

Atos in nuclear

Efficiency

safety and innovation
nuclear power in the digital age



Trusted partner for your Digital Journey

Atos



There are some 450 nuclear reactors in 30 countries around the world, with a further 65 under construction. They produce 380 GW - amounting to 10% of global electricity demand. On average these have each been in operation for 28 years. Throughout this time, safety and operational efficiency have remained top of the agenda.

Our world is being transformed by digital communications. We ask how that digital transformation can and must contribute to continuing safety and efficiency in a growing nuclear industry.

Continuity and change

The nuclear power industry is unlike any other. The responsibility for long-term safety is unparalleled, and closely related to this, is the importance of peer-to-peer collaboration between nuclear operators.

Although the nuclear industry stands apart, it does share a common focus on the continual drive for increased operational efficiency. This drive for efficiency will increasingly be influenced by the emergence of transformational digital technologies and digitally-enabled practices. Atos asks how digitally-enhanced operations can best serve an industry which must balance continuity and change while never compromising safety.

Digital transformation impact on nuclear

So where will the digital age have the biggest impact on nuclear, and where will it deliver the greatest benefits?



Safety and security

For the nuclear industry, safety and security are paramount. Not only must all physical resources be continually protected, but all digital entry points must be secured against malicious and accidental breach.

How can nuclear approaches to security anticipate and eliminate potential threats?



Innovation

The nuclear industry does not stand still. It is continually seeking to develop safer, more efficient and more sustainable technologies - with fusion on the horizon.

Will digital collaboration help rationalize and accelerate research?



Plant lifecycle status

Plant lifecycle status varies hugely. Some are well within the limits of operational expectancy. Others, although nearing the end of their original useful life, are undergoing operational extension. Some plants are being decommissioned at the same time that new facilities are planned.

Can digital technology help profile and track this complex picture with particular focus on capturing and promoting best-practice?



Experience and suitability

In an industry with over 60 years' accumulated professional expertise, it is essential to capture and protect knowledge for future use, crossing professional disciplines and geographical borders.

What opportunities are there to turn archive data into live active use?



Education and training

With 65 new units under construction, the nuclear industry will need to recruit and train a new generation of engineers. Estimates anticipate some 1.75 million new jobs in the next 25 years.

For a generation that grew up with digital lifestyles, what shape will professional training take?



Radiation protection and testing

Radiation levels must be continually monitored throughout the nuclear fuel cycle for the safety of both staff and the wider community.

Does monitoring and test technology provide maximum protection for plant and people?



Public eye and opinion

Nuclear has a high public profile - every nuclear story is front page news. New media practices demand new communications approaches.

In the new world of social media, how do you monitor and influence opinion?



Fuel cycle

Safety extends beyond the reactor to the complete fuel cycle, from mining, enrichment, transport, generation and storage right through to waste management. Although different phases are owned by different specialists, the overall responsibility must be shared.

How best can cross-disciplinary process be securely managed in the digital age?

New digital landscapes

The nuclear industry, quite rightly, is cautious and conservative. When safety and security come first, you cannot afford to make mistakes. But being risk-averse does not mean shunning the advances and benefits of digital innovation - it does mean that adoption and experiment require the utmost preparation and control.

Before any digital technology takes its place on our radar for the nuclear industry, we need to screen from two perspectives:

- ▶ Security - before bringing any new technology to its nuclear energy clients, Atos will conduct exhaustive analysis of risk implications.
- ▶ Maturity - technology in the nuclear power industry can run in +30 year cycles: in IT, cycles can last just four or five years. Innovation must always be balanced with maturity.

In parallel, we continually examine the operational and information technologies on which the nuclear industry currently relies.

When existing technology, no matter how stable, can no longer be safely managed and maintained, it must be decommissioned. Computer hardware, for example, that pre-dates the Apollo moon landings can still be found in some nuclear power plants. It is increasingly challenging to find the skills or the parts needed to sustain reliable operation.

Here are just some of the new technology themes and developments which we believe are set to enhance nuclear operations, along with examples of how they can bring value.

Machine-to-Machine

The nuclear power industry has always relied on the quality of data produced by sensors. Machine-to-machine communications now becomes one of the cornerstones of Industry 4.0.

Data Analytics

Although Big Data is today's buzzword, analytics has always been the primary focus of computing. For nuclear, radical increases in affordable computing power for analytics now benefit everything from design to predictive maintenance.

Mobility

Every member of the nuclear workforce now expects some degree of secure access to mobile information and applications - whether it is HR teams working at a recruitment fair or field-service engineers making documentation requests. Mobility is key to productivity.

Augmented Reality and Digital Plant

Augmented reality is becoming a hot topic in nuclear. When training field-service engineers or welcoming the public to a visitor center, for example, could augmented reality help positively shape their experience?

Smart documentation

The nuclear industry has always been scrupulous in documentation, logging every event, service history and process. Can advances in smart documentation now be applied to improve access to knowledge, reduce risk and boost productivity?

Additive Manufacturing

Just a few years ago, 3D printing - or additive manufacturing - was treated largely as an expensive novelty. Well not any more. 3D scanning and printing is particularly suited to producing the one-off components needed, for example, in prototyping.

Plant Lifecycle Management

Every nuclear facility must be managed securely and cost-effectively across the lifecycle. Now that every component and every asset can become a potential data source, engineering and maintenance activities can be transformed through predictive analytics.



Painting a bigger picture

Atos is keen to help its nuclear industry clients establish an overarching picture of how new digital technologies can contribute to the safety and efficiency through every phase of the lifecycle - from design, engineering and construction through to operation and decommissioning.

PLANT LIFECYCLE



Real time critical systems

Instrumentation & Control, Simulation, Radiation protection, Condition-based monitoring

OT Systems

MES, EAM, Predictive maintenance, Smart mobility, Access control & security

IT & Engineering Systems

Plant Lifecycle Management, ECM & Collaboration, MDM, Project management, Licensing support, Long-term maintenance, Non destructive tests, ERP

Foundation IT & Transformation

Big data & analytics, Industry 4.0, Cybersecurity, Cloud Services, Infrastructure & Application Management, Workplace Services, Network Management

NUCLEAR FUEL LIFECYCLE



Atos is a systems integrator and digital service provider with a deep knowledge and experience of the nuclear power sector. This places us in a privileged position when it comes to helping you craft a practicable digital strategy.

There are many skilled systems integrators and digital strategists in the world, but few who have the depth of knowledge of the nuclear industry. This experience shines through in a number of specific areas:

- ▶ **Safety and security are paramount** – we understand, for example, that cloud and internet technologies will influence your digital choices, but we also understand the need to categorically mitigate all associated risk.
- ▶ **Conservatism and longevity** – we understand that in many cases, the

nuclear industry favors retention of systems which in other sectors would have long been decommissioned.

- ▶ **Regulation and compliance** – we know the nuclear regulatory landscape intimately, and understand how any proposed changes to the digital landscape must satisfy relevant industry practices.
- ▶ **Bridging information and operational technologies** – traditionally, IT and OT have remained relatively distinct in the nuclear sector. This is now changing, and Atos is one of the very few companies to be equally familiar with both.

Crafting the big picture is a team game. The nuclear industry is used to collaboration with competitors through peer review and Atos works in exactly this spirit.

We do not have a monopoly on digital intelligence. We will work with your specialist partners to create a meaningful and grounded view of what continuing digital transformation means for you.

Atos in Action

Atos is active in a broad spectrum of digital initiatives right across the nuclear power industry. Some focus on operational technologies, such as instrumentation and control systems. Others focus on classic information technologies, such as collaboration and documentation systems.

Whether we are dealing with well-established heritage systems or with projects involving the latest technologies, Atos is constantly asking how nuclear clients can boost efficiency and enhance safety. Here is just a taster of some activities in which we have lead in recent years.

New-Build

The nuclear industry is global - and this is particularly evident in new-build projects. International teams need to be able to collaborate effectively with secure and controlled access to all technical, project and regulatory documentation.

Atos Contribution

Atos can act as a "digital facilitator" on new-builds, establishing a robust framework for Nuclear Plant Lifecycle Management and for configuration management. We deliver the systems needed to support design, handover, commissioning and operations.

We work closely with safety regulators and compliance teams.

Training and Simulation

The employees you recruit today have grown up with digital. It has been embedded in their learning, in their social lives and in their leisure. Work patterns are different too. People change jobs more frequently, and this puts on pressure both to accelerate training and to improve retention.

Atos Contribution

Atos can help you take advantage of this digital shift. Data from instrumentation and control systems, for example, can be used to create real-world training scenarios.

Secure enterprise social media can play a role too, providing access to expertise for accelerated learning.

Integrated Instrumentation and Control

Robust and responsive instrumentation and control systems must be designed to maximize safety in nuclear operations. It is becoming increasingly important for the data generated by these systems to be available for both technical and business analysis.

Atos Contribution

Our instrumentation and control systems for nuclear power stations have been in use for over 35 years. They have made an essential contribution, helping operators to achieve safe and continuous operations.

Many carefully considered advances have been made over the years. Our skills as systems integrators, for example, have been increasingly valuable in helping nuclear customers use control data in simulation and training - always making security a priority.

Predictive Maintenance

Rigorous maintenance will always be one of the foundations of safe nuclear power generation. Maintenance has traditionally been carried out according to "book schedules". Smarter equipment, often using sensors, now makes it possible to improve traditional approaches with condition-based maintenance strategies.

Atos Contribution

By taking advantage of live data streams, Atos can help you ensure that the actual performance and status of your nuclear assets now underpins maintenance programs.

Not only will this raise already high safety standards. It will help maximize the effective lifespan of assets and contribute directly to enhanced operational intelligence.

Breadth of Vision

With Atos, you gain access both to highly-specialized engineers focused on the nuclear industry and to experts in the technologies and processes which now underpin digital transformation.

Our Atos Worldgrid subsidiary has 1,600 sector-specific engineers. To date, it has equipped 70 nuclear power units in France, the UK, Russia and China with Command and Control software. We have over 35 years' continuous experience and service in the nuclear power sector.

In parallel, Atos is a company of 100,000 business technologists, with a worldwide focus on digital transformation. We bring intelligent, practical and creative approaches to enterprises wanting to embrace digital change while ensuring that all existing investments in information technology are managed securely, efficiently and cost-effectively.

For our nuclear clients, this does not only mean that we can ensure that all business IT management and services are optimized for performance, security and cost-effectiveness.

It means that we can also give you direct access to skills in which we have invested for clients in other sectors, and which we believe are becoming increasingly relevant to the nuclear power sector. These include cybersecurity, data analytics, secure private cloud provisioning and additive manufacturing.

Next steps

We are always ready to talk about specific projects and objectives. These may be focused on either operational or information technologies, maximizing the value of heritage systems or adopting new approaches.

But perhaps the best place to start is with the big picture – with sharing and envisioning overall digital strategy.

Let's bring our experts together and explore the wider implications of digital transformation in the nuclear power industry. Our network of Business Technology Innovation Centers or our Nuclear Power Center of Excellence make ideal locations in which to share ideas and experience.

Atos – the trusted partner for your digital journey.



About Atos

Atos SE (Societas Europaea) is a leader in digital services with pro forma annual revenue of circa € 12 billion and circa 100,000 employees in 72 countries. Serving a global client base, the Group provides Consulting & Systems Integration services, Managed Services & BPO, Cloud operations, Big Data & Cyber-security solutions, as well as transactional services through Worldline, the European leader in the payments and transactional services industry. With its deep technology expertise and industry knowledge, the Group works with clients across different business sectors: Defense, Financial Services, Health, Manufacturing, Media, Utilities, Public sector, Retail, Telecommunications, and Transportation.

Atos is focused on business technology that powers progress and helps organizations to create their firm of the future. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and is listed on the Euronext Paris market. Atos operates under the brands Atos, Atos Consulting, Atos Worldgrid, Bull, Canopy, Unify and Worldline.

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