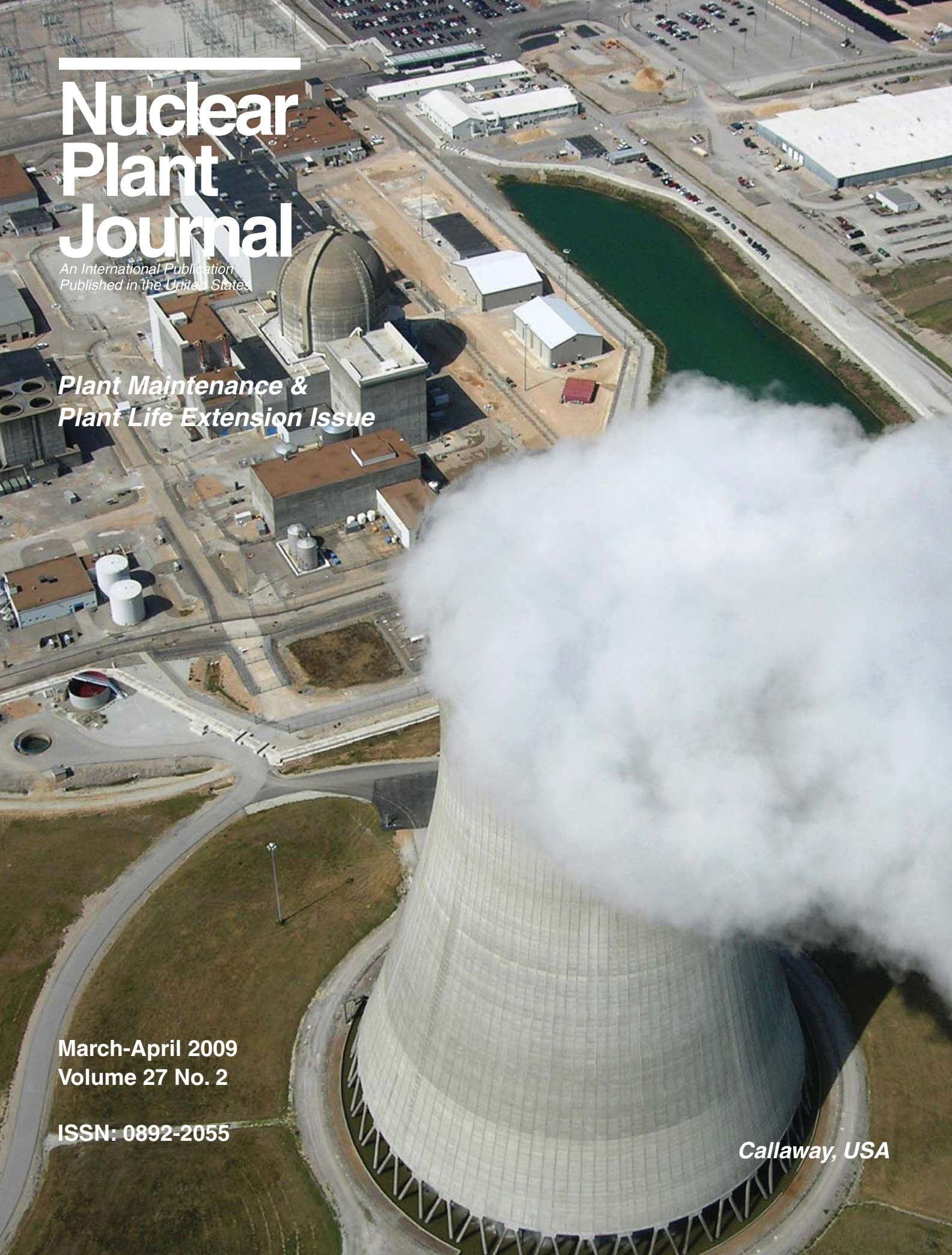

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Application of Modeling and Simulation to Nuclear Power Plants

By Berry Gibson, IBM and Rolf Gibbels, Dassault Systemes.

1. *Please describe the accuracy of 3D process simulation to nuclear power plants?*

Rolf Gibbels: People normally think of a physical mock up as the most accurate way of simulating something. They think that the digital version is an estimation. However the environment of a nuclear plant is so complex, the fact that you can actually model all the components digitally, relatively easily, makes the digital mock up actually much more accurate than the physical mock ups. Physical mock ups are the simplified representation of the environment, and what our customers have found out is that they actually miss many interferences and other challenges that they later run into during maintenance or construction procedures. They eventually found out the benefits of digital mock ups the hard way.

As I mentioned, the digital environment is actually a more accurate representation than the physical, and this is possible because of partnerships that Dassault Systemes has with companies like AREVA. Many older plants face the challenge of using digital planning and construction because they have no – or very little – digital data about the plant. We're talking about plants that have been online for decades and were built before digital design and construction were mainstream. However, AREVA's Metrology Services can use laser scanning technologies effectively to digitally scan a plant and record an "as-built" model that can be used with Dassault Systems' solutions. This is a much better option than trying to digitize blueprints, which aren't always accurate. The virtual environment can be easily changed and allows a company to perform as many 'rehearsals' as needed to reach the best possible process scenario prior to the start of the actual work.

(The Hydro Quebec nuclear case study is very new. It's so new that this is the first time we've ever heard it ourselves. They just finished the project.)

2. *How old is the 3D simulation technology? Is the nuclear industry receptive to the technology?*

Berry Gibson: We were helping companies go from 2D design to 3D design back in the 80's and 90's. This is something that has been a focus of IBM and Dassault for a number of years. Just now however, many companies within the energy industry are trying to figure out how to work in a 3D part-centric process. By "part-centric", I mean allowing plant definition data to flow seamlessly through the organization in a design process that encompasses the total project life cycle activities with an information framework based on associativity of data to parts and structures of parts, rather than to drawings for instance. This is key enabler to creating information only once and reusing it many times. 3D design and simulation technologies had their genesis in the aerospace and automotive industries 20-plus years ago so there has been a lot of time for these solutions to mature. We have found that the nuclear utility owner/operators have been very receptive to the

In person interview at Dassault Systemes' Managing Outage and New Build Risk through Virtual Planning Conference on Thursday, February 12, 2009 in Orlando, Florida.

Berry Gibson

Berry Gibson is a Sales Executive at IBM with responsibility for Plant Lifecycle Management (PLM) solutions. Before joining IBM in 2007, Berry led strategic growth initiatives for a major PLM software vendor and also managed client relationships and successful PLM implementations. Berry has served as a management consultant in the Product Development Consulting Practice of KPMG Consulting and began his career as an engineer with both Northrop Grumman and Lockheed Martin.

Berry holds bachelors and masters degrees in Engineering from the University of Texas.

Rolf Gibbels

Rolf Gibbels is Dassault Systemes' global industry director for the Energy and Process Industry domain. Rolf joined Dassault Systemes in May 2001 and brings over 15 years of experience in high technology and the computer-aided design software market to his role in PLM (Product Lifecycle Management) business development and strategy. He focuses primarily on developing new opportunities and solutions in a market now realizing the need for product lifecycle management.

Rolf holds a masters degree in Civil Engineering from the University in Munich, Germany and has extensive experience working for leading engineering and architecture firms in Germany.

technology as it solves real business problems for them today. If they don't have a 3D model of their plant, then they use laser scanning to generate one. Now, for the new plants, they are telling their suppliers that they want the richness of a full 3D part-centric plant virtual plant design with one master representation of the design and associative access to all related deliverables and descriptive content.

3. *Can the 3D simulation software run on PC based systems (servers as well as clients)?*

Berry Gibson: For design, design simulation and design data management, in the old days hardware was a constraint, and you had to buy very expensive servers. Today, it's not a constraining factor. PC based systems are fine for the majority of applications. This information can now be run on a moderately powered PC. In many cases it can be displayed over the web in a web browser from a remote system. We have the ability to show light weight visuals of information, including recorded visuals of complex assembly or dismantling sequence. You can show it over the web in a web browser, and collaborate with other users worldwide.

4. *How many partners have developed Dassault's applications worldwide?*

Rolf Gibbels: Dassault has thousands of technology partners worldwide. In the energy industry specifically, we work with companies like AREVA for its metrology services, and BCP Engineers to help with the specific work processes, nuclear engineering specialists and unique regulatory requirements. Of course, IBM and Dassault Systemes have a long history together as well, which has carried over to greatly benefit our shared customers in the energy industry.

5. *What mechanism does Dassault Systemes and IBM have to collaborate with the nuclear power industry?*

Berry Gibson: IBM has a couple of initiatives. We created our Nuclear Power Advisory Council (http://www-03.ibm.com/industries/utilities/us/detail/news/T701956Z61598F04.html) that consists of Chief Nuclear Officers, CEO's, CIO's and other thought leaders from a number of very large operating utilities with large nuclear fleets. We periodically meet with this group of executives to talk about the future, the challenges and needs that they see in the future, the things that IBM is working on for the future of technology and how we can innovate together. At these meetings we identify areas of collaboration where we can work with these companies on the future of energy production and transmission and how this business can benefit from advances in information technology. That informs our go-to-market and solution development strategies. We've also established Center of Excellence for Nuclear Power (http://www-03.ibm.com/industries/utilities/us/detail/news/W547897K49179Q12.html). This center supports improved design, construction, safety and operation of power plants based on IBM software, hardware, consulting, and services industry offerings. These include IT systems design and architecture consulting, high performance computing, advanced simulation/modeling capabilities, Enterprise Asset Management and Plant Lifecycle Management solutions aimed at both the extension of existing nuclear power plant life, as well as streamlining new plant construction.

6. *How will Dassault Systemes' technology help the nuclear industry in designing and building its new nuclear power plants?*

Rolf Gibbels: Dassault Systemes offers solutions to help usher nuclear power plants from design through construction and into maintenance. It begins with CATIA, Dassault Systemes product for designing the virtual plant. During design you can perform early finite element analysis (FEA) and multiphysics analyses using SIMULIA Abaqus solutions for virtual testing and simulation. DELMIA can be used to virtualize construction planning and fabrication sequencing to virtually plan critical maintenance scenarios before any physical work begins. Changes made in the virtual world are coming at a fraction of the cost versus any changes identified during construction, which typically result in costly delays of the project. Throughout a project, ENOVIA provides a backbone for collaboration and business process management. In addition, 3DVIA can be used to enhance operator experience by easily providing a 3D Virtual Reality environment for training and related work instructions during the entire lifecycle of a project All together, the Dassault Systemes Energy offering promotes innovation by integrating business process management with cutting-edge tools for design, engineering and construction planning.

Berry Gibson: I think IBM would see that one of the biggest challenges in the industry is the potential for lack of consistency of the information related to plant definition as the plant is being designed, constructed, operated and maintained. Historically there hasn't been a technology-enabled mechanism for consistently managing the definition of the plant throughout its life cycle. Because of that, mistakes are made and millions of dollars of unnecessary, non-value-added activity are undertaken to transition information from the design/build stage to the operational stage of the plant's lifecycle. The technology exists to manage a consistent, integrated controlled, and complete definition of a nuclear plant throughout its lifetime, from initial design through to decommissioning, and the industry is in the process of getting their arms around it. One of the keys is a 3D model/part centric design paradigm in which there should be one master representation of the design, and that representation should associatively drive all related deliverables and representations. The question remains process maturity in the owner/operator and supplier ecosystem. Other highly regulated industries (aerospace, defense, shipbuilding) have successfully managed the transition to 3D with stringent configuration control requirements, and many of their practices are applicable, but not yet known to many nuclear industry players. IBM has developed solutions that can unlock substantial business value through shortening plant development and start-up times, efficiently finding, reusing, and changing plant data and enabling an integrated and transparent collaborative environment in which to address asset management business processes.

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