Comisión Nacional de Energía Atómica

Building nuclear facilities of the future with Dassault Systèmes PLM

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Miguel Schlamp
Coordinator of Information Preservation and Operation CNEA CAREM 25 project

Challenge

CNEA needs to accelerate the design and development of its new CAREM 25 nuclear plant, which will supply power to over 100,000 people and to industries in towns isolated from major electrical grids.

Solution

CNEA has teamed up with Dassault Systèmes industry services experts for the deployment of a PLM platform that includes ENOVIA, CATIA, SIMULIA, DELMIA, 3DVIA and DRAFTSIGHT.

Benefits

The DS PLM platform helps CNEA to manage, centralize and share data, locate assets in real-time, and monitor projects more efficiently, which leads to a faster design and implementation process.

DS DASSAULT SYSTEMES

Argentina's Nuclear Energy National Commission, known as the Comisión Nacional de Energía Atómica, or CNEA, is the governmental institution in charge of investigating, developing and managing issues related to nuclear energy and technology in the country. It is run by the Ministry of Federal Planning, Public Investment and Services. It also advises the Executive branch on how to best define nuclear energy policies.

CNEA promotes technological innovation and is committed through legislation, conventions and international treaties, such as the "Treaty on the Non-Proliferation of Nuclear Weapons" signed in 1995, to the peaceful use of nuclear energy. It is regulated by the Argentine Nuclear Regulatory Agency (Autoridad Regulatoria Nuclear Argentina, or ARN) and it has more than 60 years of research and development experience in the nuclear energy industry. It has been a key participant in the development of 10 research reactors, some of which have been exported to other countries around the world.

Due to recent incidents caused by natural events, the nuclear industry is undertaking a global review of the design of nuclear reactors and plants, including examining how security systems may suffer due to natural disasters. The focus is on simulating the plants' response to such events to help reinforce design elements and deliver a well-planned approach to post-event steps.

Centralizing information in a PLM platform facilitates this review process. In addition, with 3D and simulation technologies, engineers can easily revise design components and visualize different emergency scenarios. For example, engineers can simulate the plant and reactor's performance under external forces from natural disasters such as an earthquake or flooding.

CAREM 25 - the first nuclear power plant designed entirely in Argentina

Argentina covers a vast territory with great distances between large cities and small towns. Because of its topography, the country needs to consolidate various sources of energy into a single power matrix that is available at all times Given its expertise in the field and Argentina's available uranium resources, the government has chosen to develop nuclear energy as a key power source for the country.

CNEA resumed the CAREM 25 project in 2006, a nuclear plant design and construction project representing the first nuclear plant of its kind to be designed in-country. The reactor is located in the town of Lima about 115 kilometers northeast of Buenos Aires. The plant will generate approximately 25 MW of electricity, enough to satisfy the needs of 100,000 people.

CAREM 25 is being built with state-of-the-art design and engineering technologies that will be a model for future small and middle-size plants in Argentina and the world. A key goal is to deliver a safe and reliable plant while effectively managing operations and maintenance costs over the life of the nuclear plant.
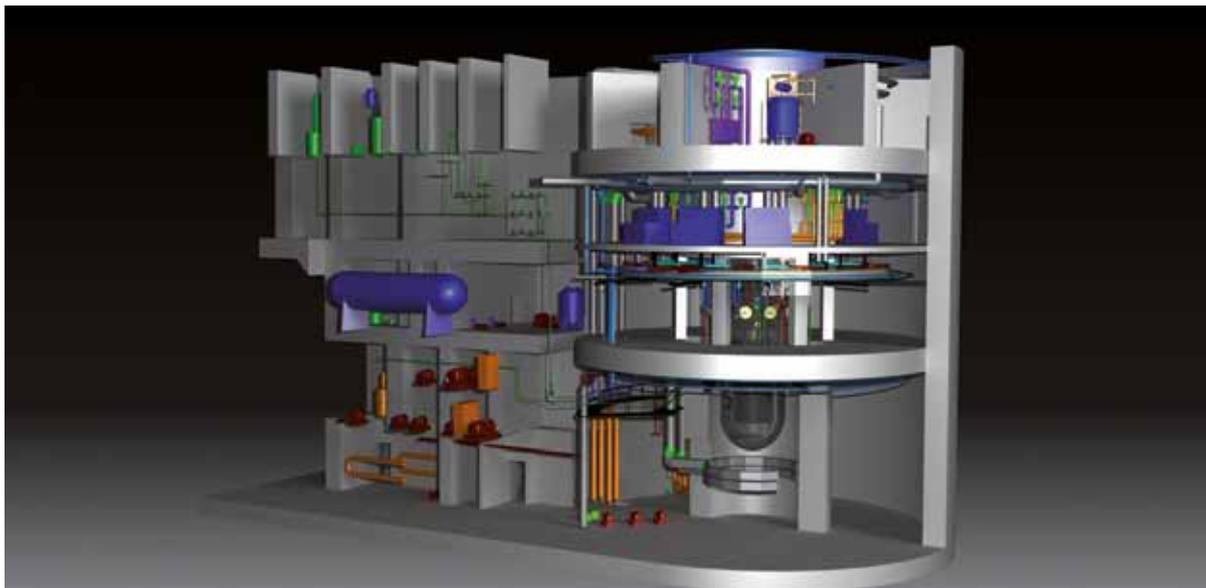
Collaborating and sharing expertise during development

CNEA worked with Dassault Systèmes (DS) industry service experts to develop a solution for managing and sharing key information among teams located in different geographic areas. The project's complexity — the number of specialists working on multiple processes simultaneously, the need to share knowledge and above all, the need to satisfy strict industry regulations — were the reasons CNEA chose to work with DS industry experts to deploy a product lifecycle management solution (PLM) for CAREM 25.

CNEA uses CATIA primarily for virtual modeling of the reactor and to accelerate construction and licensing processes. CATIA also helps engineers plan the design and engineering of the nuclear reactor's pipes and ventilation channels to minimize interference conflicts.

DELMIA Assembly is used for space planning and assembly, especially for installing large reactor pieces after the plant has been built. For example, it is important for CNEA to ensure that large water containers for the security or plant volume-control systems can make it comfortably through the plant before the entry access points are built.

DELMIA Robotics helps CNEA engineers program robots to check the functioning of pressure vessels in the reactor, an area which contains high levels of radiation. The function of the robot is to open the flanges of the nozzles and then introduce special equipment in the steam generator tubes for inspection. The robots can also cut and weld parts in case a steam generator needs replacing.

This maintenance step is done once every 12-24 months but constitutes a major advance in the industry. Instead of having these tasks performed by personnel that must work during short periods of time and take turns to avoid being exposed to radiation, the work is done by robots in a precise and optimized way. This helps complete this maintenance process faster and safer than before and decreases the time plants are inactive during these upkeep periods.

Abaqus Finite Element Analysis (FEA) software from SIMULIA is used for static analyses to verify tensions generated in the reactor pressure vessel due to differences in pressure and temperature.

SIMULIA is also used for dynamic analysis of how a seismic event could impact internal and external components of a nuclear reactor. Using SIMULIA, civil engineers study the impact an earthquake could have on the building and later, while nuclear reactor designers use it to conduct dynamic analyses on the impact such forces would have on the reactor. For example, one dynamic analysis would include simulation and testing of the reactor's internal components such as the security and control rods that shut off the reactor under certain conditions.

ENOVIA facilitates communication and collaboration among the different areas at CNEA. It centralizes project information on a single platform which is updated in real-time and is available to team members such as designers, reviewers and others involved in approval processes.

With 3DVIA Composer, CNEA can capture 3D design information and turn it into useful project-specific documentation for use as communication tools to provide interactive information to members without access to the PLM solution. For example, 3DVIA is used both to share information with external suppliers and to illustrate regulatory requirements and compliance
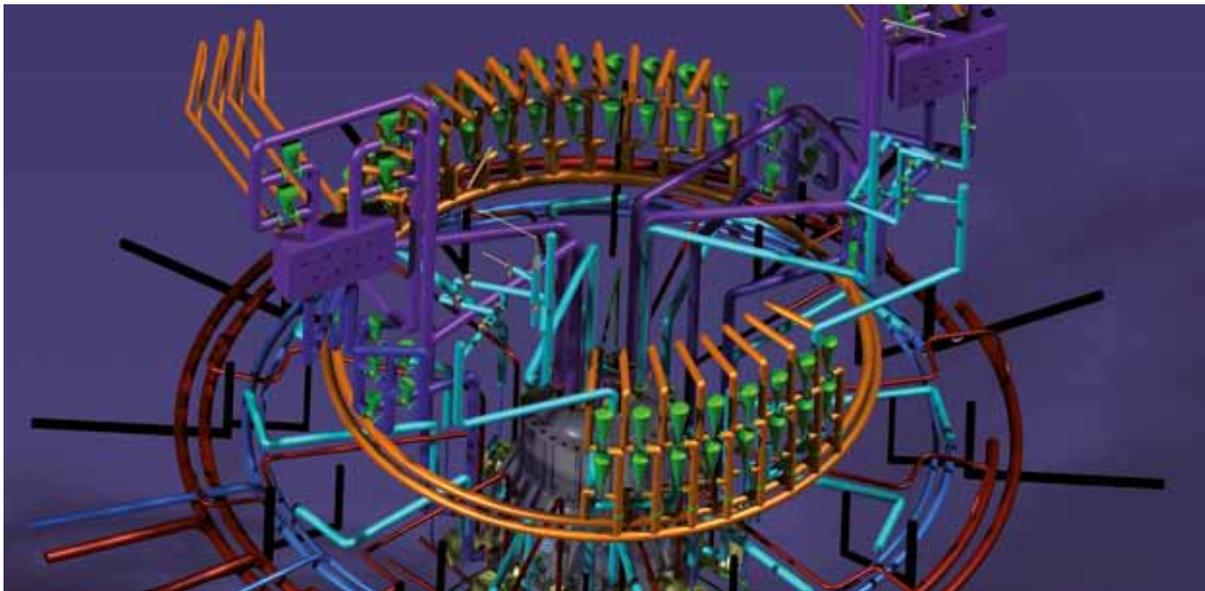
> With this PLM solution we are setting a standard in our industry by fine-tuning business processes that capture and preserve engineering and design know-how, a critical function for the on-going management and maintenance of a reliable nuclear plant.

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Coordinator of Information Preservation and Operation
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elements for government organizations such as the Argentina Nuclear Regulatory Agency in order to speed up the licensing process.

Similarly, DraftSight helps designers share 2D plans with contractors and the Argentina Nuclear Regulatory Agency that are used during project construction and revision. DraftSight, a complimentary 2D CAD product downloadable at Draftsight.com, allows CNEA to display plans and drawings easily and enables users to create, edit and view DWG files.

"The DS PLM solution combines all our activities on a single platform allowing access to up-to-date information and documentation to all teams from different technical areas. We can plan and orchestrate all tasks effectively, even if they are performed at different times and have different timelines," explains Miguel Schlamp, engineer and Coordinator of Information Preservation and Operation of CNEA's CAREM 25 project.

"With this PLM solution, we are setting a standard in our industry by fine tuning business processes that capture and preserve engineering and design know-how, a critical function for the on-going management and maintenance of a reliable nuclear plant," adds Schlamp.

Unifying knowledge, improving monitoring and facilitating regulatory supervision

A key benefit of the DS PLM solution is having teams that work collaboratively using a platform that formalizes processes and centralizes information in a single place. This helps monitoring and continuous maintenance of plant resources.

"With Dassault Systèmes' PLM technology, we are designing Argentina's first nuclear plant built entirely locally and with the collaboration of teams of designers and engineers that share their know-how on a single platform. This helps us build a modern, safe and reliable nuclear reactor that will generate electricity for an entire town of 100,000 citizens," concludes Schlamp.

DS CATIA   *DS DELMIA*   *DS ENOVIA*

3DVIA   *DraftSight*

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