The Nuclear Energy Lifecycle
Improving Efficiency and Cost Visibility with Integrated Enterprise Solutions
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Population and economic growth are feeding an increasing demand for reliable, efficient, sustainable energy, and the nuclear industry is undergoing a resurgence. New units are coming online in growth regions from Europe to Asia, design and construction costs are changing dramatically, and tensions created by regulatory and public scrutiny are running high. By leveraging sophisticated technology and solutions, the industry can improve efficiency, help ensure safety and reliability, and increase visibility into costs.
It’s an exciting time for players in the global energy industry, from traditional participants such as oil, coal, and gas to renewables like solar and wind. Emerging sources and technologies continue to alter the field. For the nuclear industry in particular, it’s a time of changes, challenges, and opportunities.

Attitudes about nuclear energy, and prospects for the industry, differ around the world. France has long relied on nuclear power, and the United Kingdom is developing next-generation technology. Germany, however, is looking closely at renewable energy, and the industry’s future in Japan is uncertain. Meanwhile, construction of new plants is booming in fast-growing economies from Europe to Indonesia, Vietnam, India, and China. In the United States, despite the lack of a comprehensive federal energy policy, there is opportunity for growth.

New reactors are being built amid changing costs and uncertain delivery schedules. Existing plants worldwide are being relicensed for longer use and must address suboptimal legacy solutions and the limitations of units nearly 30 years old. Furthermore, the aging workforce is unfamiliar with digital technology and is being replaced by less experienced people.

The paradigm for nuclear power has been that it is safe and reliable, and this largely remains true. But it is clear that the industry must strive toward clean, sustainable, low-cost production. This means coming to a complete accounting for the costs of nuclear power – not only for design and construction but also for decommissioning and waste storage. Companies must enable better transparency for public and regulatory bodies alike and offer plausible concepts, plans, and strategies for safe, reliable, clean, and efficient nuclear power generation.

CHALLENGES AND OPPORTUNITIES

While advances in technology are at the heart of nuclear power, the industry has historically faced a range of hurdles to efficient operations. Chief among these are a lack of integration (often intentional for security reasons), data isolated in silos, and limited machine-to-machine communication. The use of different IT systems creates disconnects across the value chain.

Manual activities are inefficient and prone to duplicated and erroneous data. For example, handing off paper-based documentation from design to construction can leave crucial information gaps and impact productivity and safety. Dedicated terminals don’t have the flexibility of role-based user interfaces. Insufficient analytics makes it impossible to visualize complex systems and analyze data patterns.

Early-generation construction practices were not always consistent, and plants often were designed on a case-by-case approach, without standardized systems and processes. When every plant is different, lessons learned from experience don’t always transfer.

As new technologies are adopted, they contribute to the growing amount of information that companies in all industries now face. This can lead to issues of data fidelity, deficits, and overload.

Regulatory compliance is a moving target. Associations such as the World Association of Nuclear Operators (WANO) and the International Atomic Energy Agency (IAEA) do provide standards and best practices. But there has long been a lack of enforceable, internationally accepted standards, and national regulations vary.

While the challenges are many, there are opportunities to improve efficiency and effectiveness through integration across the nuclear lifecycle. The lifecycle spans multiple industries such as mining, chemicals, discrete manufacturing, utilities, and waste management; and it involves processes including design, testing, construction, operations, and decommissioning. Companies have opportunities to improve through process and information sharing and collaboration across the lifecycle.
With new technology the industry can improve performance, help ensure safety and reliability, and adopt and develop best practices. Companies can get a more accurate picture of the costs of nuclear energy and work toward providing efficient, safe, and sustainable power.

Standardized, integrated, and secure applications eliminate disparate data and manual and paper-based processes and enable interoperability across the lifecycle. What’s more, design and operations can collaborate early in the process to make interoperability inherent in both physical infrastructure and operational processes.

Analytics allow fast processing of huge amounts of information and reveal valuable insights. Visualization and diagnostics functionalities allow business users to interpret complex data patterns. Mobile technology gives workers the information they need, wherever they are, for greater responsiveness and productivity, and it can be integrated with enterprise processes and data.

Companies like yours can optimize efficiency in supply chain management, engineering, operations, and maintenance. You can provide secure, intuitive, role-based access to all business users. You can use automation to create economies of scale across plants; increase reliability; reduce design, operations, and maintenance costs; and enable personnel to move more easily between facilities without extensive retraining. And you can enable better decision making and public awareness with increased transparency.

WHAT NEW SOLUTIONS AND TECHNOLOGY CAN DO FOR YOU

Pattern detection and high-speed analytics functionality can process data sent from the thousands of sensors located on a turbine or water pump. The software can reveal a degradation or deviance from typical data results, trigger flags or alarms, and suggest a course of action to end users. This approach allows your engineers to focus on specialized tasks or investigations.

In addition to its use in analytics displays, visualization functionality can display a 3-D view of a section of the plant that’s typically off-limits. Workers can familiarize themselves with their surroundings and the object of an upcoming repair project – replacing a specific valve, for example – to speed maintenance while reducing dose exposure and minimizing downtime.

With integration among work management and supply chain processes and spare parts inventory levels and delivery times, business users gain visibility into data critical for planning. The result is reduced “reserved” inventory (parts ordered in advance to hedge against uncertain start dates) and elimination of duplicate orders.
Solutions from SAP Can Help

Applications from SAP can help companies improve effectiveness and efficiency. You can enable interoperability, connect silos of data and processes, and reduce manual processes. You can also enable high-speed analysis and support mobile apps and devices. Solutions include:

- SAP® Enterprise Asset Management solution, to help define a comprehensive lifecycle approach for operational excellence
- SAP HANA® platform, which enables the analysis of “Big Data”
- SAP Visual Enterprise applications, to provide detailed visualizations of plant equipment, 3-D views of plant infrastructure, and more
- Sybase® Unwired Platform, to facilitate communication and collaboration with mobile workers
- SAP Risk Management application, to better understand and address operational risks

SAFETY AND RELIABILITY

With SAP solutions, companies can foster a mind-set in which business and technical systems support each other, instead of working separately with disparate functionality. This can lead to interdepartmental operability among engineering and construction activities, equipment vendors, and operational processes and can enable you to improve engineering change management. You can provide a consistent data model of technical infrastructure, standardize procedures for maintenance and operations, perform safety and risk assessments, model and visualize plant operations, and facilitate disaster management.

You can bring together technical, operational, and business applications and systems to improve safety and reliability. Enabled by cutting-edge in-memory computing and analytics of SAP HANA, you can evaluate and analyze massive amounts of data for insights into historic and current performance.

EFFICIENCY AND SUSTAINABILITY

Sustainable operations can be realized when fleet operators and owners establish a holistic view of the industry and employ strategies for long-term stewardship of individual companies and the industry as a whole. This requires process standardization and interoperability among people and information technologies.

For example, corrective maintenance, engineering change, and recurring maintenance are essentially the same for fuel refinement organizations and nuclear operations. By taking advantage of the similarities, nuclear operators can adopt best practices, reduce data and maintenance costs, and ensure that design documents, repair histories, and cost records are not lost in the system.

Conventional wisdom has held that the cost of nuclear energy is competitive with fossil fuel and renewable sources. The structures for such comparisons generally consider only the expenses of plant construction and operation. For an accounting of the true costs of nuclear energy, decommissioning and final waste storage expenses must be included in the equation. (Nuclear energy is the focus of this paper, but other sources pose similar challenges.)

SAP solutions enable you to streamline and integrate processes, improve operational efficiency and reduce expenses, and get a more complete understanding of the costs of nuclear power.

You can develop plans for plant decommissioning and waste management and improve cost visibility. This allows you to make meaningful assessments of the true costs of nuclear power and realistic comparisons to other power sources. It also facilitates the process and data transparency that is crucial for regulatory compliance and public trust and support.

LEARN MORE

Cutting-edge software can help nuclear power companies improve operational efficiency while continuing to provide a source of safe, reliable power. With SAP® solutions, you can gain a more complete understanding of the real costs of nuclear energy and increase transparency to enable compliance and public awareness. To learn more, call your SAP representative or visit us online at www.sap.com/industries/utilities/index.epx.