Powering the Future With PLM

CASE STUDY

Powering the Future With PLM
COMPANY BACKGROUND

NuScale Power is developing a new modular light water reactor to supply reliable and abundant carbon-free nuclear energy. Their groundbreaking small modular reactor (SMR) design features a fully fabricated NuScale Power Module™ capable of generating 60 MW of electricity using a safer, smaller, scalable version of pressurized water reactor technology.

“When performing our selection for a fully functional PLM platform, it was apparent that Aras was the most cost effective, flexible, and resilient solution for NuScale.”

- Neil Olivier, Director of Corporate Services at NuScale

PROBLEMS & CHALLENGES TO BE ADDRESSED

- While the NuScale SMR design is vastly simpler and safer, the design must still satisfy the same requirements of traditional plants. (A U.S. based nuclear power plant must meet over 60k safety, regulatory, and quality requirements.)
- Legacy plants have struggled largely because information is document based, with no clear way to link requirements to the physical design.
- Design requirements come in many forms: regulatory statements, code requirements, bounding parameters, customer requirements, or site-specific requirements.
- Design changes can come at various times, from many sources: the federal government, the customer, industry initiatives, or out of necessity.
- It all boils down to controlling requirements.

GOALS

- Manage all design requirements
- House all quality and non-quality records
- Manage all engineering design changes
- Manage enterprise change
- Automate all engineering work tasks
- CAD Management
- BOM Management
- Simulation Management
- Maintenance Management
- Virtual design reviews
- Replace up to 12 commercial and custom-built applications
NUSCALE’S PLM JOURNEY WITH ARAS

Founded in 2007, NuScale’s sole purpose is completing the design of and commercializing a small modular reactor (SMR)—the NuScale Power Module (NPM). NuScale’s mission is to improve the quality of life for people around the world by providing scalable advanced nuclear technology for the production of electricity, heat, and clean water.

NuScale is taking a whole new approach to nuclear power. Their unique, self-contained modular reactors are capable of generating 60 megawatts of electricity and can be combined with other modules (up to 12 total) in a single power plant. NuScale’s first plant is slated to begin operation in the U.S. in 2026.

A veteran of the nuclear power industry, Neil Olivier, NuScale’s Director of Corporate Services, arrived at the company in 2015 and quickly discovered that there were multiple databases controlling the information surrounding various engineering processes, including design control and configuration management. According to Olivier, “We had different systems controlling various aspects of our design control process, everything was managed by PDF paper-based processes, with pointers between the systems. As I started managing more and more groups, I realized there are systems and processes everywhere and they’re all disparate databases.”

At that time, NuScale had Teamcenter® in place, but it was being used solely for handling document control. In addition, there were cumbersome processes for managing the configuration of the design so that the information and the document control system were kept accurate. The reliance on document-based systems for something as complex as a nuclear plant is not unusual and has historically made linking information to the physical design a significant challenge.

As it happened, and unrelated to Neil’s findings, there was already a study underway to explore the feasibility of implementing PLM at NuScale. Ultimately, one of the study’s recommendations was to eliminate the existing document control system and implement a PLM system that would house all the data and allow for the establishment of a digital thread. A subsequent visit to a CIMdata conference presented him with the opportunity to speak
with a presenter from Microsoft who had detailed his company’s experience doing a “rip and replace” of Teamcenter. Upon further inquiry, Neil discovered that the replacement PLM system was Aras Innovator.

On his plane ride home from the conference, Neil and a co-worker downloaded Aras Innovator and started exploring what it could do. This experience led him to expand his vision for PLM at NuScale. “I should be integrating the current corrective action program. I should be integrating all my design control processes. I should be integrating open design items. I should be integrating how I finalized records in this. I should be integrating all these things. We have a chance to simplify everything into one system, so that employees aren’t putting a corrective action item into one system, then using that system to track a design change that is also tracked and controlled in the design control process, and then having to enter that engineering product in the document control system, and then the final record into the records management. And then there has to be another record that wraps up this corrective action and proves that we did it for regulatory purposes. So it just snowballed.”
A NEW APPROACH TO NUCLEAR POWER NEEDS A NEW APPROACH TO PLM

Neil says that, with Aras, NuScale has changed their approach to PLM. "I have three Aras development teams versus two guys sitting in a cube that are managing Teamcenter. We’re only doing the minimum to sunset the old systems to pay for the new system because when you start sun-setting all these old systems, the cost savings on those offset the costs incurred on Aras."

He continued, “We are now configuring rather than trying to do as much out-of-the-box as we can. We are customizing where we see the need that will give us real long-term value. A good example is we have to keep track of all our design control meetings. We have all kinds of other regulatory meetings that need to be documented and the way to do it now, if somebody types it up, we flop a cover sheet on it, we turn it into a record. If it’s in the system, they just open up an item up...fill out the pertinent information, and then select whether it’s a record or not, and it pumps it out. We’re going to save a ton of support time. And so that’s the goal really—that we stop having to do so much admin help to get things done and the system is designed from the ground up to do that.”

SIMPLER DOESN’T MEAN FEWER REQUIREMENTS

While NuScale’s SMR design is much simpler, they must still meet the same requirements for safety, regulations, and quality as those of a traditional nuclear plant. Neil and his team are aiming to take a very requirements based approach to designing engineering and to designing the plant—particularly in terms of the module and the reactor itself. With his many years of nuclear power experience, Neil says that he has experienced the pain of inefficient paper-based processes to manage requirements first-hand. "I’ve worked at nuclear power plants all my life. And as a licensed operator, I used to have to validate that an engineering change to the plant was done correctly. And it was nauseating to go back through all the paperwork and try to validate that. A good example, is a heat exchanger or any pump, the pump has its core function what to do, but it also has ancillary functions…and those requirements were never really easily linked and accumulated in one set, in one concise place.”
A “ONE STOP SHOP” FOR REQUIREMENTS

Configuration management throughout lifecycle, from concept through decommissioning, is NuScale’s goal for Aras PLM. NuScale’s goal is to use Aras Innovator as a “one stop shop” for all requirements down to the part level. For example, going from the highest level requirement a plant would have to withstand, all the way to the individual pump that has to be able to withstand high temperatures for 30 days in the event of a failure in the electric grid. In the past, with paper-based systems, this level of requirements management was simply impossible due to the sheer volume of information required. According to Neil, “If I have a system that says this requirement, and it decomposes those requirements as systems engineering, down to the part level, and then on top of that, you test it and you have all the documentation that’s attached to it and you’ve verified that it meets those requirements at any given time, when I need to replace that, I just go click. And so that’s the goal—that this super complicated piece of machinery, this plant, has the ability to trace those requirements down to the part level at any given time. And you can tell, that pump’s supposed to be able to run for 30 days. And we just did a test and it only lasts 27, therefore it’s inoperable and I need to go fix it. It makes it very clear and concise.”

Unlike traditional nuclear power plants that are designed as a single, large stand-alone facility, NuScale’s plants are made up of individual power modules that are manufactured in an offsite factory and then transported to the plant’s location. NuScale’s goal is to approach design changes in much the same way as the aircraft manufacturers treat different versions of aircraft—managing all requirements and variants in one place.
LIFECYCLE TRACEABILITY FOR A SINGLE SOURCE OF TRUTH, DIGITAL THREAD, AND DIGITAL TWINS

The NuScale NPM will be the first nuclear power plant to be designed and managed with PLM as the backbone for its single source of data. This will allow configuration management of multiple iterations of the same design, ensuring that the original design requirements are always met, within any variation or design change. Furthermore, Aras Innovator’s platform architecture allows NuScale to apply systems engineering principles, driving requirements down to any part in the BOM with clear traceability—ensuring that their customers can maintain Configuration Management of the design, whenever a design change occurs.

NuScale’s customers, the owner/operators of a plant, can be provided with a Digital Twin containing all relevant design engineering information. With the Digital Twin, design requirements for each part will be traceable. With Aras PLM, all owners/operators will be able to consistently manage configurations throughout the entire lifecycle of the plant while, at the same time, staying in alignment with licensing and safety requirements.

INTO THE FUTURE

And, what’s next on the horizon for NuScale and Aras? Neil Olivier is already looking toward the future. “We are setting our system and our processes up so that we are constantly going to be adding functionality. So, simulation management’s way down the horizon but will be great. Virtual walk downs of the design will be great. A lot of things that we want to go do are just, they’re on the back burner, because we’re going to have to incorporate our corrective action program in the next phase, we’re looking at building out separate databases for, or modules for trainings and things like that. So, there’s all kinds of things on the horizon that we’re looking to do. And that’s why we were hiring and developing three development teams—so we can constantly be modifying and be adding to the platform.”
"With Aras we believe we will realize the benefits of the digital thread sooner, at lower cost, with a platform that can transform with NuScale. The unique architecture easily adapts to meet the changing processes and business requirements of our company and industry. Customization is not only allowed, but encouraged, with solutions tailored to our needs, rather than tailoring our processes to the software."

"The Aras PLM Platform scales to support increasing demands. Extending our solution to accommodate a growing global supply chain will be essential in the future, with eventual access for suppliers and distributed teams that will increase performance and communication, ensuring that information is available to the correct people at the correct time. This was not possible under a traditional software licensing structure."

"Aras’ unique architecture enables system upgrades without disrupting custom functionality, and most important, system upgrades are guaranteed, and are performed at zero cost to NuScale. Historical upgrade costs to our legacy PLM system (with limited module functionality) were averaging $100k per upgrade. Aras offers a much lower long-term cost of ownership."

"Aras will allow NuScale to manage a variety of tools and databases in a way that would not be possible in other PLM systems. A good example is CAD, there are multiple vendors that will be required to be engaged, and they use various CAD authoring tools, being able to manage and store those files in concert, is essential to NuScale in the future."
Aras provides a resilient platform for digital industrial applications. Only Aras offers open, low-code technology that enables the rapid delivery of flexible, upgradeable solutions for the engineering, manufacturing, and maintenance of complex products. Aras’ platform and product lifecycle management applications connect users in all disciplines and functions to critical product data and processes across the lifecycle and throughout the extended supply chain. Headquartered in Andover, MA with major offices throughout the world, Aras supports more than 350 global multinational customers and over 250,000 users. The Aras Innovator platform is freely downloadable. All applications are available at a single subscription rate, which includes all upgrades performed by Aras. Aras customers include Airbus, Audi, Denso, GE, GM, Honda, Kawasaki, Microsoft, and Nissan.

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