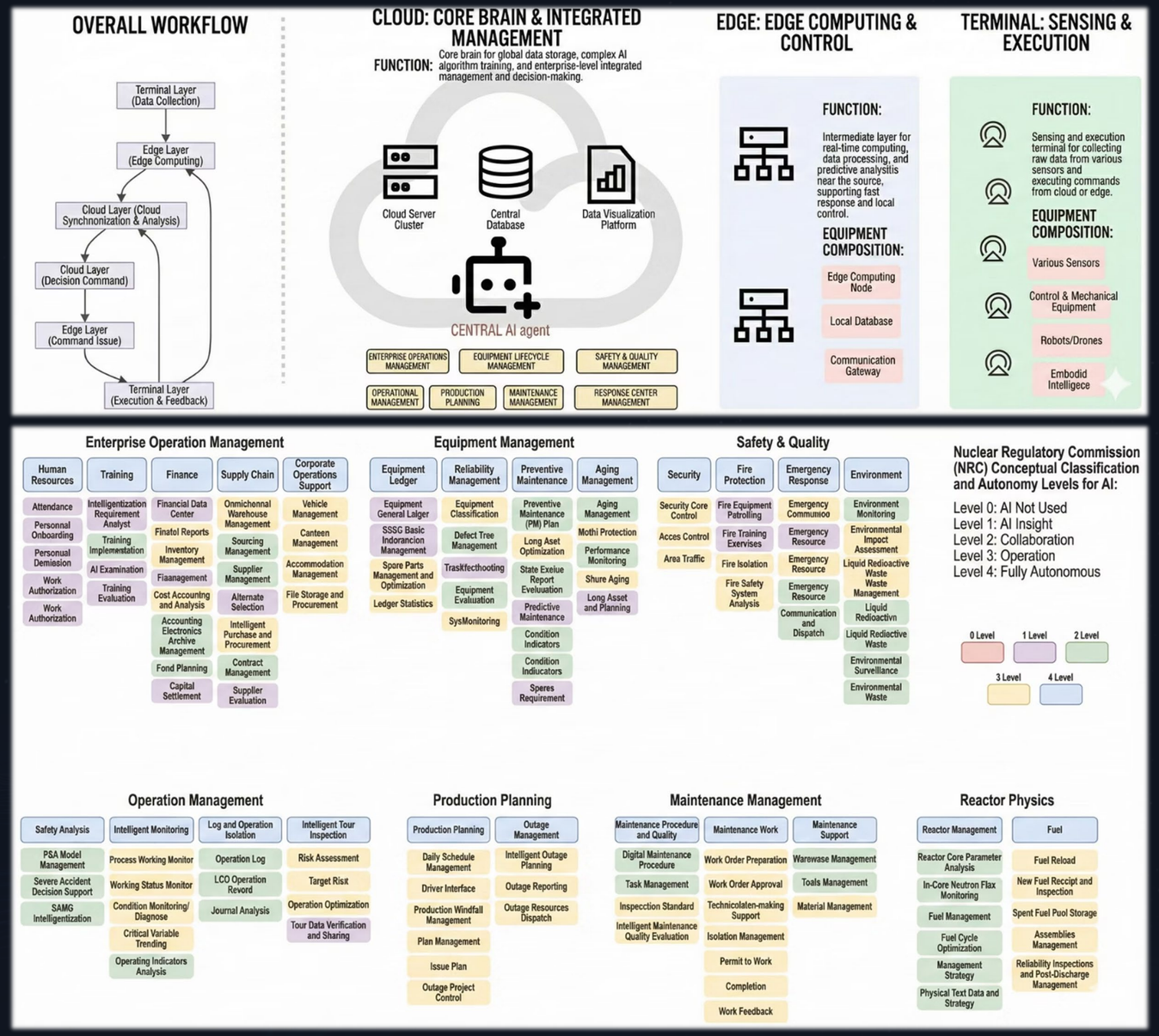
Outage Costs:

- Outage are **financially devastating and unaffordable**
- O&M inefficiencies (e.g., HU Issue) often lead to **unplanned outages**
- **AI solution** is operationally and economically efficient to **reduce such inefficiencies, preventing unplanned outages**

Compliance Costs:

- Regulatory Burden—**Over 100,000 pages per license**
- Zero-tolerance environment—**Massive volumes of safety-related terminology across NRC regulatory papers**
- **Accelerate** the audit process and **improve** the efficiency of compliance drafting **through leveraging AI capabilities (e.g., Long-Text Generation)**

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Architecture at a Glance

Domain-Specific Expert Models

Specialized mini-expert models or skills for different operational domains

Central Agent Orchestration

Central agent coordinates and manages all specialized models and workflows

Hierarchical Decision Framework

Intelligent classification determines the degree of AI intervention (aka. Human-in-the-Loop)

Adaptive Intelligence

Dynamically adjusts the balance between human expertise and AI-driven automation

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NukeML.AI: Flagship Solutions



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Use Case 1

Nuclear AI Assistant Platform

1

Instant and precise answers

with source citations in your routine O&M (e.g., unfamiliar or complex term/procedure/web data explanation)

2

Built-in confidence thresholds

to prevent unreliable outputs

3

Engineer-friendly customization

on Databases, AI models, Toolbox, tailoring a **role-specific AI Copilot** for engineers in O&M

4

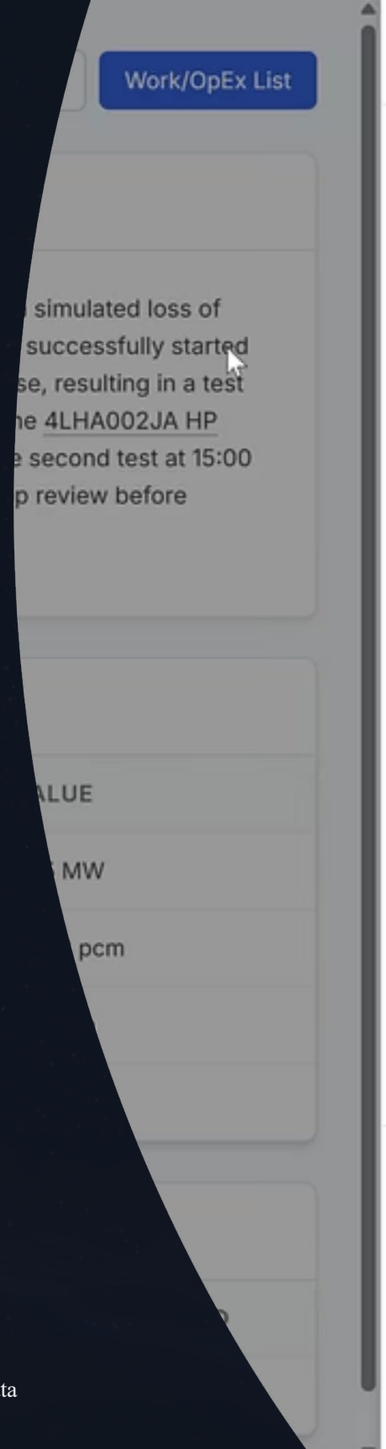
Automated compliance document drafting

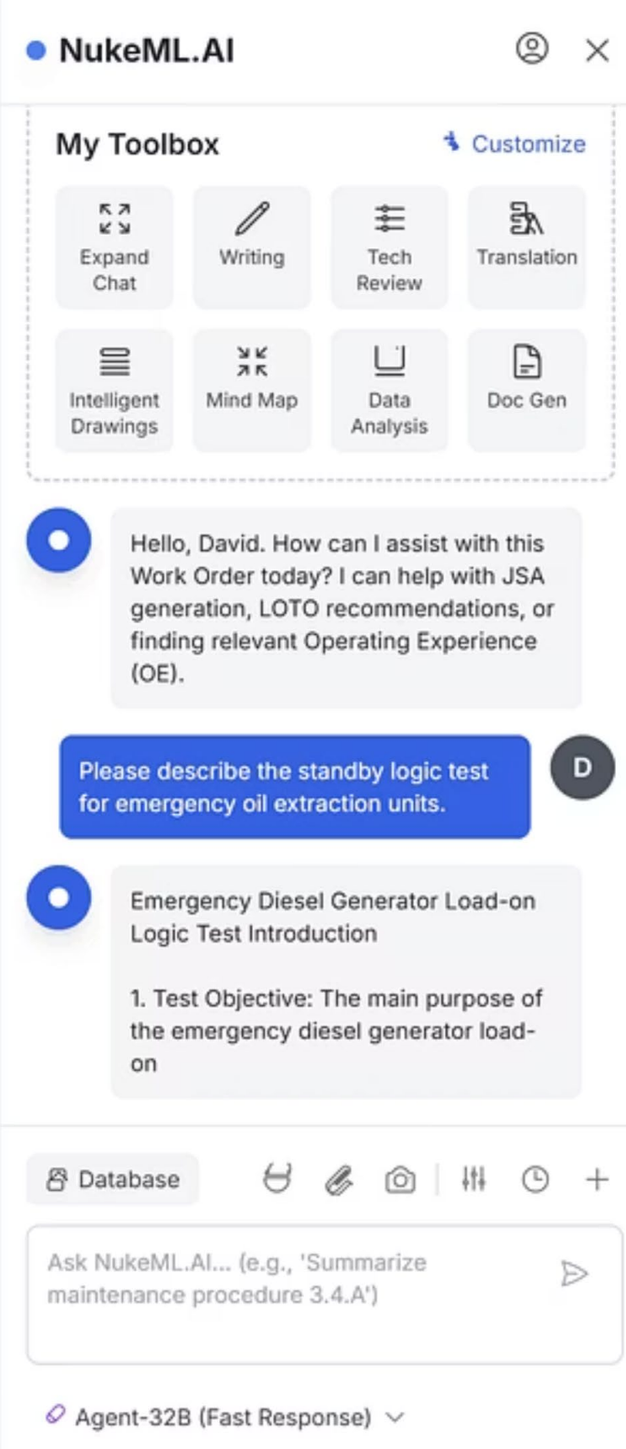
for example, Licensee Event Reports (LERs)

5

Integrated Admin Console for rigorous governance requirements

including Knowledge Base Management, Data Resource Configuration, User Permissions, and System Traffic Monitoring.





The Product Demo has been attached on NukeML.AI website, please check it out ☺

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Use Case 2

Intelligent Drawings

1

Digital drawings with rapid and precise search

based on efficient management on your drawing library

2

Instantly highlight and center on the target equipment for the task

via intelligent search box

3

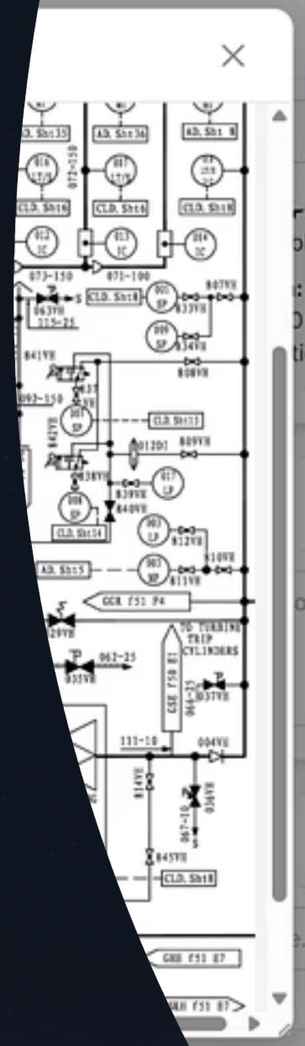
Access the relevant information of the drawing and target equipment immediately

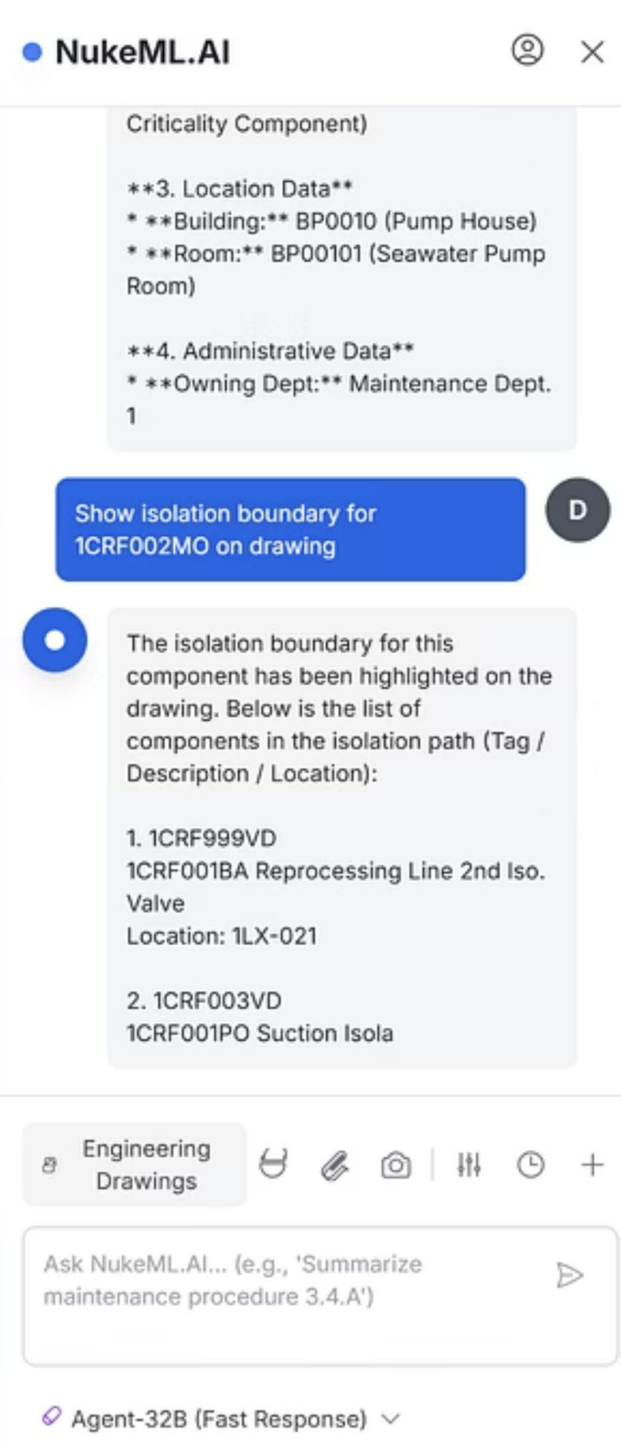
through engineer-friendly conversational interaction

4

Topological awareness

powered by an AI vision model trained on nuclear engineering drawings, enabling precise, drawing-based decision support for engineers





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Use Case 3

Intelligent Training Platform

Competency Modeling for Every Position

- maps Knowledge, Skills, and Behavior (Attitude) compliant with INPO standards for every position

Training Plan Drafting Based on Competency Model

- generates tailored training plans for every position to meet the competency requirements

Course Dev + Management

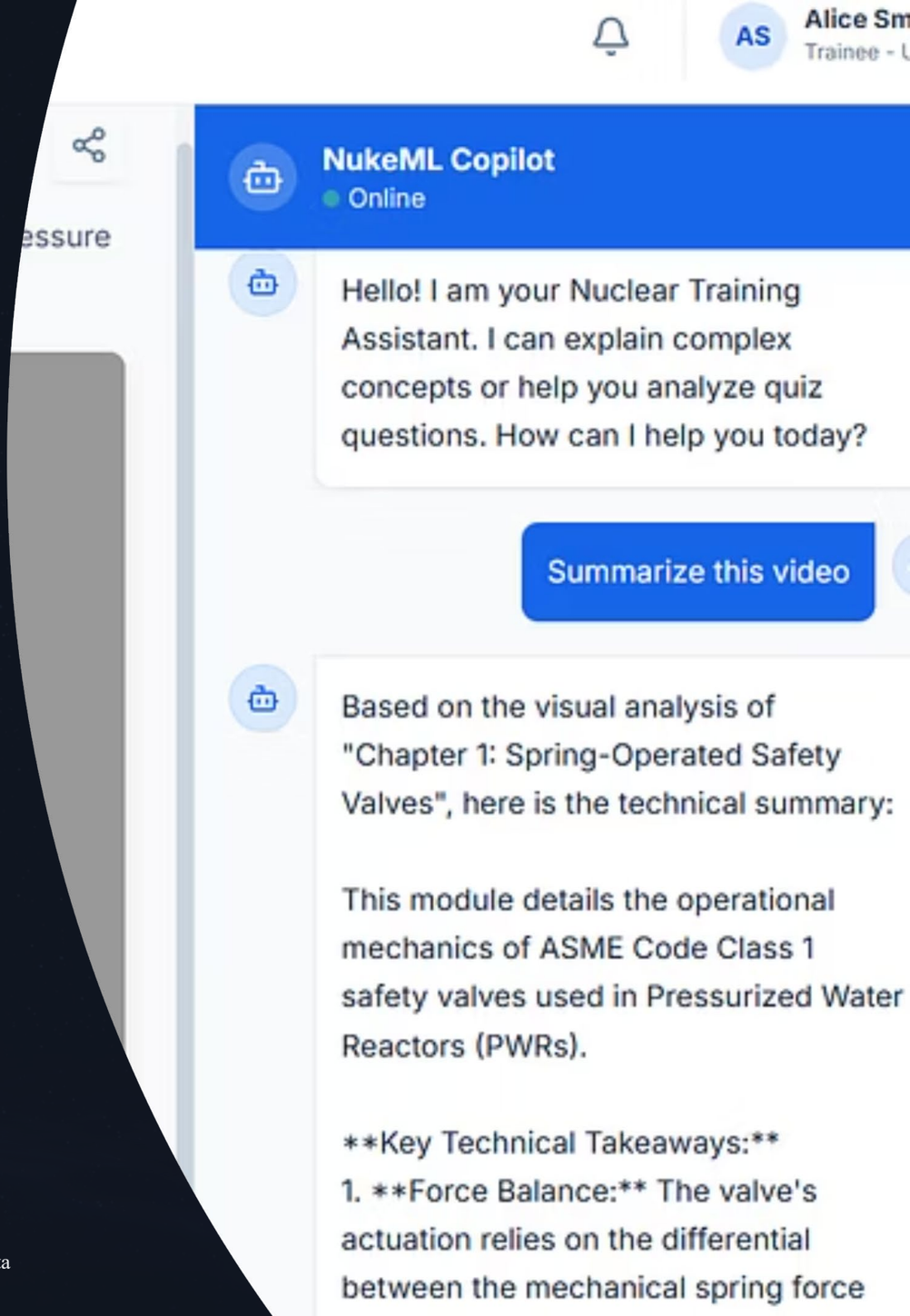
- Efficient material creation (e.g., slides, textbooks, lecture scripts, etc.) powered by AI
- "One-click" distribution of course updates to students via Emails, Teams, and WhatsApp, with trackable student status of learning such as score and completion

Training Portal for Students

- 24/7 AI expert assistance for learning
- Personal Learning Evaluation support powered by AI, including personalized learning analysis, and targeted recommendations

Training Evaluation

- provides comprehensive macro insights into course effectiveness for instructors, including knowledge gaps, frequent remediation topics, and engagement-performance metrics across the whole cohort



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Use Case 4

Intelligent Data Cleansing Platform

Gives your proprietary data a voice

Unstructured/Structured Data Cleansing

- break down data silos, transforming your disorganized, unstructured documents into an AI semantic library such as extracting key elements such as images/tables/json/md from a simple input such as PDF and Word

Multi-source Heterogeneous Data integration

- Supports access to multi-source heterogeneous databases
- supporting both structured and unstructured data

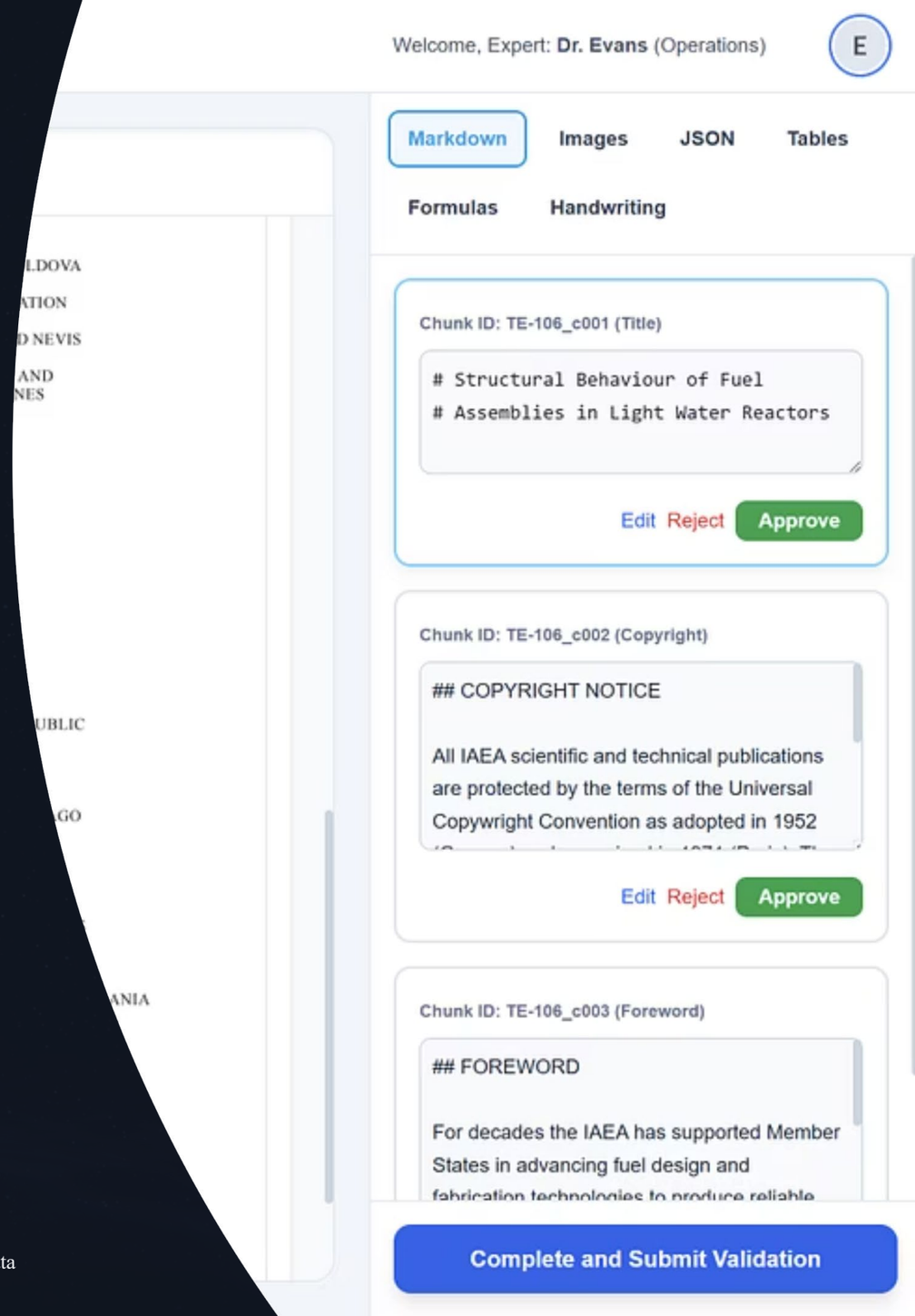
Customize the Entire Cleansing "recipe" with Trackable Cleansing Progress

- Configurable, data-type-specific cleaning strategies incorporating vector models, intelligent chunking, and data desensitization.
- Save and reuse multiple data cleansing pipeline configurations.

Fully Controlled Data Security and Operations

- Real-time monitoring of Q&A accuracy, error logs, and user feedback
- High-quality semantic database access permissions managed by built-in Database API Permission Management

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From self-service platform access to fully managed solutions, find the perfect fit for your team's data operations.

Platform Subscription

Access our powerful data cleaning platform to process your documents on-demand.

Recommended

Consulting Service

Everything in Platform, plus expert guidance to optimize your specific workflow.

Full-Service Package

A complete, end-to-end managed solution for your most critical data operations.

Additionally, our Intelligent Data Cleansing Platform offers

Flexible Plans to Meet Specific Needs

Including Platform-Only, Platform with Expert Consulting Service, and End-to-End Full-Service Package

For Non-Sensitive Environments

We provide Platform Licensing with Expert Consulting Service and End-to-End Data Cleaning Full-Service Package, combining our proprietary toolchain with expert execution services

For Highly Sensitive Environments

We strictly adhere to an On-Premise Platform Licensing Plan, ensuring total data sovereignty and security compliance

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Use Case 5

Intelligent Asset Management Digital Twin Platform

Reinvent the 6 modules of AP-913 Equipment Reliability Management standards via AI

3D digital twin of assets at the center with AI Copilot and Live Monitoring Tab on the sides

Scoping and Identification

By referencing Technical Specifications and historical data, it autonomously proposes safety classifications and SPV status—boosting onboarding efficiency while ensuring regulatory rigor.

Performance Monitoring and Predictive Maintenance

The platform offers live performance monitoring of assets with the data trend analysis capability and physical explainability, enabling engineers to engage in high-level dialogue with the AI Copilot in human language to solve multi-layer monitoring tasks—from computing 7-day T-avg thermal trends to complex predictive maintenance with transparent physical explanations

Corrective Action

Our AI Agent strictly adheres to NRC Safety Tiers and ensures the "Human-in-the-loop" in transient emergencies (e.g., a significant pressure drop of a SPV)—AI only assists engineers with reliable and timely suggestions based on on-site operational conditions, historical corresponding event reports, and other reliable references, while the engineer grants final authorization

Maintenance Strategy Optimization

Based on historical trends and real-time health monitoring, our AI Agent proactively identifies over-maintained or under-maintained assets and proposes an optimized Preventive Maintenance interval for the assets, which efficiently reduces O&M costs and optimizes safety

Continuing Improvement & Life Cycle Management

Our AI Agent can automatically aggregate all maintenance history and provide a closed-loop evaluation of pre- and post-repair performance of an asset with accurate condition assessment and Remaining Useful Life (RUL) predictions

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Preliminary ROI Analysis

Initial estimates suggest significant returns from NukeML.AI across key operational areas.

Product Module	Key Value Driver	Conservative (USD/unit/year)	**Base Case (USD/unit/year)**	Aggressive (USD/unit/year)
1. Nuclear AI Assistant	Knowledge Asset Retention & Automated Compliance Documentation Generation	$610,000	**$1,150,000**	$1,800,000
2. Intelligent Drawings	Design Basis Control & Engineering Rework Avoidance	$750,000	**$1,400,000**	$2,800,000
3. Intelligent Training	Reduced Time-to-Competency	$350,000	**$750,000**	$1,200,000
4. Intelligent Data Cleansing	Legacy Data Governance & Release of High-Value Engineering Hours	$300,000	**$550,000**	$900,000
5. Intelligent Asset Management Digital Twin Platform	Reinvention on AP-913 Asset Management via AI (e.g., Predictive Maintenance and Maintenance Strategy Optimization)	$450,000	**$950,000**	$1,850,000
Total Operational Benefit	Cost Reduction & Efficiency Gains	$2,460,000	**$4,800,000**	$8,550,000
Strategic Add-on	Unplanned Outage Avoidance (1 Day)	—	**$1,500,000~$3,000,000**	more than 1 day
GRAND TOTAL	Total Annual Impact	$2,460,000	**~$6,300,000 ~ $7,800,000**	$8,550,000+

Annual Subscription & Implementation Fees: Estimated range of **$1,500,000 – $2,000,000** per unit per year.

Projected ROI: ($6,300,000 - $2,000,000) / $2,000,000 × 100% = **215%**

FYI: The report ***Scalable Methods to Automate Manual Work Management Activities Using Artificial Intelligence*** of INL in 2024 shows a potential cost savings of **$14.5M** per nuclear power plant unit per year

Main Sources: BLS, NEI, McKinsey, CAD Crowd, Westinghouse, IAEA, DOE, NRC, INL, Frost & Sullivan White Paper, EPRI, and Exelon, etc.

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