

# controlling energy potential

real-time, secure processes for nuclear operators





## Safe hands

It is the most powerful yet sensitive energy supply we have. The intense debate that surrounds nuclear is not going to disappear easily - but demand for affordable energy is only going to rise. The answer is to embrace nuclear, and manage it correctly. Nuclear Operators, to ensure greater safety and deliver greater value from the energy they produce, must constantly look for new ways to monitor and control resources.

Atos Worldgrid delivers real-time control to the nuclear industry through more effective instrumentation and control, better scoping and simulation of events, and condition-based monitoring. Through more intelligent technology that allows every step in the control and value chain to be seen and controlled as it happens, Atos is fusing Operational Technology and IT to bridge the gap between real-time critical systems at the front end and business systems (including BI, ECM, Portal and Application Rationalization).

The goal is to deliver absolute understanding, as it happens, of the nuclear energy chain - and allow you to exercise instant control over it.

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# Controlling nuclear through better instrumentation and control

The scope of nuclear instrumentation and control has changed hugely since the first power station went live in 1956. However, now – more than at any point in history – the pressure is on to deliver continuous, safe operation.

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## The challenge

Whenever a new nuclear power plant is commissioned, fully computerized instrumentation and control (I&C) will be part of the specification. Those commissioning the plant need to understand the options and make their decision based on the quality, cost and availability of specialist solutions.

For existing plants, more traditional instrumentation and control solutions need to be reviewed. As they near obsolescence, renewal needs to be planned and implemented.

The functions and characteristics made possible by today's systems are increasingly regarded as must-haves. These include integrated alarm processing and context sensitive procedure management.

Increasing regulation by nuclear safety authorities also becomes a factor for change. Cost is always an issue, and the choice must deliver the best value while meeting all operational and safety requirements.

Quality of transition is essential too, ensuring that switchover is managed smoothly, that all training is efficient, and that the new instrumentation and control solution will continue to be a viable platform long into the future.

## Putting in place instrumentation and control that brings perfect clarity every time

We've had a lot of experience in the design, deployment and integration of large-scale instrumentation and control systems. To do this, we exploit the latest technological developments – but only after rigorous testing and after ensuring full compliance with the most stringent regulatory requirements. Our experience enables us to bring nuclear power customers some extraordinary benefits:

- ▶ **System availability over 99.99%, with maximized operational safety**
- ▶ **Online, real-time data modification**
- ▶ **Full-scope training and engineering simulation**
- ▶ **Asset optimization and comprehensive predictive maintenance**
- ▶ **Future-proofing, with lifetime management for every system delivered.**

You should be expecting these features in any instrumentation and control system. Only with this level of control and guaranteed oversight can you truly govern nuclear facilities. In order, however, to ensure the maximum real-world benefit from better control instrumentation, it's vital to test them in simulation – with an accuracy that replicates reality to the finest possible degree. This is why we use exactly the same software within the simulator than in the instrumentation and control.

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**“Instrumentation and control must deliver maximum value – making a clear contribution to safety and long-term operational value.”**

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# Full-scope simulation - training operators to be ready at all times

In the nuclear industry more than any other, efficiency and safety depend on close, real-time relationships between people, processes and systems. Training regimes must be able to take these elements into account in order to deliver.

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## The pressure to test and validate

The quality of plant operator training is fundamental to safety and operational efficiency in any nuclear plant. Operators need full-scope simulators to experience scenarios and conditions that are a perfect mirror of what they may experience in the control room itself.

The challenge is to develop techniques and systems that make each simulation a true representation of its real-world equivalent. The full digital simulator that makes operator training real also makes an essential contribution to engineering and application scenario modeling. For this to happen, it's vital to get real-time data feeds into engineering workstations, as well as accessing tools that can test and validate application and engineering modifications before they go live in the control system.

Because of common techniques and requirements for real-time data feeds, engineering simulators and training simulators are effectively sides of the same coin. Together, these complementary simulator functions become a perfect replica of actual control systems and are built on the same technology.

## Driving training, ensuring safety, deepening control

We have a long track record and wide experience in advanced data processing and delivering control systems to nuclear power plants. Because of this, we deliver the best training and engineering simulation environments - and we can do it with a single investment initiative.

We bring depth of both specialist technical expertise and understanding of the process and personality of the industry. And because we can work with a wide range of technology providers in our work for EDF in France and UK, and CNNC in China, we're always looking for the best solution no matter what technology it revolves around.

The best simulation enables us to scope how your facility will behave under stress. But to enable your facility to function as long as possible, you need mechanisms that control maintenance schedules according to the conditions and performance of your equipment.

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**“Today’s training and engineering simulators for the nuclear power industry must be a genuine facsimile of the real thing - and that means real-time data management.”**

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# Condition-based monitoring: delivering predictive maintenance

A founding principle of all nuclear power operation is that potential problems should be identified and neutralized before they become actual. This is as true for efficiency as it is for safety - and therefore measures that improve both need to be considered together.

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## Seeing the future - and ensuring longevity

Predictive maintenance of critical equipment in nuclear plants is of the utmost importance. This applies to all systems and sub-systems contributing to plant safety and to all those directly related to operational availability.

Such equipment itself represents a massive investment, which must be protected in its own right and maintained in optimum condition. Predictive maintenance is also crucial because of the interdependency of systems; one component failure in one sub-system can have much more serious consequences on the entire system.

## A complete understanding of your facility's needs

We have created a range of condition-based monitoring systems that ensure complete, and absolutely reliable, predictive maintenance across nuclear plant operations. These systems don't just optimize operational availability but minimize the burden of maintenance overall. For us, predictive maintenance is a core expertise.

Our systems manage multiple high-volume data flows from plant equipment, and convert these into timely and actionable intelligence. This approach prevents problems before they occur and contributes to significant reductions in maintenance service overheads.

Through delivering real-time, condition-based monitoring for all plant equipment from turbines and generators to coolant pumps and internal reactor structures, we give nuclear operators:

- ▶ **Automatic early detection of equipment malfunction**
- ▶ **Active repository of critical data**
- ▶ **Advanced diagnosis tools, essential for planning**
- ▶ **Rapid information transfer, enabling experts to deliver timely and focused assistance to local operators.**

In the world of nuclear power generation more than any other, the ability to maintain every piece of equipment and element of structure, and ensure that the entire system is robust and failure-proof, is paramount. We deliver more than simply the ability to see, understand and predict: we deliver certainty of supply and control for the most powerful energy source we have. However, it is also vital for the very different maintenance requirements of every piece of hardware and software - and structure - within the nuclear power plant environment to be balanced, so that maximum safety and longevity is guaranteed.

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**“Predictive maintenance is about more than stopping small issues becoming big ones - it's about gaining actionable intelligence for continually improved operational efficiency.”**

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# Long-term service maintenance

The average nuclear power plant is active for 40-60 years. However, the lifespan of most IT and technical equipment is much shorter. Ensuring that service of key technology remains up to date is an absolute requirement for safe and efficient running of nuclear facilities.

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## Faultless lifetime management for hardware and software

This inevitable mismatch needs to be managed faultlessly. Operational continuity must be guaranteed without compromising safety or performance. A controlled, non-disruptive and cost-effective way must be found to update hardware and software, as dictated by their shorter lifecycles.

This is obviously a significant organizational and technical challenge. Meeting it requires a sustainable, long-term service approach and active partnership with specialists who you know are committed for the duration of the exceptionally long overall industry life-cycles.

## A practical approach to the most practical of challenges

As in any energy-generation scenario, the key challenge is that maintenance and operations have to co-exist. In the nuclear industry, of course, the potential issues, public sensitivity and oversight are such that every potential challenge is heightened.

We know this, which is why we have created a maintenance approach that enshrines operations at its heart. Our Maintenance in Operational Conditions (MOC) approach provides full industrial continuity as individual IT systems and components are renewed and replaced over a full operational life-cycle of 50 years or more.

MOC is structured around three complementary service types:

- ▶ Support for day-to-day activities, including non-planned intervention
- ▶ Maintenance for a full cycle of pre-planned activities
- ▶ Long-term sustainability for long-term activities.

This way, we deliver sustainability in the long term - our key differentiator. Our work for EDF, SIAAP, CNR-Suez and Sedif-Veolia in France and SIG in Switzerland has confirmed that our approach works to give certainty and cost-effectiveness that others can't match.

The MOC approach brings together all the elements that are critical to ensuring operations and maintenance can move ahead as one. That requires a complete, integrated approach to competence management, hardware and software maintenance and evolution, software configuration and ensuring that technical documentation is constantly up to date.

In nuclear power generation, continuity, longevity and safety are all maximum priorities. What's more, they are absolute priorities that must co-exist. To do this requires a combination of big-picture and fine-grain view of the systems involved than in any other operating environment - and the ability to simulate, control and maintain them - and demonstrably guarantee that control and maintenance to a wary world at the same time as guaranteeing it the power it needs.

Our MOC model is that guarantee.

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**“The Atos Worldgrid MOC (Maintenance in Operational Conditions ) approach is used for long term monitoring and control of all 900, 1300 and 1450 MW EDF nuclear power plants.”**

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# Atos Worldgrid and nuclear energy

Delivering solutions that help nuclear energy exercise accurate command and control requires a deep understanding of technology, operational requirements and safety.

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We have more than 30 years experience in providing instrumentation and control as well as training and engineering for the nuclear power industry, with 300 simulators installed in over 70 nuclear plants relying on our solutions.

In all of our work for nuclear power - as in any other area - we are truly vendor-independent. We work as a systems integrator with all leading instrumentation and control specialists, put in place predictive maintenance for organizations such as nuclear operators, and deliver training on any systems and technology. Our own MOC services are the also the culmination of three decades of experience working with nuclear power clients.

We have unrivalled depth of experience and understanding of the incredible complexity of the systems and sub-systems of the nuclear power industry.

We embrace the entire systems landscape, not just as observers but also as a pro-active partner and active R&D researcher into new ways to deliver greater control, certainty and maintenance effectiveness. In an environment that depends so absolutely on certainty, having a systems and IT partner who really knows their stuff is critical.

Atos Worldgrid is the partner that many leading nuclear power operators have chosen to put their faith in, either as sole or leading contractor. Together, we help them create new efficiencies as well as a greater level of control of the power they create for all of us.

This is what we deliver.

Smart energy. Powering progress

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## About Atos

Atos is an international information technology services company with annual revenues of EUR 8.7 billion and 78,500 employees in 42 countries. Serving a global client base, it delivers hi-tech transactional services, consulting, systems integration and managed services. Atos is focused on business technology that powers progress and helps organizations to create their firm of the future. It is the Worldwide Information Technology Partner for the Olympic Games and is quoted on the Paris Eurolist Market. Atos operates under the brands Atos, Atos Consulting, Atos Worldline and Atos Worldgrid.

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## About Atos Worldgrid

Atos Worldgrid is an Atos business unit delivering sophisticated integration projects and real-time smart energy solutions to Energy and Utilities companies across the power, water, oil & gas value chains. With 1,500 engineers and over 30 years experience, Atos Worldgrid operates in more than 15 countries. It has in particular equipped 70 nuclear power plants with its supervision and command & control software in France, UK, Russia and China and delivered the world's largest smart metering system.

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