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CASE STUDY · MARLUC SYNOPSIS

Idaho National Laboratory AI for nuclear licensing documents

IMPLEMENTED 2025 ONWARDS · SCIENCE AND RESEARCH · US · BAND D · CLAIMED ONLY

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Idaho National Laboratory and the Department of Energy tested AI that drafts nuclear licensing documents; in one 2026 test it produced a 208-page draft in a day, which an expert then reviewed.

ABOUT THIS SYNOPSIS

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Facts and figures are as reported by the sources listed below, which may be incomplete, self-reported or out of date. Check the original source before relying on any figure.

The impact band, proof marker and SEAM view are MarLuc's opinion. The organisation is not a MarLuc client and has not reviewed or endorsed this synopsis. Names and trademarks belong to their owners.

NOTICE WORDING LAST UPDATED 16 NOVEMBER 2026

AT A GLANCE

AI used: Generative AI that drafts nuclear licensing documents from engineering and safety source documents.

Implemented: 2025 onwards. Grade: band D, Task support, Claimed only.

Headline result, as reported: A 208-page licensing draft generated in one day against four to six weeks by a team, in a single Department of Energy demonstration, March 2026

1 · The case

The facts, as reported by the 4 sources listed at the end. Where a source is silent, the field says "Not reported".

Organisation

Idaho National Laboratory, with the US Department of Energy. US national laboratory for nuclear energy research, managed by Battelle Energy Alliance for the Department of Energy. The work was funded through the National Reactor Innovation Center based at INL. Canvas block: 4. Operations and process. Also 8. Governance and risk, 6. Data and technology.

Business challenge

The challenge. Generating the large engineering and safety reports needed for construction permits and operating licences is time-consuming and expensive, INL says. The Department of Energy says the licensing process involves multiple rounds of manual review and can take years.

Who implemented it

Microsoft (Model or cloud provider): Developed the Azure AI solution for INL and hosts Gordian on Azure.
Everstar (Software vendor): Supplied the Gordian AI used in the 2026 demonstration.
Argonne National Laboratory (University or research lab): Partner in the 2026 demonstration.
In-house (In-house): Idaho National Laboratory: leads the research and is developing its own AI tools.

Technology (SEAM pillar E)

SEAM types: T3 API integrations, T7 AI agents. Deployment: Cloud APIs. Vendors and products: Microsoft, Everstar, Azure AI services, Gordian.

Where it was built in: Source engineering and safety documents are ingested and mapped to NRC licensing document sections; drafts go to experts for verification.

What changed

Before: teams compile licensing documents by hand, four to six weeks for the task tested, by the Department of Energy's account. After: in one demonstration, AI produced a 208-page draft in a day and flagged missing information, then an expert reviewed it. No change to live licensing practice is reported. [1] [2] [3] [4]

What it cost

Not reported

What it saved

In the demonstration, one day against four to six weeks, by the Department of Energy's account. Money saved: Not reported. An NRIC study suggested up to 50% shorter document development and review cycles; this is a potential, not a measured result. [1] [2] [3] [4]

Governance and control

INL says the tool constructs documents for subsequent human verification and does not perform the analyses. The Department of Energy describes a rule that experts design, AI accelerates and experts validate, and one expert evaluated the demonstration output. Regulator review: Not reported.

S2 · Accountable owner · Claimed
INL's associate laboratory director for nuclear science and technology and the Department of Energy's Office of Nuclear Energy speak for the work; a named owner is not reported. [1] [3]

A1 · Safe use · Claimed
INL says the tool does not perform analyses and only constructs licensing documents. [1]

A2 · Human in the loop · Claimed
Drafts are for subsequent human verification, and an expert reviewed the demonstration output. [1] [3]

A3 · Monitoring and assurance · Claimed
A reviewing agent and a benchmarking rubric were being developed to check drafts against NRC guidance. [4]

A4 · Vendor AI · Not reported
Built on Microsoft Azure and Everstar's Gordian; vendor controls are not reported. [3]

A5 · Agent controls · Not reported
A planned reviewing agent is described; its controls are not reported. [4]

A6 · Standards and regulation · Not reported
No NRC review of AI-drafted documents is reported.

What worked, what did not, what is unproven

WORKED

– Drafting speed in a single demonstration, by the Department of Energy's account.

– The tool identified missing or incomplete information needed for an NRC application, by the Department of Energy's account.

DID NOT

– Not reported

UNPROVEN

– Whether the NRC accepts AI-drafted applications, and whether review times fall.

– Accuracy across many documents: the benchmarking rubric and reviewing agent were still being developed.

– Results from INL's own Microsoft-built tool, as distinct from the Everstar demonstration.

Timeline

2023 INL and Idaho State University build a reactor digital twin on Microsoft Azure [1]

Jul 2025 INL and Microsoft announce AI to generate engineering and safety analysis reports for licensing [1]

Mar 2026 Department of Energy reports a demonstration converting a safety analysis into a 208-page NRC-style draft in one day [3]

Mar 2026 Partners plan a reviewing agent and a benchmarking rubric to validate drafts against NRC guidance [4]

2 · Grade and SEAM assessment

MarLuc's opinion, made on the evidence above. How cases are graded: marluc.co.uk/case-studies/how-we-rate

Level of change and impact

Claimed: Not applicable. Grade: D, Task support. Proof: Claimed only. Level of change: Task support.

Task support (Level 1, band D). AI drafts documents that experts still verify, in a demonstration; the licensing process itself is unchanged so far.

The SEAM view and lessons learnt

Drafting regulated documents is a natural fit for generative AI because experts already review every page. The control that matters is the separation between drafting and engineering judgement, which INL states plainly. For any organisation with heavy regulatory filings, the transferable step is to benchmark AI drafts against the regulator's own guidance before claiming time saved.

1. Keep engineering analysis with experts and use AI for drafting.
2. Benchmark AI drafts against the regulator's guidance before use.
3. Count time saved only once a regulator has accepted the output.

Evidence

Score 1 of 4. Self-reported: the laboratory's and the department's own accounts of one demonstration, relayed by trade press.

Evaluation method. Self-reported demonstration: one test case with a single expert review; no comparison group or independent evaluation.

Sources disagree. The Department of Energy's March 2026 article says INL collaborated with Microsoft earlier this year; INL announced the collaboration in July 2025. INL's 2025 tool does not perform analyses, while the Department of Energy describes Everstar's Gordian as equipped with physics and engineering tools; these are different tools.

Status. Ongoing: research and validation; no licence application drafted this way reported as submitted at 16 November 2026.

3 · Original sources

Read these in full. To challenge a fact or a grade, use the contact form at marluc.co.uk or the link on https://marluc.co.uk/case-studies/inl-ai-nuclear-licensing-documents

[1] Idaho National Laboratory: INL collaborates with Microsoft to streamline nuclear licensing (July 2025)
https://content.govdelivery.com/accounts/USDOEINL/bulletins/3e96b9f

[2] Nextgov/FCW: Idaho National Lab teams up with Microsoft to improve nuclear permitting reviews
https://www.nextgov.com/acquisition/2025/07/idaho-national-lab-teams-microsoft-improve-nuclear-permitting-reviews/406772

[3] US Department of Energy, Office of Nuclear Energy: Department of Energy Unleashes AI to Reduce Reactor Licensing Timelines (March 2026)
https://www.energy.gov/ne/articles/department-energy-unleashes-ai-reduce-reactor-licensing-timelines

[4] Power Engineering: Can AI help the DOE reduce nuclear reactor licensing timelines?
https://www.power-eng.com/nuclear/can-ai-help-the-doe-reduce-nuclear-reactor-licensing-timelines/

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