

INFRASTRUCTURE,
ENERGY & MATERIALS

THE STRATEGIC GUIDE TO MAXIMIZING EFFICIENCY IN SMR PROJECTS

Empower design, simulation, collaboration
and end-to-end scaling, all on one platform.

INTRODUCTION

ADVANCING TOWARDS A NET-ZERO TOMORROW

In our collective journey to net zero, the construction of new power generating assets is essential to decarbonize transport, generate heat for buildings and power the industry and businesses while providing national energy independence.

New civil nuclear power plants are expected to play a key role in the energy transition, alongside other forms of energy generation, storage and demand-side management. Recent Nuclear Energy Agency analysis (NEA no. 7628) finds that meeting the average of the International Panel on Climate Change pathways consistent with a 1.5°C scenario will require tripling the global installed nuclear capacity by 2050.

This creates a need for nuclear companies to prioritize scalability for low-carbon energy production to meet global demands while aligning with net zero goals.



There are four main types of new build civil nuclear power plants:

Gigawatt-scale reactors

These massive infrastructure projects, such as Hinkley Point C in the UK, use existing designs which focus on plant scale to maximize the long-term levelized cost of electricity.

Small modular reactors (SMRs)

They are based on the evolution of proven Generation III or more novel Generation IV fission technology, where a focus on production rather than plant scale allows design simplicity, standardization and factory fabrication to lower capital cost.

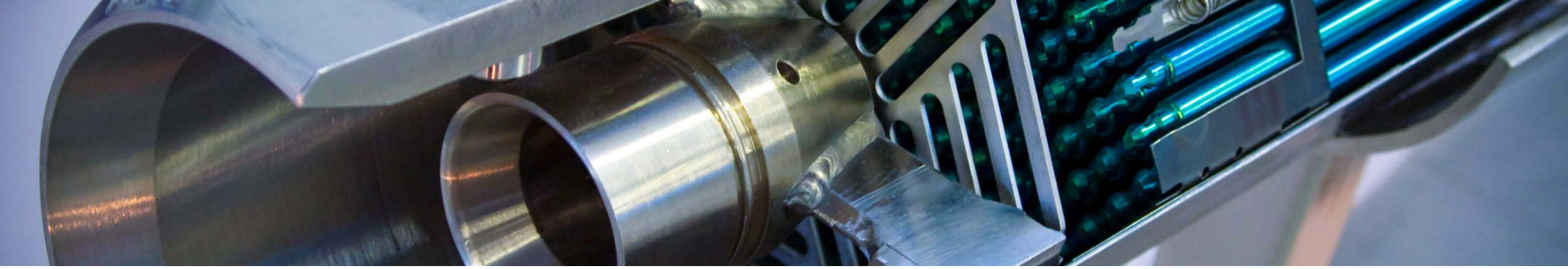
Fusion reactors

The fusion energy market is gaining significant investment as governments, private companies and research institutions race to turn decades of research into low-cost power generation with lower environmental impact.

Microreactors

They are factory-fabricated with transportable units that reduce capital cost and construction time. With responsive self-adjusting properties, they will automatically utilize passive safety systems to prevent any potential hazards.





All nuclear new build projects, however, face a number of challenges regarding regulatory compliance, workforce and skills availability, as well as cost of development and construction.

As a relatively new technology, the cost effectiveness of SMRs stemming from economies of scale magnifies its potential to power a low-carbon future. However, the SMR technology is not expected to reach the commercial market until 2030, as SMRs' commercial viability still needs to be proven in practice.

According to the International Atomic Energy Agency (IAEA), there are currently four ongoing SMR constructions in Argentina, China and Russia. But there is only one operating prototype, a floating nuclear power plant, which has been operating at full capacity since May 2020.

Since 2016, the United Kingdom has been investing around £460 million of public funds towards developing SMR technology. With the goal of commercial deployment by 2030, the low cost nuclear (LCN) program is expected to generate up to 40,000 high-value jobs for the British economy.

There is also increasing interest towards SMRs in developing Southeast Asian countries. Indonesia announced plans to build a small 10MW experimental High Temperature Reactor (HTR) back in 2014.

As a technology leader driving innovation across various industries, Dassault Systèmes believes now is a critical moment to stimulate digitally transformational conversations in the nuclear industry.

We focus on three pillars of business sustainability:



People: The required workforce growth and upskilling challenges necessitate solutions that will empower and optimize teams.



Business models: Following a data-centric approach in new nuclear build is the key to improved efficiency, sustainability and predictability.



Products: Our **3DEXPERIENCE®** platform helps reactor vendors, construction companies and supply chain partners collaborate and mitigate risks that have the potential to undermine successful project delivery.



Digital Continuity

The plant lifecycle is connected by a series of decisions, where the ability to make effective decisions is crucial for the successful delivery of a SMR plant from concept to decommissioning.

Dassault Systèmes believes that effective decisions need to be informed, traceable, timely and communicated. Data-centric methods such as PLM and BIM Level 3 can play a significant role in all four aspects of effective decisions in the manufacturing and construction phase of a project:



Informed

An effective digital strategy democratizes data, revealing the right to empower effective decisions at every level.



Traceable

Robust systems to manage and record change provide a trusted data set to underpin reliable decisions.



Timely

Less time spent finding and validating information results in faster decisions, reducing the time and cost of change.



Communicated

Effective communication enables efficient action following a decision, reducing re-work and delays when plans change.

Product lifecycle management (PLM)

PLM is the process of managing a product and the associated data through every stage of its lifecycle.

Developed with the ability to manage complexity and collaboration across disciplines, it is well established in manufacturing industries to allow significant contribution to productivity improvements. It also complements the use of systems engineering methods to bring innovative products to market quickly.

Building information modelling (BIM)

BIM has been the design and construction industry’s answer to improve the flow of data through the building process by improving the overall efficiency.

More and more benefits are gained with each BIM Level of Maturity (Level 0 to 3). The most advanced state, BIM Level 3, is achieved when building data is fully “transactable” across project contributors, not locked in proprietary systems.



As-Specified

As-Designed

As-Planned

As-Manufactured

As-Built

As-Tested

As-Maintained

As-Decommissioned

New Project

Conceptual & Detailed Design

Manufacturing & Construction

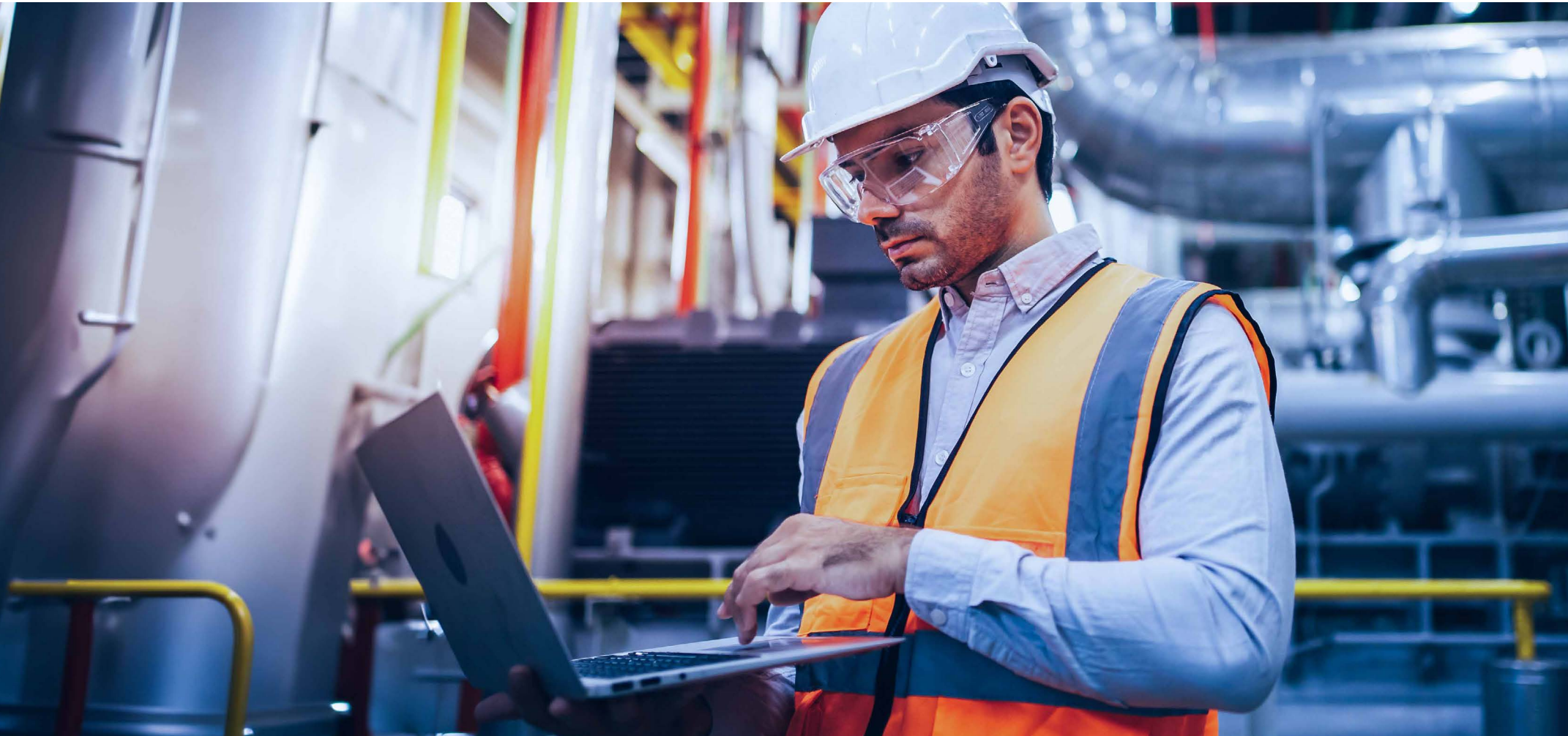
Commissioning

Operations

Decommissioning

While the **3DEXPERIENCE** platform provides solutions that can support the whole lifecycle from pre-concept design to decommissioning, this master plan focuses on the manufacturing and construction phase of nuclear SMR projects.

Through effective decision intelligence, our two key platform capabilities support the transformation of people, business models and products. Together, our end-to-end collaboration and simulation solutions ensure traceability, continuity and digital configuration management for a successful project delivery.





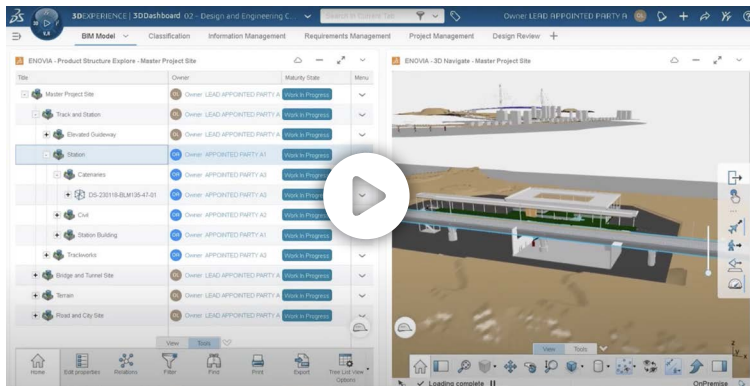
Streamlined Project Collaboration

From designing to construction, team collaboration is the glue that binds multiple stakeholders together during each phase in a nuclear SMR project. This is especially true for design coordination and on-site connection during construction, where continuity and traceability plays a big part to streamline the chain of processes as the project passes through multiple hands of cross-functional teams.

DESIGN COORDINATION

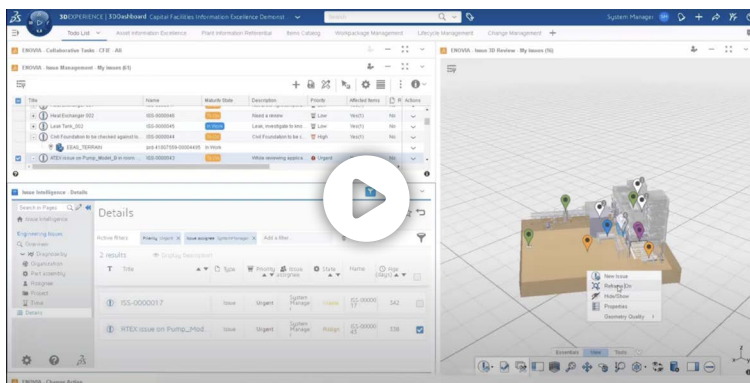
With multiple companies involved in the design of each plant system or sub-system, any design changes during construction must be managed for seamless coordination to avoid costly rework and schedule delays.

The demonstration of compliance to requirements (including regulatory conditions) is also essential. The **3DEXPERIENCE** platform combines all project and asset information while integrating with other software providers' solutions to create a collaborative environment between relevant project stakeholders. Ultimately, this enables an increase in the efficiency and effectiveness of decision making.



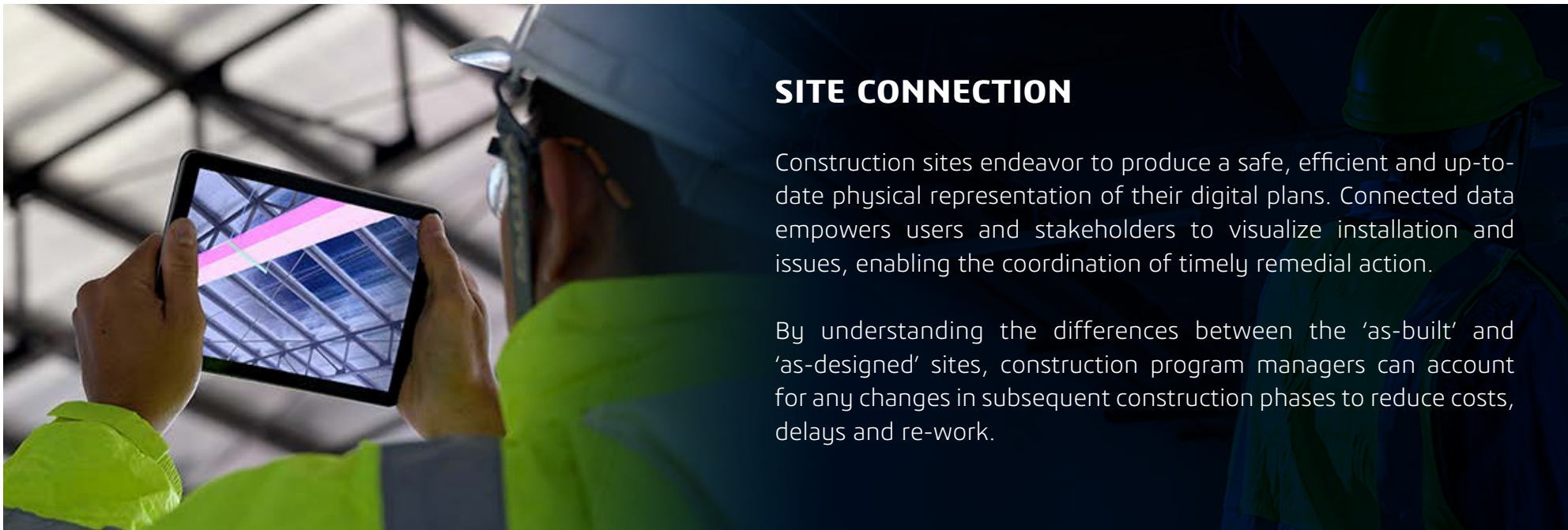
PLM and BIM working together

- Empower the construction supply chain to leverage existing investment in BIM tools and processes
- Take a data-centric approach and connect the BIM models with the product breakdown, linking the execution design with everything that came before it
- Ensure the construction detail is retained against the product breakdown to support operations and maintenance



An accessible, up-to-date design reference

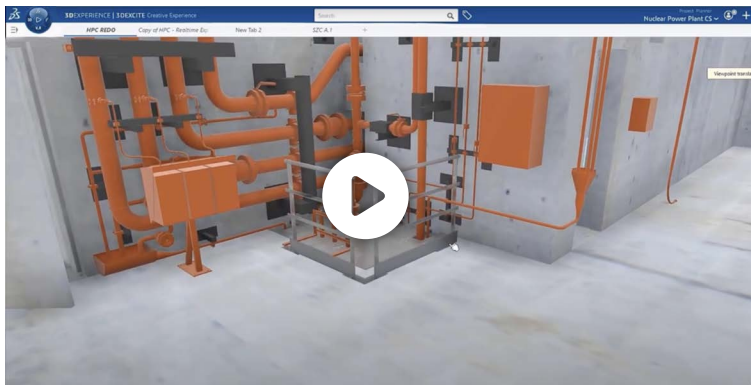
- Aggregate engineering, regulatory, commercial, environmental, societal and governance information into a common referential to make all important information accessible to multiple teams
- Connect and simulate 1D (requirements and functional design) to the 2D (system) and 3D (layout and detail) design to support effective and efficient design decisions while utilizing systems engineering tools



SITE CONNECTION

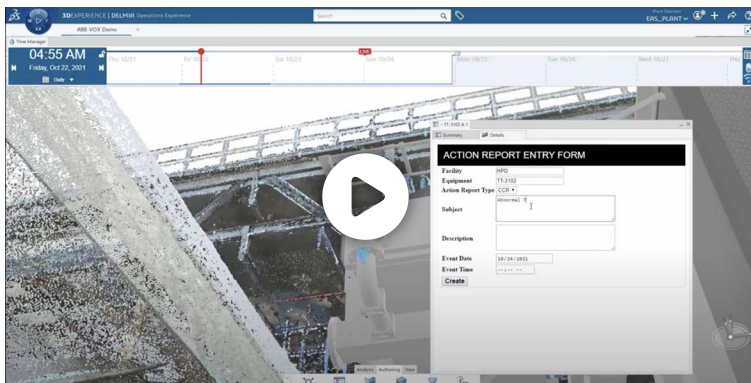
Construction sites endeavor to produce a safe, efficient and up-to-date physical representation of their digital plans. Connected data empowers users and stakeholders to visualize installation and issues, enabling the coordination of timely remedial action.

By understanding the differences between the 'as-built' and 'as-designed' sites, construction program managers can account for any changes in subsequent construction phases to reduce costs, delays and re-work.



Digital to site

- Design and site reference information available at the point of work
- Use augmented reality to visualize issues and de-risk installation of equipment
- Up-to-date work instructions is visible in context, enhancing training and execution
- Records of installation can be stored and recalled for traceability



Capture the as-built

- Manage scans of the site alongside the design models to quickly identify and interrogate differences
- Use augmented reality to support inspections and assess conformity, documenting relevant data and raising comments

Simulation for Project Success

When it comes to the supply chain integration and construction management of a SMR project, scheduling and coordination are important factors that can make or break progress. Through digital configuration management, our simulation solution monitors project planning and optimizes logistics to adapt to any changes in the movement of materials to stay on schedule for delivery.



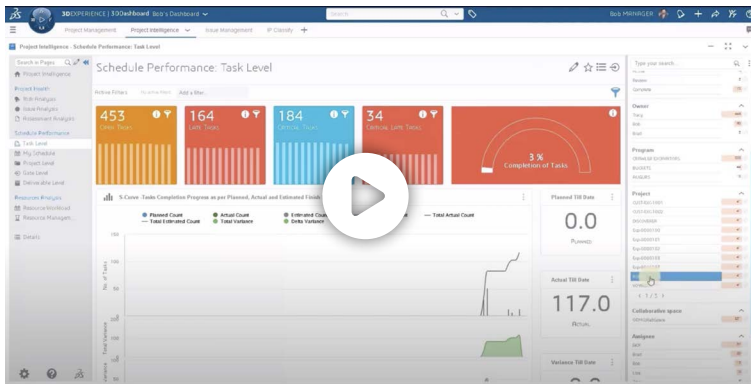
SUPPLY CHAIN INTEGRATION

Supply chains in nuclear construction projects can be vast and complex, leading to challenges in coordinating logistics and site activity that result in potential construction delays. Long manufacturing lead times for manufacturing, alongside complex transportation logistics for large components, modules and equipment to site, impart risks which must be managed. The required components and materials of SMR projects have stringent quality requirements, where compliance must be demonstrated, documented and accessible.



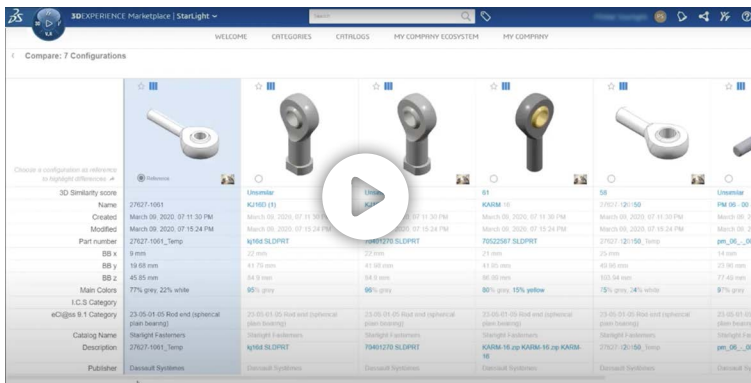
Flexible work packages to manage interfaces

- Connect site activity to the relevant assets, equipment and documentation in a collaborative data environment
- Clear visibility and accountability for all risks and issues
- Monitor overall performance easily while enabling proactive decisions to maintain project schedule



Managed parts catalogs

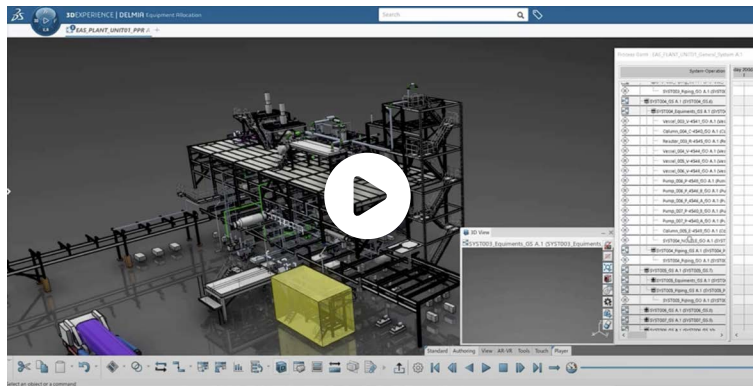
- Drive standardization to reduce procurement and maintenance cost
- Manage alternative parts to build resilience and diversity of sourcing
- Support demonstration of compliance with quality requirements through related data connectivity





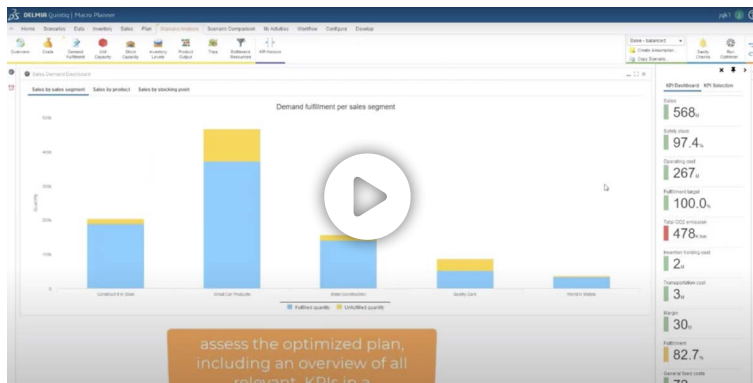
CONSTRUCTION MANAGEMENT

The supply and movement of materials and equipment around large, congested sites requires extensive planning and also the flexibility to change and adapt to emergent conditions. Site safety is of particular importance, which relies on preparation (e.g., lift plans), enhanced training and procedural use. In parallel, the scheduling of the specialist workforce on-site must be responsive to keep construction progress on track.



Integrated 4D planning and simulation

- Create and share sequencing models to make a de-conflicted plan available to all teams
- Simulate activities and changes to ensure smooth execution of critical tasks
- Monitor the scheduled plan and progress against 3D representation to enhance execution and remove bottlenecks



Schedule and workforce optimization

- Driven from work packages, optimize and balance supply network strategically to meet project metrics
- Respond swiftly to any changes in the supply and demand of skills and resources

TAKE CONTROL OF YOUR SMR PROJECT EFFICIENCY

It is expected that SMRs and other new build nuclear power plants will make a significant contribution to expand, diversify and decarbonize worldwide energy supplies.

Nuclear companies are presented with the opportunity to capitalize on SMR technology as a new source of low-cost nuclear energy generation. However, the complex construction of nuclear SMR projects face many challenges, which threaten to delay construction and increase costs.



Backed by scientific capabilities and experience with today's industry leaders, Dassault Systèmes is uniquely positioned to help deliver safe and reliable nuclear SMR plants. Our end-to-end collaboration and simulation solutions ensure traceability, continuity and digital configuration management for successful project execution.

For further information about nuclear infrastructure development, click on the following topics to find out more:



Our **3DEXPERIENCE**® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating virtual twin experiences of the real world with our **3DEXPERIENCE** platform and applications, our customers can redefine the creation, production and life-cycle-management processes of their offer and thus have a meaningful impact to make the world more sustainable. The beauty of the Experience Economy is that it is a human-centered economy for the benefit of all – consumers, patients and citizens.

Dassault Systèmes brings value to more than 300,000 customers of all sizes, in all industries, in more than 150 countries. For more information, visit www.3ds.com.



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