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Sydney desalination plant chooses
one-stop shop for all electrical, automation
and energy management needs

250 million litre per day desalination plant is realizing
energy savings around 1500 MWh per month.

Built on time in 29 months and around \$90 million under budget, Sydney's \$1.8 billion desalination project includes a 250 million litre per day capacity plant at Kurnell and an 18-kilometre pipeline.

The project was designed to provide a non-rainfall-dependent drinking water source.

The desalination plant was built by the Blue Water Joint Venture, comprising John Holland and Veolia Water Australia. The pipeline connecting the plant to Sydney's water supply was built by the Water Delivery Alliance, comprising Bovis Lend Lease, McConnell Dowell, Worley Parsons, Kellogg Brown & Root, Environmental Resources Management and Sydney Water.

The plant started production in January 2010 and in June hit full capacity to provide up to 250 million litres of drinking water per day. Since the start of the year, the plant has provided over 45 billion litres (gigalitres) of drinking water. It is now able to supply water to up to 1.5 million people, which is equivalent to 15 per cent of Sydney's total drinking water supplies.

Investing in partnerships

To deliver a project of this scale, a combination of world-class expertise was required. The Blue Water Joint Venture (BWJV) was formed, comprising of Veolia Water and John Holland as partners. To achieve the project deadlines, close collaboration between all partners and contractors was required, as well as the ability to look at problems and challenges with a fresh perspective.

BWJV was responsible for managing the design and delivery of the process plant, underwater tunnels and outlet diffusers, water storage as well as electrical substation and high voltage distribution. They appointed Aecom and SKM to the JV as consultants for the detailed design, including electrical design. As the design lead for the electrical and instrumentation for the whole plant and project manager for the Aecom JV, Peter Jones required flexible business partners who were willing to go the extra mile and meet the tough project deadlines.

Schneider Electric is a global partner to Veolia Water and was first approached to provide the transformers for the project. However, Schneider Electric's global buying power and expertise across the entire electrical, automation, and energy management sector saw its role soon expand. This included the provision of medium- and low-voltage switchgear components for MV boards, MCCs, and distribution boards supplied by others, as well as the design, implementation and commissioning of the plantwide process control system (PCS).

The PCS included the design and manufacture of 690V variable speed drives (VSDs) and the supply of more than 160 400V/690V VSDs.

Schneider Electric also supplied 17 Quantum Unity PLC's, 4 redundant CitectSCADA Servers and 10 display clients, providing the control platform for over 45 Profibus networks and associated discrete I/O.

Goal

Sydney Water needed a system that would integrate all energy management systems to save money across the project operation

Story

For the electrical design, instrumentation and project management of the whole plant, Sydney Water required flexible business partners who were willing to go the extra mile and meet the tough project deadlines

Solution

- Schneider Electric EcoStruxure
- SCADA, PLCs, VSDs, transformers and switchgear
- 24/7 on-site

Results

- Significant energy savings of around 1500 MWh per month
- Schneider Electric EcoStruxure
- SCADA, PLCs, VSDs, transformers and switchgear
- 24/7 on-site support

This scope of supply allowed for a homogenous process control system with components seamlessly integrated, resulting in a smooth and rapid commissioning cycle.

Schneider Electric also provided CCTV equipment, including 64 IP cameras that work on the desalination site's Ethernet network.

Automation and instrumentation plays a vital role in the plant's day-to-day operations. An important consideration in the selection of suppliers for this critical part of the project was the interoperability of all of the plant's 8,500 devices. This included integrating the motor control centres and field instrumentation within the system's communication networks.

Working closely with Blue Water, Schneider Electric was able to prove the compatibility of all the selected devices during the bidding process, which resulted in a considerable reduction in commissioning time on site. This involved detailed bench-testing of hardware from Endress+Hauser, Pepperl+Fuchs and ProSoft to demonstrate that Schneider Electric could achieve the integration requirements for approximately 1,500 instruments via Profibus PA.

Peter Jones, Project Director, Aecom explains: "Schneider Electric was chosen as a key partner because it brought the whole package to the table – competitive costs, reliable products and international buying power. In addition, it provided a highly responsive team with a dedicated, single point of contact who had breadth of knowledge across the whole of Schneider Electric's business.

Streamlining the supply chain

"Typically when working with major international providers, you deal with different individuals within each part of the organisation, which leads to fragmented services," explains Jones. "What impressed us all in dealing with Schneider Electric was the product and technical knowledge across all areas of the project. They provided a real service.



EcoStruxure works by integrating all energy management systems to save money across the project operation.

"The fact we had a single point of contact at Schneider Electric with detail across every business process, whether it was switchgear, transformers or controls was hugely beneficial. If a problem couldn't be answered immediately, Schneider Electric would find out and come back to us with the answer."

Commenting on Schneider Electric's approach to the project, Scott Wooldridge, Vice President, Schneider Electric Industry Business explains: "We challenge traditional supplier relationships and invest in developing key partnerships to help both parties get the most out of the relationship."

"Veolia Water is one of 60 strategic global partnerships that Schneider Electric has invested in to ensure best practice and establish truly effective ways of working. We have embedded Schneider Electric engineers into Veolia's design and technology teams so that we have a really deep understanding of the key business requirements and how we can best support them."

"We approach major projects as a single entity rather than a series of product requirements. This means we look at a project holistically and draw together relevant specialists from across the business to deliver a complete solution."

"Our approach, called EcoStruxure™, works by integrating all energy management systems to save money across the project operation. It provides real-time visibility of operational performance through constant measurement and monitoring of systems to help users optimise performance and reduce waste."

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Onsite co-location

With so much riding on the project, Schneider Electric invested in establishing a permanent onsite base at the desalination plant to undertake the front end design and testing of all controls. Involving up to 50 Schneider Electric engineers and personnel at any time, this investment brought the technology and engineering expertise to site and significantly reduced the time needed to get the control system right.

“The controls system is one of the critical parts of the project and typically we would use three or more suppliers for this project component,” explained Jones. “It was a big risk to rely on a single provider, but Schneider Electric got it right. We could trust them to manage and take ownership of the entire energy and automation management system, which enabled us to streamline the supply chain and cut costs.”

Schneider Electric also provided technical support teams to deliver specialist engineering assistance 24 hours a day to support critical installation and commissioning across the range of components. This included SCADA/PLCs/VSDs/transformers and switchgear.

“In more than 20 years of managing major projects, this is the first time I’ve seen a project partner run the field testing for controls onsite,” commented Jones. “Typically timings for the control system are pushed out by other delays in the design and build process. The design and testing takes place offsite and requires key members of the project team to fly to all corners of the country at critical stages of the project to see the systems in action.

“It was a major commitment by Schneider Electric to build a design and implementation facility onsite, but the investment really paid off. It meant we could see the systems being developed and tested and see the results in real-time so we could identify and solve problems early.”

“The approach was an outstanding success and made a very valuable addition to the program. Because of the time and cost savings it provided, I will request this in every major project I manage moving forward,” concludes Jones.

Driving energy efficiencies

Another aspect of the desalination plant that Schneider Electric supported was ensuring the plant met high energy efficiency standards and incorporated the latest efficient and low-energy technologies.

Sydney Water designed the desalination plant so that 100 per cent of the energy consumption is offset by wind power. This program involved the construction of 67 wind turbines to create the Capital Wind Farm in Bungendore, NSW. With expertise in the renewable energy market, Schneider Electric provided all the energy kiosks for each turbine, as well as switchgear, transformers, and SCADA systems.

Another approach to minimise environmental impacts was the use of vegetable grade oil in the transformers. The vegetable oil is derived from renewable resources and is less energy intensive during processing. In the event of any leaks, the oil is non-toxic, non-harmful to the environment or marine life, and is biodegradable. It also has a higher flash and fire point.

Efficiency gains have also been achieved through improved air cooling. The design and adaptation of the LV VSD heat load removal, with a common manifold ducting arrangement, enables significant design and operational savings on air conditioning since 90 per cent of the losses are dissipated outside the switchroom. Cooling energy consumption is thus greatly reduced, contributing to the overall energy efficiency of the plant.

Plant performance

During the plant’s two-year proving period, efficiencies are continuing to be achieved. Ian Gabriel, Operations Manager for the Sydney Desalination Plant from Veolia Water Australia, explains: “The plant is averaging 3.4 kWh per cubic metre compared with an anticipated 3.6 kWh per cubic metre across the plant. As the plant is a 250 thousand cubic metre facility, these are significant energy savings we are seeing of around 1500 MWh per month.”

“We challenge traditional supplier relationships and invest in developing key partnerships to help both parties get the most out of the relationship.”

— Scott Woolridge,
VP, Schneider Electric
Industry Business

“The reduced energy consumption we are experiencing is a result of the quality of the raw sea water and better performance of the reverse osmosis membranes than anticipated. The membranes are requiring less pressure to achieve the necessary salt reduction.”

“Overall we’ve been really impressed with the performance of the plant, including the absolute necessity of meeting the drinking water guidelines. We are experiencing better results than other desalination plants of this size and will continue to look for further efficiencies that can be made over the coming months.”

To ensure the plant retains its current operational efficiencies, a 12-month support agreement has been developed that will provide Veolia with preventative maintenance and engineering assistance for the VSDs, PLCs, SCADA and network; with the added benefit of 24/7 emergency support on and off site.

Establishing best practice partnerships

“The success of the desalination plant from Schneider Electric’s perspective was down to the quality of partnerships,” explains Scott Wooldridge, Schneider Electric. “We bid on multiple components of the desalination project and were able to secure many of these because of our integrated approach and ability to provide value across the whole of the project timeline.”

Peter Jones agrees, “Schneider Electric approached the program with a solutions driven approach rather than a product driven approach. This mindset was really important when designing systems and overcoming challenges. Schneider Electric wasn’t just concerned with single elements of the program, they were committed to the delivery of the whole system.”

“Solutions to problems were developed within hours rather than days. Schneider Electric had a sense of urgency, and a willingness to work with you to get the job done, that you rarely find with other partners.”

“[There] are significant energy savings we are seeing of around 1500 MWh per month.”

— Ian Gabriel,
Operations Manager,
Sydney Desalination Plant,
Veolia Water

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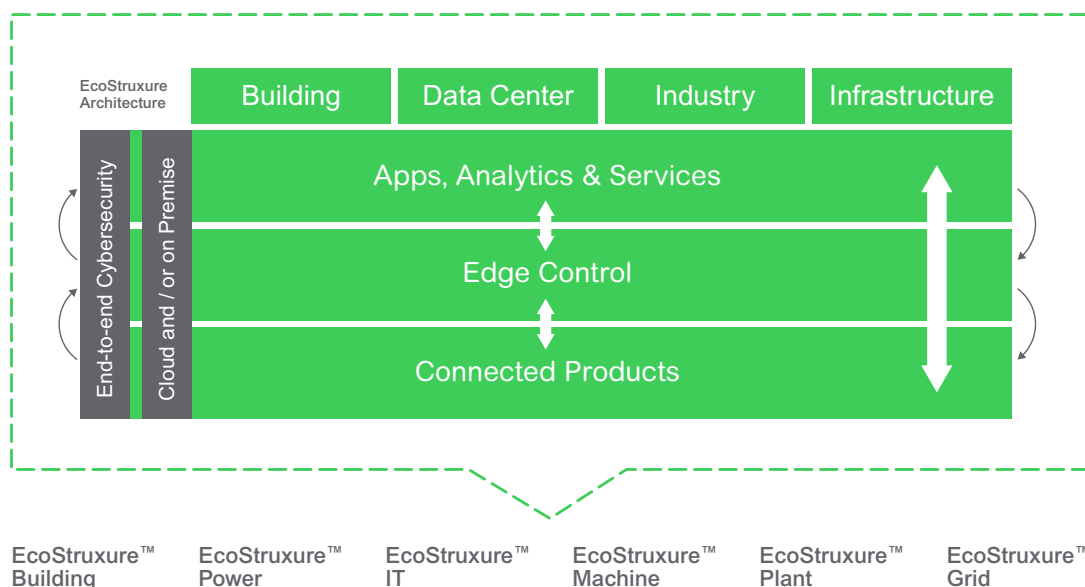
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EcoStruxure delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for our customers.

EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level including Connected Products, Edge Control, and Apps, Analytics & Services. EcoStruxure™ has been deployed in 480,000+ sites, with the support of 20,000+ system integrators and developers, connecting over 1.6 million assets under management through 40+ digital services.

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Schneider Electric

Boston ONE Campus
800 Federal Street
Andover, MA 01810 USA
Phone: + 1 978 794 0800

www.schneider-electric.com

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