Energy efficiency solutions guide
Make the most of your energy™

Schneider Electric
Our commitment

At the heart of our strategy is a simple and powerful idea; using natural resources more efficiently is both profitable and better for the environment.
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The global specialist in energy management
Every day our world demands more - more power, more reliability, more comfort and control. In today’s energy conscious environment, the world requires the most energy efficient means possible. More for less.

Achieving these goals in a variety of project applications is a difficult design brief to achieve. Every infrastructure and industry specification is unique and requires specialist expertise. That’s where the advantages of dealing with one key supplier to deliver on all your electrical and energy management criteria is a major benefit.

In Australia, New Zealand and throughout the world, that specialist is Schneider Electric.

Schneider Electric is the global specialist in energy management, offering integrated solutions that make energy safer, more reliable, efficient and productive.

**Australian snapshot**

Energy use in commercial office buildings in Australia is estimated at 18% of the total energy consumption and growing at 3% per annum. Energy saving strategies can allow building owners to enjoy reduced operating costs throughout the life of the building, while moving closer to the projected emission reduction target.

Schneider Electric estimates the commercial office space in Australia at greater than 20 million square metres. The majority of office accommodation achieves an energy rating of 2 to 2.5 out of a possible score of 5, as stipulated by the National Australia Built Environment Rating System (NABERS). A rating of 4 is equivalent to an annual greenhouse gas emission of 110 kg CO² per square meter, which is the minimum rating that local, state and federal government departments and many corporate customers now accept in their buildings.

**Outlook for the future**

World energy consumption has risen 45% since 1980. It is projected to be 70% higher by 2030.

Emerging markets (including China and India) account for more than 75% of demand, placing new pressures on global resources. Meanwhile, mature markets such as North America, Europe and Japan will face increased demand and limited resources.

These mature markets will continue legislating to reduce consumption, shift to alternative energy sources and improve energy security.

Energy efficiency is the quickest, cheapest and cleanest way to reduce energy consumption and lower greenhouse gas emissions.

Australia’s commitment to an energy efficient future is supported through a combination of voluntary rating programs, legislation, mandatory reporting requirements, Government funding programs and building codes.

Schneider Electric can assist your business to:

- adhere with the pending Carbon Pollution Reduction Scheme (CPRS) by providing energy efficient solutions
- meet energy reporting criteria as stipulated by the National Greenhouse Energy Reporting System (NGERS)
- identify, evaluate and report on cost effective energy saving opportunities as required by the Energy Efficiency Opportunities Program (EEO)
- take advantage of funding and incentive programs such as the Green Building Fund and Green Loans
- participate in voluntary rating programs for both building design and operation, such as Green Star and the National Australian Built Environment Rating System (NABERS)
- meet minimum energy efficiency requirements for buildings as set by the Building Code of Australia.

In our four-step approach, we:

1. measure energy use to identify potential savings and dysfunctions
2. install low-consumption equipment and systems
3. improve long-term use by deploying automation management, consulting, training and tracking resources while maintaining high performance
4. continuously analyse energy savings through maintenance, supervision and monitoring.

When you engage Schneider Electric, you are in fact tapping into an unrivalled line-up in terms of offer breadth, synergy and related services.
Financial opportunities
We can combine cost-oriented choices and environmental commitments

Energy savings of 30% in a building can reduce overall operating costs by 10%

In buildings, cutting energy use by 30% yields the same bottom line benefits as a 3% increase in rental income or a 5% increase in net operating income.

- In non-profit healthcare a $1 savings in energy equates to $20 in new revenue.
- In supermarkets reducing energy costs by 10% can boost profit margins by 6%.
- In full service hotels reducing energy costs by 10% equates to an increase of $1.35 in the average daily rate.

In industry, experience shows non-energy benefits often exceed the value of the energy savings on energy efficiency projects.

- There is a positive correlation between energy efficiency and productivity.
- Estimation of non-energy benefits is crucial to project justification.

Good environmental governance helps deliver better financial performance.

Energy management is a business decision. Improve your corporate bottom line while becoming an environmental leader.

30%

Energy is the single greatest cost of a commercial office building’s operating expenses.

Project achievement:

- reduce energy required
- increase production
- reduce operating time, which saves direct labour and reduces ancillary operations
- save raw material
- improve product quality
- extend the life of equipment and supplies
- reduce cleaning and maintenance requirements
- increase system capacity
- decrease noise
- reduce emissions.

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Energy management is a business decision. Improve your corporate bottom line while becoming an environmental leader.

Schneider Electric can help you understand your options.
Opportunities are all around you.
Energy efficiency improvements require a life cycle approach

Improvement starts with a decision about what to implement. In most cases an energy audit is the first step. Generally, the next identified actions will be passive measures to fix the basics such as replacing inefficient devices and repairing leaks. Finally, active measures for the optimisation and automation of systems are where substantial savings can be made.

Control and monitoring systems will sustain the savings

A combination of automation and appropriate energy awareness is the best approach.
Schneider Electric example case study

Energy efficiency opportunities in a commercial building

Subject:
- high-rise commercial building
- 16-storey
- 13,100 square metres of total floor area
- looking for opportunities to save money and be more energy efficient.

Solutions considered:
- power factor correction
- variable speed drives
- lighting upgrade.

Power factor correction using Varset

The building’s maximum demand for apparent power is 4,304kVA per month costing some $215,745 per year from the utility on demand charges alone.

Using Schneider Electric’s PowerLogic energy monitoring system, the facility manager was able to gain historical reports on the building’s power factor. The report showed that the building was operating at a power factor of 0.77. Most utilities require an electrical installation to have a power factor, of 0.9 or greater. By measuring the power factor, the facility manager was able to determine that the building’s electrical system was not running efficiently.

By improving the power factor, the kVA demand was reduced. This showed direct savings on the electricity bill and unloaded the main transformer. Power factor correction also reduced the occurrence of line losses and voltage drops within the network.

A 1500kVAR Varset automatic power factor correction bank from Schneider Electric was installed to improve the power factor from 0.77 to 0.96. Varset makes use of Varplus2 capacitors, special contactors for capacitor switching, detuned reactors to protect the capacitors from the effects of harmonics, a protective device and a Varlogic power factor controller. This resulted in a demand reduction of 851kVA per month thus reducing the demand charge to $173,046 per year and a savings of $42,700 per year.

Energy saving using Altivar variable speed drives

Five motors in the building were regulated by a manually controlled valve comprising a 500kW motor used in the carpark exhaust system, a 400kW motor for the building exhaust system, a 300kW motor for the chiller and two 50kW motors in the cooling tower.

Without implementing variable speed drives the throttle value controls the flow. By analysing the fan and pump characteristics it was evident that variable speed drives could save a significant amount of energy. With a variable speed drive, the valve is fully open so the mechanical energy loss is minimised. By adjusting the motor speed required for optimum flow, energy is saved.

By installing variable speed drives to control these motors, a saving of $293,272 per year was achieved.

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## Summary of energy efficiency opportunities

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Solution</th>
<th>Estimated capital cost to implement solution</th>
<th>Potential annual savings ($)</th>
<th>Possible payback period</th>
<th>Estimated % of annual energy savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power factor correction</td>
<td>Install Varset power factor correction bank 1550kVAR, 415V</td>
<td>$80,000</td>
<td>$42,700</td>
<td>1.9 years</td>
<td>5%</td>
</tr>
<tr>
<td>Variable speed drives to control large motors</td>
<td>Install Altivar variable speed drives to significantly reduce energy consumption whilst maintaining the flow load factor with the valve fully open.</td>
<td>$206,474</td>
<td>$293,272</td>
<td>0.7 years</td>
<td>36%</td>
</tr>
<tr>
<td>Lighting upgrade</td>
<td>Upgrade existing luminaires with new luminaires featuring KW/2 advanced reflector technology.</td>
<td>$325,000</td>
<td>$77,940</td>
<td>4.2 years</td>
<td>10%</td>
</tr>
</tbody>
</table>

### $611,474 total investment

### $413,912 saving per year, with a pay back period of 1.48 years

## Lighting upgrade

A lighting energy audit of the building revealed that the lighting was predominately a twin lamp configuration with an energy consumption figure of 84W per luminaire. The luminaires were arranged in a standard grid pattern with 2.4m centres resulting in a lighting power density of 14.6W/m², which was above the Building Code of Australia’s maximum of 10W/m².

In addition to high power consumption, the lighting energy audit revealed that the office spaces were over illuminated and above the Australian Standard for Lighting Designs (AS1680) recommended lighting levels for these applications. Finally, many of the light fittings were near the end of their service life. High failure rates and maintenance was costly.

The new lighting design aimed to achieve two objectives. The first was to reduce the lighting energy use by a substantial amount and the second was to restore the lighting levels and lighting quality throughout the building.

The new lighting design saw the existing 2 x 36W luminaires replaced with a single lamp luminaire featuring the KW/2 full specular optically engineered reflector. Energy consumption was reduced to a total of 35W resulting in a 58% saving. The lighting power and density was reduced to 6.1W/m², within the Building Code of Australia’s requirements.

Following the installation and commissioning of the lighting, the light levels were measured in the general office spaces, individual offices, conference rooms and the call centre. All light levels were found to meet and satisfy the requirements of AS1680. The lighting was more uniform and the quality of lighting improved.

In total 2,360 luminaires were upgraded, resulting in an annual energy saving of 433,000kWh, energy cost saving of $64,950(1) and a reduction in greenhouse gas emissions into the atmosphere of 424 tonnes. In addition, the annual maintenance savings were estimated at $12,990, with the introduction of a programmed maintenance service.

(1) Based on a electricity tariff of $0.15 / kWh
Schneider Electric example case study

Energy efficiency opportunities in an industrial site

Subject:
- a pumping station providing water to a small town
- due to the increase in demand, the existing pumping station has been upgraded with new pumps.

Solutions considered:
- power quality improvement
- variable speed drives.

Flow control using variable speed drives

Due to an increase in demand over the years, the existing pumping station has been upgraded with new pumps of the following sizes:
- 280kW at 75% flow
- 315kW at 75% flow
- 630kW at 75% flow
- 75kW at 75% flow.

In addition, there is 650kVA of non-linear load running at 0.7 lagging power factor.

The nature of the operation made it essential to use variable speed drives for flow control, which leads to the following advantages:
- optimal flow and pressure control
- reduction in mechanical and electrical stresses on system components
- enhancement in the system’s dynamic response to rapid load changes
- substantial reduction in system losses
- significant reduction in energy consumption.

Using variable speed drives for this application resulted in energy savings of 615,342kWh per year. This equates to a $55,381 reduction on the electricity invoice per year.
Opportunity Solution Estimated capital cost to implement solution Potential annual savings ($) Possible payback period

Use of variable speed drives to control pumps. Install Altivar variable speed drives to significantly reduce energy consumption on the pumps. $118,000 $55,381 2.1 years

Use of active harmonic filter for harmonic correction to optimise the transformer capacity. Install 2 x 300A AccuSine active harmonic filters for harmonic mitigation and power factor correction. This will avoid investing in an additional 2.5MVA transformer worth $220,000. $150,000 $25,560 5.8 years

$268,000 total investment $80,941 saving per year, with a pay back period of 3.3 years + one time saving of $220,000

Summary of energy efficiency opportunities

Power quality improvement

The introduction of variable speed drives in electrical installations increases harmonic levels thus impacting the transformer derating. To avoid oversizing transformers, it is imperative that harmonic levels are managed effectively.

An assessment on the effect of harmonics on the existing supply fed by a 2.5MVA transformer indicated that the transformer derating factor is 45% and the available transformer capacity is 55%.

When the 45% derating factor is applied in the calculation, it revealed that a 5MVA transformer is required to supply the existing and additional loads. The purchase and installation of a 2.5MVA transformer would cost around $220,000, including the switchboard and protection components required.

The use of active harmonic filters is a cost-effective solution for this application. By calculation, 550A of compensation is required to reduce the harmonic distortion to an acceptable level and bring the transformer derating factor from 45% down to just 5%. Two units of 300A AccuSine active harmonic filters were installed on-site costing $150,000.

In addition to harmonic mitigation, 240kVAR of reactive power is supplied by the AccuSine filters, which then improved the power factor of the system and reduced the demand by 142kVA per month. This equates to a saving of $25,560 per year on demand charges.

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Customer Case
The iconic building at One Shelley Street, Sydney features a range of innovative design principles to help it achieve an industry benchmark 6 Star Green Star rating.

One aspect that makes this cutting-edge development a global showpiece for environmental sustainability is the complete energy management solution designed by Schneider Electric.

The energy management solution integrated within the building comprises of Schneider Electric’s hardware and software, which monitors consumption and generates real-time reports and troubleshooting alerts.

Schneider Electric’s principal design engineer, Sam Mangion, says Schneider Electric is committed to improving its customers’ energy performance and quality. “For Schneider Electric sustainable development is about energy efficiency, building automation and backup power supply.”

Mr Mangion adds that efficiency goes hand-in-hand with safety and increased client confidence in the solution.

“The ION Enterprise system identifies leak detection and will provide the customer with a warning of potential trouble spots. As this warning point is per flow meter, the software can determine which area of the building the leak is coming from,” he explains.

The system also identifies any equipment failures. This timely identification allows for the problem to be corrected quickly and efficiently thereby minimising, or avoiding equipment malfunction or downtime. In the event of power failure, the customer still has peace of mind.

“Using Schneider Electric’s complete energy management solution provides a hierarchy of load shedding that can be brought down to a micro-level, minimising disruption to the entire building,” Mr Mangion says.

Importantly, energy consumption data is continually logged to enable the customer to trend the building’s energy use in accordance to their participated baseline, allowing further identification of areas where overall operating efficiency can be improved.

“This is vital as it helps our customers to track their energy efficiency and helps them to verify the initiatives they have undertaken to maintain their 6 Star Green Star rating,” Mr Mangion says.

“"For Schneider Electric sustainable development is about energy efficiency, building automation and backup power supply.”

- Mr Mangion
Schneider Electric Sales Engineer Graeme Shannon says “The main components for the job were actually within the main switchboards, which were built by SMB Harwal and incorporate our drawout air circuit breakers and moulded case circuit breakers. Our product was favoured because the cascading and discrimination capabilities between our switchgear ensure that our product is safer, more reliable and more efficient.”

Building services and environmental engineering consultancy WSP Lincolne Scott has been involved in the design of several Australian and international 5 and 6 Star Green Star projects, including One Shelley Street.

WSP Lincolne Scott’s project leader John Osborne said the Schneider Electric metering system was chosen for the project because of its quality and capability.

“The quality of Schneider Electric meters is excellent, and represents an industry benchmark,” he says.

“We decided early on in the project that we wanted to keep the Building Management Control System (BMCS), metering and lighting control separate in order to take advantage of their full capabilities. Having separate screens and separate servers for each of the three systems allows you to take full advantage of the power of each of the programs.”

“We did our research. We looked at several brands and it came down to a couple of different systems. Developer, builder, owner and manager of the building, Brookfield Multiplex, selected Schneider Electric and in using their system we have purity – high separation between all of the tenants and the base building equipment, which enables us to call up individual meters to monitor the energy usage of specific items of equipment,” Mr Osborne explains.

“We have set up energy modelling benchmarks for the building so we can track against the model and raise alarms if the actual performance deviates from that modelling. From a maintenance perspective, it enables fault finding; the building manager can look at this information on screen and then analyse the system to determine any reasons behind excess energy usage,” he says.
Brookfield Multiplex Services Manager Nani Melwani says the metering system will provide a unique opportunity to maximise energy efficiency, reinforcing the company’s reputation for quality and innovation and its commitment to providing a sustainable future.

“This system gives us a good method of tracking the building’s performance on a daily basis. We have installed a lot of meters around the building, both actual and virtual meters, and we have broken the building down into segments, which gives the building managers the ability to target areas that aren’t performing efficiently. We haven’t been able to do that before with this sense of correct diversity,” he says.

Sam Mangion says more than 150 of Schneider Electric’s PowerLogic PM700 series power and energy meters have been installed in the building to allow tenants to effectively monitor and manage power supplies to critical systems like generators, uninterruptible power supplies (UPS), and sensitive IT and plant equipment.

“The PM700 meters provide a wide range of functionality and data such as power, energy, demand, voltage, current, power factor and harmonics, and send real-time data back to the ION Enterprise Energy Management System, where it is accessed via a customised LCD interface.”

“This system allows our customers to go to the one central application to manage their electrical distribution network. It allows them to view data simply and more effectively by building and floor location, as well as accessing historical data and reports necessary for NABERS ratings.”

Heyday Group commissioned and installed the system and project manager, David Howell, says the One Shelley St, Sydney project was one of the most challenging projects that we have done with energy metering, but it is also one of the easiest in terms of installation.

Mr Howell adds that this is also one of the most innovative and user-friendly energy management solutions that he has seen. “Incorporating the base building, tenant and the tenants load shedding system so that all systems can be viewed off the one server makes for a more compact and efficient system”.

“Photographs courtesy of: Martin van der Wal

“The quality of Schneider Electric meters is excellent, and represents an industry benchmark”
For each market there are simple energy efficiency solutions

Residential
• Using energy efficient products may save up to 40% electricity.

Buildings
• Three key areas: HVAC, lighting & integrated building solutions.
• Technical projects can yield up to 30% of energy savings.

Industry and Infrastructure
• Motors account for 60% of the electricity usage.
• The average facility can reduce its energy consumption by up to 20%.
Solutions for residential and small buildings

Enabling products

- Lighting control: dimmers, timers, movement and presence detectors, specific switches and light sensitive switches.
- HVAC: metering and programmable time switches.
- Motor control: programmable time switches and variable speed drives.
- Renewable energy: system for the production of solar energy.

Management systems

- Lighting control systems.
- Home control systems.

Added value services

- Remote control.
- Multimedia control.
- Alarm handling.

Residential energy efficiency solutions may save up to 40% electricity

Heating is 30% of energy usage

Lighting and appliances are over 40%
Solutions for medium and large buildings

Enabling products
• Lighting control: dimmers, timers, switches, movement and presence detectors.
• HVAC: variable speed drives for flow and pressure control of fans and pumps.
• Energy management: power compensation and filtering, meters.
• Renewable energy: system for the production of solar energy.

Management systems
• Building management systems.
• Power monitoring and analysis.

Added value services
• Site audits.
• Data collection and analysis.
• Financial analysis and return on investment.
• Planning of improvement plan.
• Remote monitoring and optimisation.

Building energy efficiency solutions can yield up to 30% energy savings

Three key areas: HVAC, lighting and integrated building solutions
Motors consume more than 35% of electricity
Solutions for industry and infrastructure

Enabling products
- HVAC: variable speed drives for motors.
- Motor control: programmable logic controller to optimise equipment usage and maximise variable speed drive benefits.
- Energy management: power compensation and filtering, meters.

Management systems
- Power monitoring and analysis.
- Process supervisory systems.

Added value services
- Site audits.
- Data collection and analysis.
- Financial analysis and return on investment.
- Planning of improvement plan.
- Remote monitoring and optimisation.

An average facility can reduce consumption by up to 20%

- A 25% reduction would save 7% of the world’s electricity
- The largest consumer, motors, account for over 60% of electricity usage
- There is a positive correlation between energy efficiency and productivity
Solutions
How can I optimise my energy consumption and spending?

Energy use analysis and tariff optimisation with power management systems

Diagnosing energy consumption and cost allocation is a key first step to achieve reduction. Energy use analysis solutions provide the means to understand energy consumption of all relevant utilities (water, air, gas, electricity, steam). Cost allocation and sub-billing reports enable building or factory owners to hold tenants and cost centres more accountable for energy costs. Subsequent actions can reduce overall energy usage by 8 to 10%!

Energy tariff optimisation solutions can have significant impact on overall utility costs. Businesses can optimise the cost of their energy if they have the knowledge to negotiate advantageous supply agreements.
Power metering:
PowerLogic, Compact NSX, Masterpact, Power meters, SEPAM 20/40

This entry-level solution provides a field operator with the initial understanding of the electrical flow in a network. The solution provides information on electricity consumption in subsystems and real-time power factor information. This first analysis capability improves knowledge of energy use, saves money through improved efficiency and allocation, and helps to avoid peak demand penalties.

Power monitoring and analysis:
PowerLogic, ION Enterprise, ION, PMs/CMs, SEPAM 80

This system provides accurate information on energy demand. It embeds advanced functions to log and sort all events on the electrical network. The data screens and reports provide a means to encourage and drive behaviour towards efficient energy usage through identifying usage patterns and allocating costs according to cost centre, production unit, or shift in a facility.

Enterprise Energy Management (EEM):
PowerLogic ION EEM

PowerLogic ION EEM is an energy focused software solution. Even in enterprises with multiple sites and complex energy data, EEM provides the tools to quantify the cost of energy and relate it to your everyday business.

AUD 3.03M
saved after allocating energy cost to appropriate cost centres.
Experience by a movie studio and theme park.

-20%
i.e. AUD 910K year cut in our energy budget.
Says NSU at Fort Lauderdale USA.

AUD 1.3M
saved in new construction costs and in elimination of extra systems.
Testifies Sappi in Belgium.

-30%
of our electrical budget or AUD 1.3M savings thanks to load reduction now installed.
Stresses the University of Mississippi, USA.

1 HVAC System
2 Lighting
3 Motor & Processes
4 Critical Power Loads
5 Generator Banks
Monitor and analyse electrical consumption of a shopping centre

Customer’s needs
The manager wants to identify excessive or unnecessary electrical energy use by controlling the consumption in different areas of the shopping centre and subsequently allocate the cost to the appropriate cost centre.

Schneider Electric solution
A three-phase meter with neutral ME4zrt counts the total energy consumed by the installation; measurement is taken using current transformers.

A three-phase meter ME3zr measures the energy of the food court.

A three single-phase meter ME1zr measures the active energy of the other circuits.

A yellow indicator light on the face of the meter flashes according to consumption.

The EN40kWh meter measures the active energy consumed by single phase circuits in the refrigeration room.

Energy efficiency core products
PowerLogic ME kilowatt hour meters are designed for measurement of Watt-hours of single-phase or three-phase electrical circuits.
Solution diagram

Energy efficiency benefits:

- Metering can reduce energy consumption by up to 10% by raising users’ awareness of consumption habits.
- Easiest way to start tracking consumption.
- Can be used for sub-billing and cost allocation.

Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ME3zr</td>
<td>Three-phase meter</td>
<td>C60N</td>
<td>MCBs 2.3 and 4 pole</td>
</tr>
<tr>
<td>ME4zrt</td>
<td>Three-phase with neutral meter</td>
<td>TI 75/5</td>
<td>Current transformer 75/5</td>
</tr>
<tr>
<td>ME1zr</td>
<td>Single-phase meter</td>
<td>EN40</td>
<td>1 pole kWh meter</td>
</tr>
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Monitor and analyse electrical consumption in your production workshop

Customer’s needs

The factory manager wants to control the electrical energy use by monitoring consumption in different production workshops. Once this is established the manager needs to analyze the data by department and allocate costs to the appropriate centre.

Aiming to reduce energy use by 10%, the manager wants a permanent indication of the data through a remote easy-to-use monitoring system, with historic data, consumption trends and cost allocation facilities.

Schneider Electric solution

Just use a PowerLogic System! The metering system has one power meter PM710 and two PM9C equipped in the panel-boards of the workshop.

A PM820 power meter controls the main panel-board. The power meters are inter-connected through a RS485 serial link and an Ethernet communication card. PM8ECC is added to PM820 to enable communication to the Ethernet network of the factory. The supervision is done by the ION Enterprise monitoring system.

Energy efficiency core products

PM9C offers basic measurement capabilities to monitor simple electrical installations:
- Instantaneous rms values
- Energy values
- Demand values and communication RS485.

PM series 700 and 800 offers all the high-performance measurement capabilities, data recording and communication.

The ION Enterprise software provides user friendly monitoring for:
- Cost allocation
- Equipment
- Power consumption
- Preventive maintenance.
Solution diagram

Energy efficiency benefits:

This measurement can be used to implement actions designed to reduce energy consumption.

Permanent monitoring and visualisation of the consumption helps to encourage more efficient use of energy and create a more disciplined behaviour among those in charge of workshops. It is a key first step towards a comprehensive energy intelligence strategy.

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<table>
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<tr>
<td>PM710</td>
<td>Power meter series PM700</td>
</tr>
<tr>
<td>PM820</td>
<td>Power meter series PM800</td>
</tr>
<tr>
<td>PM9C</td>
<td>Power meter with RS485</td>
</tr>
<tr>
<td>PM8ECC</td>
<td>Ethernet communication card</td>
</tr>
<tr>
<td>ION Enterprise</td>
<td>Ethernet communication card</td>
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Shed your non-priority loads automatically and simply

Customer’s needs
The owner wants to switch to a more cost-effective contract with the electric utility. The owner wants to shed non-critical loads to make sure this stays within the utility rate block, but can’t afford sudden power cuts.

Schneider Electric solution
Design your electrical system around Compact NSX circuit breakers. Compact NSX circuit breakers allow you to manage reflex load shedding (the automatic shedding of specific loads).

The Compact NSX circuit breaker with integrated Micrologic 5.2E electronic trip unit sends the reflex load shedding command. The trip unit measures I, V, P and E, and produces the appropriate alarms. Each alarm is associated with a load shedding trigger setting and a deactivation setting, each with time delay. The reflex load shedding order is sent via the Compact NSX circuit breaker’s SDx output module.

PT: Pick-up threshold
PD: Pick-up time delay
DT: Drop-out threshold
DD: Drop-out time delay
Alarm: activation zone (in red)

Each alarm is associated with a load-shedding trigger setting and a deactivation setting.

Energy efficiency core products

Compact NSX 100-630A circuit breaker:
- The first-ever moulded case circuit breaker to include protection, measurement, and communication capabilities in a single unit.
- Independent, configurable alarm time delays with flexibility in a single unit.
- Micrologic 5.2E trip unit with integrated energy measurement.
- SDx module with two outputs and power supply from 24V to 415V, AC or DC.
**Solution diagram**

### Energy efficiency benefits:

- Save up to 10% off your energy bills.
- Subscribe to a more cost-effective utility contract and avoid costly utility rate-block overrun penalties.
- Get the most out of your investment and enjoy greater reliability with the Compact NSX circuit breaker, integrating both protection and measurement capabilities.
- Increase power availability by preventing overload tripping.
- Save design time and space.
- Limited part numbers for easy selection and ordering.
- No need for external current transformers.

![Energy efficiency benefits diagram](image)

**Products used**

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact NSX</td>
<td>Circuit breaker</td>
</tr>
<tr>
<td>Micrologic 5.2E</td>
<td>Intelligent trip unit</td>
</tr>
<tr>
<td>SDx module</td>
<td>Intelligent output module</td>
</tr>
<tr>
<td>C60N</td>
<td>MCBs</td>
</tr>
<tr>
<td>CT contactor</td>
<td>Contactor for load shedding</td>
</tr>
</tbody>
</table>

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How to improve my electrical network performance and upgrade energy efficiency?

Power factor correction and harmonic filtering

Most utilities have specific policies for billing reactive energy. Price penalties are applied if the active power/apparent power ratio is not within the guidelines.

Power factor correction solutions modify and control the reactive power to avoid utility penalties and reduce overall kVA demand. These solutions result in lowering utility power bills by up to 10%.

Harmonics stress the electrical network and potentially damage equipment.

Harmonic filtering solutions are a means to reduce and eliminate the harmonics. They increase the service life of equipment up to 32% for single phase machines, up to 18% for three phase machines and up to 5% for transformers.
Power factor correction: Varplus®, Varpact, Varlogic, Varset

Every electrical machine needs active and reactive power to operate. Power factor measurement identifies the level of reactive power and optimises it to minimise cost and avoid penalties. If the power factor drops below the limit set by the utility then the power factor correction bank modifies the level to avoid penalties. By correcting poor power factor, these solutions also reduce kVA demand. Reduced kVA demand results in a 5 to 10% lower utility power bill, cooler equipment operation and longer equipment life. In addition, proper power factor correction helps optimise electrical network loading and improves reliability.

Harmonic filtering: Sinewave, Accusine

Equipment such as drives, inverters, UPS, arc furnaces, transformers, filters and discharge lamps generate voltage distortion or harmonics. These harmonics stress the network, overload cables and transformers, cause outages and disturb many types of equipment such as computers, telephones and rotating machines. Subsequently, the life of equipment can be greatly reduced. Harmonic filtering is a means to reduce and eliminate harmonics. These solutions increase service life of equipment up to 32% for single-phase machines, up to 18% for three phase machines and up to 5% for transformers.

1 month payback. We installed a 5MVAR capacitor banks with detuned reactors. Annual cost savings will reach AUD 20M and implementation cost AUD 1.7M.

Portucel Paper Mill in Portugal.

-9% of our energy consumption after we installed 10 capacitor banks with detuned reactors. Electricity bill was optimised by 8% and payback in two years. Testifies Michelin Automative in France.

AUD 15.5M MV capacitor banks installed, cost saving of AUD 15.5M, payback in just two months.

RFF Railways France.

1 year 70 capacitor banks with detuned reactors installed, energy consumption reduced by 10%, electricity bill optimised by 18%, payback in just one year.

Madrid Barajas airport Spain.

5% LV capacitor bank and active filter installed, energy consumption reduced by 5%.

POM A OTIS Railways Switzerland.
Reduce energy consumption and operating costs of a manufacturing plant

Customer’s needs
The manufacturing plant manager wants to identify and reduce energy consumption and improve the power quality on the network. As there are many motors with variable speed drives, the harmonic levels are considerably high on the network. The plant also needs to improve its power-factor to gain efficiencies and meet the utility prescription.

Schneider Electric solution
Varset capacitor banks can reduce the energy costs by improving the power factor. Avoid penalties for reactive power consumption on energy bills and gain savings on active consumption, thanks to the reduction of losses. AccuSine harmonic filters can effectively mitigate harmonics on the network and also provide power factor correction.

Energy efficiency core products
- Varset capacitor banks (options available with circuit breaker protection or fuse protection).
- Varpact function plates and Varlogic controllers to build your own capacitor banks.
- AccuSine active filtering solutions.
Solution diagram

Energy efficiency benefits:

- Power factor correction can reduce up to 10% on the energy bill.
- Can increase available power up to 30%.
- Can reduce harmonic content to acceptable levels.

Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varset</td>
<td>Capacitor bank with detuned reactor and circuit breaker</td>
</tr>
<tr>
<td>AccuSine</td>
<td>Active filtering solution</td>
</tr>
</tbody>
</table>

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Reduce energy consumption and operating costs of a shopping centre

Customer’s needs
The manager wants to identify, localise and reduce electricity costs. The manager also wants to improve the quality of electricity and increase its availability.

Schneider Electric solution
Installing capacitors will reduce the energy cost by improving the power factor.

The detuned reactor will master the harmonic levels and reduce the impact of harmonics on all electronic devices. Using capacitors will reduce the energy cost by improving the power factor of the installation.

Using detuned reactors will reduce the impact of harmonics on electronic devices like telephones and computers.

Energy efficiency core products

The solution includes:
• Varplus² capacitor:
  - modular offer
  - easy and fast assembly
  - high quality protection system with internal HRC fuse.
• Detuned reactor

OR
• Varpact function plates:
  - modular offer
  - onboard detuned reactor
  - circuit-breaker or fuse protection.

Varplus²  
Varpact
Solution diagram

Energy efficiency benefits:

A power factor correction solution will:
• Reduce the energy bill by up to 10%.
• Increase available power up to 30%.

Products used

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<th>Product</th>
<th>Description</th>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varplus²</td>
<td>Capacitor</td>
<td>DR</td>
<td>De-tuned reactor</td>
</tr>
<tr>
<td>Varlogic</td>
<td>NR6 controller, 6 steps</td>
<td>LC1-D.K</td>
<td>Contactor</td>
</tr>
<tr>
<td>Compact NSX</td>
<td>Compact NSX circuit breaker</td>
<td>CT</td>
<td>Current transformer</td>
</tr>
</tbody>
</table>

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Energy savings with pump control

In industry, 60% of consumed electricity is used to turn motors and 63% of this energy is utilised within applications such as pumps and fans. Many of these devices are driven by simple motor starter solutions. This means that the motor runs at full speed even when lower levels of flow are required. Often, inefficient throttling or control methods are used and energy consumption remains high.

Pumping and air handling applications fitted with variable speed drives can achieve significant energy savings when compared with conventional starting solutions; up to 50% for fans with full payback within one year, up to 30% for pumps with payback within two years.
Modular solutions for booster or complex pumping stations:
Altivar 61, M340, Advantys, ETG

This solution can manage multiple pumps and provide additional functions such as chlorination or tank management. It enables a reduction in energy consumption of up to 30% depending on pump characteristics. This flexible solution provides strong diagnostic capabilities via Transparent Ready functionality and Ethernet connectivity.

Smart cost saving solution for drinking water stations:
PowerLogic, Compact NSX, Altivar 61

An innovative solution to update an electrical installation and provide new analysis services to reduce consumption and lower the electricity bill. Based on electro-technical competencies and a web-enabled measurement system, this solution produces high level recommendations to optimise the pumping process and reduce the electrical utility cost.

High performance integrated solution for wastewater plants:
PowerLogic, Modicon Quantum, Unity Application Generator, Altivar 61

Based on electrical distribution equipment, power monitoring, motor control, automation and services, this integrated solution is ideal for high-tech plants requiring adherence to stringent specifications and the flexibility to adapt to future requirements. Altivar variable speed drives optimise energy costs and the Unity Application Generator (UAG) brings a library of smart water objects to the process. UAG shortens the process design cycle by helping to automate code generation. This in turn increases code re-use for similar applications, saving both time and cost. This web-enabled power and control solution will bring energy efficient operations to your business.

-30,000 kg/year

of CO2 emissions. As irrigation pumps are driven by water flow, a constant pressure is essential for even water distribution over fields. To keep this pressure constant, a 75kW a.c. drive replaces a typical on-off control. About 60,000kWh of energy was saved each year. Experienced by a customer using irrigation pumps.

535,339 kWh/year

energy savings further to variable speed drives installation. Investment: $14,700, payback in just 6 months. WTP booster pump – Indonesia.

25% saving

in energy consumption with 10 variable speed drives installed, ranging between 55 to 110kW. Pumping station in La Rochelle – France.
Reducing energy usage in a treatment plant’s boosting station

Customer’s needs
The management of a treatment plant have identified an area of energy wastage within the facility’s boosting stations. Approximately 30% of the power consumed by the motors is dissipated every time the valves are closed to adjust pressure delivered by the pumps. The pump motors continue to run at full speed regardless of the position of the valves or the required pressure.

Schneider Electric solution
The Altivar 61 variable speed drive is the ideal solution to address this problem. The drive regulates the motor speed to adjust pressure, vastly improving the efficiency of the application when compared to the fixed speed system currently in place.

The solution shown provides a specific control algorithm for a constant pressure pumping system consisting of up to four pumps. One pump is controlled by the variable speed drive which includes an optional ‘water solution control card’. The remaining three external pumps can be controlled by direct-on-line starters, or preferably, soft starters.

This combination will determine how many external pumps need to be in operation to meet the present demand.

The variable speed drive will operate one of the pumps to make up any demand requirement as and when necessary. Under normal operating conditions, the control algorithm will respond to an increase in demand by initially increasing the speed of the pump controlled by the variable speed drive.

If this pump is unable to fulfil the demand and has already reached full capacity, the control algorithm will switch in one or more of the external pumps to assist.

The variable speed drive controlled pump will then reduce speed and share the load with the external pump whilst making up the demand shortfall.

Energy efficiency core products
The Altivar 61 is specifically developed for pumping applications and offers even greater functionality and performance when combined with one of the two ‘water solution control card’ options.

The cards take into account the specific application characteristics of:
(1) pumping and boosting, and (2) irrigation and sprinkling.

These cards provide greater installation flexibility and accuracy while reducing energy consumption and water wastage.
Solution diagram

Energy efficiency benefits:

Thanks to variable speed drives, energy consumption is reduced on boosting pumps. Energy savings are easily estimated via ECO² software. The installation maximises efficiency by ensuring that the pump motors are running at optimum output, only when required.

Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altistart 48</td>
<td>Soft starter or DOL contactor based solution</td>
</tr>
<tr>
<td>Altivar 61</td>
<td>Drives for pumps and fans 0.75 &gt; 630kW</td>
</tr>
<tr>
<td>Water solution control card</td>
<td>ATV61 water solution control card</td>
</tr>
</tbody>
</table>

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Optimise pumping for swimming pools

Customer’s needs
The private home-owner wants to save energy while optimising the water flow in the swimming pool filtration system, keeping water moving for chemical dispensing or chlorination efficiency.

Schneider Electric solution
To minimise energy costs, the pump should operate at the lowest possible flow rate. With a variable speed drive placed between the circuit breaker and the motor, flow variation is achieved by electronically controlling the speed of the motor.

Energy efficiency core products
The Altivar 12 variable speed drive combines all the functions that your application requires:
- reduction of energy consumption
- flow variation
- simplicity of use
- motor protection.

ATV12
Solution diagram

Energy efficiency benefits:

- At 80% of the flow, power consumption drops by 50% when using a variable speed drive.
- Energy savings are considerable when, optimising water flows for any application including cycles such as filtration, cleaning, spa and heating.

Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Product</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>A1</td>
<td>Altivar 12 variable speed drive</td>
<td>Q3</td>
<td>Control circuit breaker</td>
</tr>
<tr>
<td>Q1</td>
<td>Circuit breaker</td>
<td>S1, S2</td>
<td>Pushbutton</td>
</tr>
<tr>
<td>KM1</td>
<td>Contactor</td>
<td>T1</td>
<td>100 VA transformer 220 V secondary</td>
</tr>
<tr>
<td>Q2</td>
<td>Circuit breaker (rated at twice the normal primary current of T1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Energy savings with HVAC control

Heating, ventilation and air conditioning (HVAC) can represent over 40% of energy consumed in many buildings and facilities. Improved control and management of ventilation, temperature and system usage will reduce energy consumption and sustain it at the optimal level.

From simple stand-alone control products up to global building management systems, HVAC solutions can save up to 30% of energy consumption. For fan ventilation applications, solutions based on variable speed drives can save up to 50% in energy consumption compared to conventional motor starter and flow regulation installations.
Stand alone temperature and energy control with thermostats and load shedding contactors:

**Multi 9**

This solution is based on a load shedding strategy, thermostats to optimise energy consumption and simple contactors to shed load at peak demand. It lowers energy bills, reduces peak demand charges and prevents unexpected tripping of loads. This solution can be applied in the residential domain to manage heating systems and electrical appliances and in the commercial domain to manage lighting, heating and other small industrial processes.

Enclosed drive for variable torque applications:

**Altivar 21**

Specifically designed for HVAC fan applications, these solutions are cost effective energy savers. Pre-assembled, pre-wired and pre-programmed, they guarantee quick installation time.

HVAC control system with centralised management:

**Altivar 21, ECO2, Twido, Magelis**

An open, scalable control platform with communications to the main building management system for advanced air treatment control. Standard Modbus and Ethernet communications couple drives, controls and HMI to optimally manage the HVAC systems from a central control station. From design to implementation, specialists are available to define and implement the most efficient architecture depending on specific needs.

Small stand-alone HVAC control solution:

**Xenta 700**

Xenta 700 is an IP-based building management controller combining building control, web functionality, alarm handling and amazing graphics in one powerful package. As a stand-alone solution, the controller is ideal for smaller installations where cost and simplicity matters. In addition to being a stand-alone solution, the Xenta 700 is a core part of the Vista building management solution.

HVAC management system:

**Vista Continuum and iNet**

Vista, Continuum and iNet are building management systems that provide complete control of heating, ventilation and air conditioning. They are based on open, IT-friendly standards and include management software, a complete range of controllers (network, programmable and application specific), communication devices and field devices. The solutions enable a centralised management of alarms, set points, schedules, logs, graphs and reports. You can monitor and control one or several buildings – on-site or remotely – through multiple devices. The benefits are substantial energy savings, more efficient facility operations and an optimal indoor environment.

---

To cope with rising energy costs Talum needed to improve the air purification plant in its aluminium production process. Using six Altivar drives to control the ventilation system instead of direct-on-line starting and pneumatic controlled flaps, the energy consumption was reduced by 20%. Simple payback was achieved within six months. Harmonic distortion, a major concern of Talum, was within limits. Schneider Electric’s ECO8 motor system simulation tool was used to project the 20% savings.

**Talum d.d. in Slovenia**

**-20%**

Improved efficiency by managing air conditioning ventilation in clean rooms. Installation of 37kW Altivar drives on seven fans provided energy savings of $50K per year, and a payback within 16 months.

**Thomson Multimedia in Germany**

**$50 K/year**

Improved efficiency on a central air handling unit for the production plant. The solution, based on four 90kW Altivar drives, provided 30% energy savings and an investment payback of 13 months.

**TEMIC semiconductors in France**

**-30%**

The customer’s ambition was to get a property-wide energy management system, that would help generate significant costs savings. By installing a building management system the customer reduced installation cost by 35% and due to accurate and easily accessible information, they can now make well-informed energy management decisions.

**Westphalian Centre for Psychiatry and Psychotherapy in Germany**

**-35%**
Ensure effective operation of a cooling tower fan

Customer’s needs
In an operation involving heat extraction from process cooling water, the customer wants to maximise the energy efficiency of the cooling tower and reduce the electricity bill.

Schneider Electric solution
Use variable speed drives to regulate the tower’s fan and pump.
The best way to control air-water exchange in a cooling tower is to use variable speed drives to control the tower’s fan and pump, eliminating additional maintenance-hungry mechanical systems while meeting the tower’s needs. A PLC regulates fan airflow and pump volume via the variable speed drives.
This solution uses up to 50% less energy than direct-start fans and pumps and eases maintenance requirements.
Over a given season, the fan and pump motors must operate at full speed just 2% to 5% of the time - the rest of the time this energy is wasted. Direct-start motors require additional mechanical systems to solve problems like fan blade rotation due to wind, or additional resistance due to freezing.
This solution uses 20% less energy than two-speed motors and while two-speed motors offer a partial solution to energy consumption issues, they do very little to resolve maintenance needs.

Energy efficiency core products
Variable speed drive range dedicated to building HVAC applications. All essential functions for variable torque pumps and fans applications:
- 3-phases 200/240V, 380/480V
- UL Type 1/IP20 and IP54 up to 75kW
- Speed range: 1:50
- Overload: 110% - 60s
- Integrated EMC filters class A or B.
- Supports main communication bus used in the building market: LornWorks, Metasys N2, BACnet and Apologe FLN.
- Conformity to the international standards and certifications: CE, UL, CSA and C-Tick.
- Reduced-capacitance technology: immediately operational and without harmful effect, harmonics treatment without added artifacts: THDI < 30%.
Solution diagram

Energy efficiency benefits:

Speed control can generate huge energy savings in these applications. The return on investment is very short, usually between nine and 24 months by reducing the electricity bill for large office buildings, hospitals and schools.

Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATV 21</td>
<td>Variable speed drive</td>
</tr>
<tr>
<td>Q1</td>
<td>Circuit breaker</td>
</tr>
<tr>
<td>C1</td>
<td>Contactor</td>
</tr>
<tr>
<td>Q2</td>
<td>Miniature circuit breaker</td>
</tr>
</tbody>
</table>

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Reduce electricity costs and noise in an industrial fan application

Customer’s needs
The customer wants to maximise energy efficiency of an industrial fan according to demand, reducing the electricity bill. The customer also wants to remove dust from the plant while reducing noise.

Schneider Electric solution
Using an Altivar 61 variable speed drive, you can start the fan and control its speed. The drive is equipped with built-in PID control and can even be connected to a building management system or through an industrial communication link. A solution in IP54 is also available for application in harsh environments.

Energy efficiency core products

Altivar 61 is the right solution to decrease or increase the fan speed according to the demand. It reduces energy consumption and increases the comfort of the people in the area.

• This drive is also easily integrated into building management systems or industrial networks as it offers a variety of communication cards.
• Thanks to macro-configurations, the Altivar 61 allows immediate starting and fast set-up and commissioning.
Solution diagram

Energy efficiency benefits:

- Energy saving reduces the electricity bill for industrial plants with large power fans.
- Adding a variable speed drive in the installation eliminates using a fan running at full speed with a damper partially closed.
- Remember, controlling a fan at 80% of its nominal speed can cut your energy bill in half!

Products used

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<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATV61</td>
<td>Variable speed drive</td>
<td>Q2</td>
<td>Circuit breaker</td>
</tr>
<tr>
<td>KM1</td>
<td>Contactor</td>
<td>Q3</td>
<td>Control circuit breaker</td>
</tr>
<tr>
<td>L1</td>
<td>DC choke</td>
<td>S1, S2</td>
<td>Pushbutton</td>
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<td>Circuit breaker</td>
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<td>100 VA transformer 220V secondary</td>
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Lighting can represent over 35% of the energy consumption in buildings depending on the business. The use of efficient lighting luminaires and lighting controls are one of the easiest ways to save energy costs and one of the most common applications.

Solutions featuring efficient lighting luminaires can save upwards of 50% on traditional lighting solutions, whereas the addition of lighting controls can save an additional 30% in energy use.

The solutions can range from small offices where efficient lighting design may be used in conjunction with stand alone occupancy sensors or timers, through to full building installations with efficient lighting, smart lighting controls and integration with the building management system.
Intelligent lighting control for commercial buildings

C-Bus

C-Bus is a lighting control system with distributed intelligence designed to deliver energy savings and user flexibility in any commercial space. C-Bus lighting solutions combine occupancy and daylight harvesting sensors to control and regulate lighting in office spaces, while timers manage schedules for lighting and other electrical services to better manage energy use in a building. Energy savings can be significant – up to 65% with occupancy sensors, up to 40% with daylight harvesting and up to 35% with time scheduling.

Efficient lighting to reduce energy consumption by up to 50%

KW/2 Luminaires

Compared with traditional 2 x 36W T8 luminaires most often found in modern offices and with power consumption typically being 90W, the KW/2 single lamp luminaire with KW2 full specular optically engineered reflector only uses 35W for the same application, whilst meeting the requirements depicted in the Building Code of Australia and AS1680 for lighting design. Lighting energy savings of up to 50% can be realised using the KW/2 luminaires without compromising light quality or user comfort.

Automatic car park lighting according to sunrise and sunset

56 Series Sunset Switch

The back to basics 56 Series Sunset switch is a light sensitive switch that allows automatic switch on at sunset and switch off at sunrise. The sunset switch increases the reliability of car park lighting operation and no timer adjustments need to be made to compensate for movements in the sunset and sunrise times throughout the year. The sunset switch is IP66 rated and designed for outdoor and direct weather use. Energy savings range between 12 to 20% and is achieved over traditional timer based controls.

51

-433,000 kWh/year

Telstra House located in Adelaide, comprising 16 floors underwent a major refurbishment of the office lighting to reduce energy consumption. A total of 2,363 luminaires were upgraded to a KW/2 luminaire, resulting in energy savings of 433,000kWh per annum and reducing greenhouse gas emissions into the atmosphere of 424 tonne.

-225,685 kWh/year

The Four Seasons Hotel located in Sydney, and one of Australia’s premium hotels underwent a major refurbishment in 2008 and at the same time improved its environmental practices.

By installing more efficient lighting and use of voltage reduction devices energy savings of 255,885 kWh and cost savings of $38,947 were the result. With a capital outlay of only $77,950 the project achieved an attractive payback period of only 2 years.

- 19,320 kg GHG emissions/

year

A C-Bus lighting control solution consisting of daylight harvesting sensors and time scheduling for lighting was deployed at the 15,000 sqm, Toyota Tsusho Distribution Centre, South Australia. The daylight sensors automatically switched lighting on when ambient light levels from skylights fell below a certain value, time management of the lights meant lights were only switched on during operational hours. Energy savings of 21,000kWh, GHG reduction of 19.3 tonne and payback of 21 months was realised on this project.
Automatic car park lighting according to sunrise and sunset

Customer’s needs
The facility manager of a large building estate wants to increase reliability of the outdoor car park lighting operation to increase safety for the building’s tenants and reduce energy consumption by only switching car park lighting on when needed.

Schneider Electric solution
Use an IP66 rated light level sensor switch allowing automatic switch-on and switch-off according to sunset and sunrise times.

Energy efficiency core products
The light level sensor requires no user adjustments and has been factory calibrated to switch lights on at sunset and switch them off at sunrise. The light level sensor also features hysteresis to prevent lighting from switching rapidly due to sudden changes in light conditions such as cloud cover or car headlights.

• IP66 rated, suitable for outdoor use.
• No programming required.
• Automatically adjusts switching times with sunset and sunrise times throughout the year.

4RCBM210/30  56PEDD3
Solution diagram

Energy efficiency benefits:

- Power saving by automatically extinguishing lighting when it is not necessary.
- The change in summer/winter time is automatic.
- Remote on/off override function is possible.

Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>56PEDD3</td>
<td>Sunset switch, 250V, 10A, 3 wire</td>
</tr>
<tr>
<td>4RCBM210/30</td>
<td>Combination residual current device and miniature circuit breaker, 240V, 16A, 10kA</td>
</tr>
</tbody>
</table>

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Intelligent lighting controls for a commercial building

Customer’s needs
The building owner wishes to optimise the energy costs of the building, provide greater flexibility in the lighting design for future changes to office layouts and provide central control of the lighting throughout the building. It is also a requirement that lighting is switched on in a specific zone if a security breach is detected to permit capture of higher quality video images on the video surveillance system throughout the building.

Schneider Electric solution
Install an intelligent lighting solution that can be programmed to suit office layouts and changing tenant’s requirements. Use occupancy sensors to control lighting in private offices, meeting rooms, bathrooms and amenity rooms. Use dimmable ballasts for interior perimeter lighting to regulate lighting levels under the control of daylight harvesting sensors and use time schedules to turn lights on during periods of occupancy in the building. Integrate the lighting control system to the building management system to enable lighting and air-conditioning control from a single point. Incorporate a security link between the CCTV system and lighting control system to enable lighting in those zones where an intrusion is detected and to enable capture of higher quality video surveillance.

Energy efficiency core products
The universal sensor combines a 360 degree occupancy sensor and light level sensor in one, simple to install module. The occupancy sensor will only switch lighting on if the ambient light level is below the pre-set threshold; the light level sensor is programmed to switch banks of lights or to dim electric lighting according to ambient lighting conditions.

With the lighting control system integrated to the building management system, the universal sensor can send messages to the Building Management System (BMS) to indicate occupancy of the zone, and supply an input trigger to the HVAC and security systems to operate more effectively in those zones.
Solution diagram

Energy efficiency benefits:

- Lighting in office spaces is only enabled when occupied.
- Lighting on the perimeter of the building is automatically dimmed to maintain a constant light level based on ambient light conditions.
- Local manual on/off controls allow users to switch local zones.
- Integration to BMS means lighting and air-conditioning control is enabled when space is occupied.
- Time schedules automatically switch lighting on and off to pre-define schedules to ensure lights are not left on after hours.

Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5753PEIRL</td>
<td>C-Bus, Universal Sensor, 360° Occupancy Sensor c/w daylight harvesting sensor</td>
<td>L5504RVF</td>
<td>C-Bus, 4 Channel Relay, 220/240 V, 10A</td>
</tr>
<tr>
<td>5055DL</td>
<td>C-Bus, Dynamic Labelling Technology switch</td>
<td>5502DAL</td>
<td>C-Bus to DALI Gateway, 2 networks</td>
</tr>
<tr>
<td>5500PACA</td>
<td>C-Bus, Pascal Automation Controller</td>
<td>5000BACNET</td>
<td>C-Bus, to BacNet Protocol Converter</td>
</tr>
</tbody>
</table>

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Customer’s needs

The owner occupier of a large commercial building wants to reduce the total lighting energy consumption. In addition, staff have complained of high and uneven light levels throughout the office space which is contributing to high absenteeism and lower productivity.

Schneider Electric solution

Following a site survey, it was determined that the light levels were in excess of 700 lux in the general office spaces and that a lighting upgrade was warranted. It was determined that the spatial separation of the light fittings was 2.4m and that light fittings were standard metric size of 1200 x 300mm. A retrofit kit was developed for the existing luminaire.

A custom design optically engineered full specular KW/2 reflector was developed to fit the luminaire. In addition, the magnetic ballast and inefficient lamp were replaced with a professional electronic ballast with constant power output and high efficacy tri-phosphor lamp. The energy consumption of the luminaire was reduced from 90W to just 35W, achieving an energy saving of 50%.

The light levels were measured at the conclusion of the installation and they were found to be between 400 and 420 lux and estimated end of life illumination level of the lamps between 360 and 380 lux, and well within the recommendations of AS1680 for lighting design.

Energy efficiency core products

- KW/2 optically engineered specular reflector.
- Professional electronic ballast with constant power output.
- High colour rendering tri-phosphor lamp.
Solution diagram

Energy efficiency benefits:

- Power savings of up to 50% remain constant throughout the life of the luminaire.
- Reduced maintenance costs as the number of lamps have been halved.
- Lighting levels reduced and reports of absenteeism and loss productivity reduced.

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Products used

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KW/2 Specular reflector</td>
<td>Customised solution</td>
</tr>
</tbody>
</table>
How to best optimise my building for energy usage?

Building management

The combination of HVAC and lighting contribute to over 70% of energy used in many buildings.

This major source of energy consumption can be optimised by installing an integrated building management system.

Integrated building management solutions are based on open, scalable systems which allow monitoring and control of all building systems including: HVAC, lighting, access control, security and other special systems. Complete building solutions offer significant operation and maintenance benefits during the life cycle of a building.

Coordinated behaviour across multiple systems can provide up to 35% reduction in overall energy usage.
Building management systems
A flexible, easy-to-use, networked Building Management System (BMS) is an important tool for the implementation and monitoring of energy conservation measures. Through its Direct Digital Control (DDC) capabilities, the BMS provides occupants of a facility with a comfortable, precisely-controlled environment. At the same time, the BMS provides the building operator with a powerful tool for monitoring and controlling the facility, with instant access to critical performance information. Benefits of a BMS include:

- Historical logging and graphical display of trended data (temperature, humidity, energy consumption, setpoint deviations) for quick analysis and troubleshooting of energy performance. It can also pinpoint problems with badly tuned control loops, which can result in excessive ‘hunting’ and premature equipment failure.
- Real-time graphical displays of mechanical systems, floor plans, energy usage and building performance.
- Instant alarm notification of any out-of-normal condition – equipment failure, environmental threshold exceeded electrical demand rise, dirty filter, etc.
- Ability to quickly make changes to normal building operating conditions (setpoint, alarm limits) while also being able to override and manually control equipment if necessary.
- Ability to implement facility-wide control strategies.
- Custom programming. The current generation of Building Automation System (BAS) offers the power to go beyond a “factory loaded” control sequence, and tailor the control logic to optimise the performance of almost any building system. As a building’s use changes and new control strategies are devised, the programming of the BAS can be easily modified to match the new sequences.

Dedicated building services
Schneider Electric takes long term responsibility for customers, their buildings and the comfort of the end users of the buildings. Solutions offer comprehensive packages of energy efficient improvements that include services such as:

- Operational services – On site support and alarm handling to assure the very best efficiency in building operations.
- Maintenance services – Keep the value of a building at a strategic level via regular adjustment and optimisation of systems. Regular maintenance and exchange of spare parts according to planned maintenance schedules.
- Consulting services – A range of consulting services, from training to energy and indoor climate audits as well as analysis and documentation of a building’s status.

-AUD 4.5 million
A comprehensive program has saved the university more than AUD 4.5 million in energy costs in 2000. The efforts included lighting change outs, motor replacements, a TAC building management system, over Continuum network controllers and energy.
University of New Hampshire with 10,500 students in 40 buildings - USA.

Competitive
Telenor needed a new headquarters for thousands of its employees. By using a TAC Vista™ building management system to integrate and control HVAC, lighting, power monitoring, chillers, heat recovery and emergency lighting they realised significant cost reductions in the operation and maintenance of the facility.
Telenor leading telecom, IT and media company - Norway.
Schedule selected loads simply via your own building management system

Customer’s needs
The building manager wants to take advantage of scheduling certain energy consuming activities during less expensive off-peak hours.

Schneider Electric solution
The solution is built around a PC or PLC that controls load shedding. The controller is used to generate load shedding orders based on the electrical variables of the entire electrical installation, taking into account time bands, operating, or even process related information. The system communicates with selected Compact NSX circuit breakers. Power to outgoing loads is cut for a given amount of time, and selected loads are restarted at more optimal times chosen by the controller.

The system is simple, with an IFM Modbus interface between the PC or PLC and the circuit breakers. The Compact NSX circuit breakers are equipped with Breaker Status Control Modules (BSCM) input/output modules, which are hooked up to the remote control (MTc) that opens and closes the Compact NSX.

Energy efficiency core products
- Compact NSX100-630 circuit breaker with remote control (MTc).
- BSCM (Breaker Status Control Module).
- I/O module sends circuit breaker O/C status and O/C commands.
- FDM121 switchboard display unit.
- Local measurement and alarm readings
- Local circuit breaker O/C command with status display
- Local/remote circuit breaker command management
- Connected to Modbus network via interface module Ethernet/Modbus EGX100 communication gateway

Compact NSX
Solution diagram

Energy efficiency benefits:

- Up to 10% lower electricity bills, with savings proportionate to rates negotiated with the utility.
- Local circuit breaker open/close command.
- Get the most out of your investment: the FDM121 saves cost by combining traditional pushbutton/lighting/display solutions in one single device.
- Local/remote monitoring.

Products Used

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<tbody>
<tr>
<td>Compact NSX</td>
<td>Circuit breaker with remote control MTc</td>
</tr>
<tr>
<td>FDM 121</td>
<td>Front display module</td>
</tr>
<tr>
<td>EGX 100</td>
<td>Gateway</td>
</tr>
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Monitor your building’s power supply and control HVAC, lighting and blinds

Customer’s needs
The facility manager wants to deliver the level of comfort the building’s occupants expect while limiting energy costs. The facility manager needs to ensure that the equipment is working correctly and also keep the operating and maintenance costs to a minimum.

Schneider Electric solution
Install a Building Management System (BMS) to monitor and control the building’s equipment and provide energy consumption data. Based on the TAC Vista Building Automation and Control System, the solution integrates the best of both power monitoring functions and HVAC, lighting and blind control capabilities thanks to data acquisition via Xenta 731 multi protocol IP controllers.

The solution provides comprehensive energy data covering water, air, gas, electricity, and steam (WAGES) via TAC Xenta 400 I/O modules or additional PM850 digital inputs. Energy metering is provided by the PM meter range and Masterpact and Compact NSX meters with built-in protection.

TAC Xenta controllers run HVAC, lighting and blinds, as well as loads and power sources.

Energy efficiency core products

TAC Vista software provides advanced data management, including:
• Load aggregation, multi-site meter aggregation and trending, bill verification, cost allocation and sub-billing.
• Trigger on complex conditions, alarming, event logging, power quality analysis and compliance monitoring.
• Coordinated control functions and complex calculations.

Advanced information delivery:
• Web-enabled, local or remote preconfigured and custom reports.
• Manual, scheduled or event-triggered reports via email or web.
• Trend graphing for any parameter measured.
• Analysis of efficiency, losses, and capacity.

Scalable architecture:
• IP-based communication via existing building IT infrastructure.
• Internet communication tools for remote or local operation.

TAC Xenta 731 multi protocol controllers provide a broad array of communication capabilities:
• Open LonWorks® field bus compatible with multivendor equipment.
• Fan coil, cold beam or air handling unit controllers.
• Lighting controllers.
• Sensors and actuators.
• Modbus communication for power monitoring and control.
Solution diagram

Energy efficiency benefits:

- Heating and cooling solutions can produce energy savings of around 30%.
- Electrical energy savings of around 13%.
- Highly scalable system, hardware, and software architectures for maximum cost effectiveness.
- Remote alarming, reporting, and operation for reduced on-site presence.
- Building performance rating for NABERS, Green Star and improvement guidance.

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<tr>
<td>TAC Vista</td>
<td>Building automation supervision software</td>
<td>PM9/ME/EN</td>
<td>Range of power and kWh meters</td>
</tr>
<tr>
<td>TAC Xenta 731</td>
<td>Multiprotocol IP controller gateway and web server</td>
<td>Masterpact and Compact NSX</td>
<td>Circuit breakers</td>
</tr>
<tr>
<td>TAC Xenta 411/421</td>
<td>LonTalk HVAC system controller</td>
<td>CT contactors</td>
<td>Load shedding contactors</td>
</tr>
<tr>
<td>PM850/870ECC</td>
<td>Power meter with ethernet</td>
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Boost energy efficiency and increase the availability of your electrical installation

Customer’s needs
The customer would like to save energy in an industrial plant with zero tolerance for power cuts.

Schneider Electric solution
Combine ION Enterprise power monitoring software and the PowerLogic SCADA operations and maintenance management software. The solution delivers a detailed analysis of events while optimising control of the plant’s power supply.

ION Enterprise software manages energy efficiency related functions including:
• Comprehensive management of energy information.
• Metering through PowerLogic meters; Sepam, Masterpact and Compact NSX with built-in protection.
• Load aggregation, trigger on complex conditions, alarming, event logging, trend graphing for any measured parameter, analysis of efficiency, losses and capacity, bill verification, cost allocation and sub-billing.
• Web-enabled, local or remote pre-configured and custom reports; manual, scheduled or event-triggered reporting and distribution via email or web.
• Load and power source controls; demand and power factor correction.
• Collection of all WAGES (water, air, gas, electricity, steam) metering data through additional meters or directly via Ethernet, from a PLC/SCADA.

PowerLogic SCADA addresses power availability:
• Real-time monitoring and control of the entire power installation.
• Advanced alarm and shift management functions for smoother maintenance scheduling.
• Advanced communication architectures: hot/warm redundant I/O device configuration, self-healing ring communications and primary and standby server configurations.
• Fast manual control operations by clicking on-screen trigger buttons, and remote breaker, protection relay and other power distribution equipment operation.

Galaxy 7000 – Uninterruptible Power Supply (UPS)
The Galaxy™ 7000 is easy to install, operate and integrate in electrical networks. The Galaxy 7000 supports paralleling up to eight units for easy power upgrades or additional redundancy. The full redundancy feature of its cooling system provides a high level of reliability. Its 0.9 output power factor provides more available kW to be fully compliant with the latest power factor–corrected IT loads. Other features include cold start, soft start and inrush current limitation for generator compatibility.

Energy efficiency core products
ION Enterprise version 6.0 software:
• High interoperability with third-party systems, applications, and services such as BAS, MES, and ERP via ODBC, OPC, XML, FTP, e-mail, CSV and PQDIF.
• Integrated metering of all utilities (water, air, gas, electricity, steam).
• Enterprise web portal access to system - wide displays.
• Power quality analysis including compliance with international standards (IEC 61000-4-30, EN50160).
• Windows SQL Server 2005 database, ODBC compliant, support for multiple distributed servers and clients.

PowerLogic SCADA:
• Monitor an entire electrical distribution system with up to 2,000 devices.
• Web interface.
• Library of objects and page templates.
• Calculations (MVA, Power Factor, MWh, etc.).
Solution diagram

Energy efficiency benefits:

- Reduce energy consumption by 10% by analysing usage.
- Implement additional controls such as curtailment programs for even greater savings.
- Improve availability of your facilities through faster access to decision critical reports and automated multisource controls.
- Increase accuracy of monitoring and troubleshooting with highly-accurate 1ms time stamping capabilities.
- Remote alarming, reporting and operation for reduced on-site presence meaning saving costs.

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<td>Energy management software</td>
<td>EGX100</td>
<td>Gateway</td>
</tr>
<tr>
<td>PowerLogic SCADA</td>
<td>Electrical distribution SCADA software</td>
<td>ION, PM, ME, EN range</td>
<td>Power and kWh meters</td>
</tr>
<tr>
<td>Galaxy7000</td>
<td>UPS</td>
<td>Masterpact, Compact NSX</td>
<td>Circuit breakers and source change over system</td>
</tr>
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Today’s technologies + A growing business
30% energy savings are achievable with today’s technologies. Up to 40% of the potential savings for a motor system are realised through the use of variable speed drives and automation.

Up to 30% of the potential for savings in a building’s lighting system can be realised via the lighting control system.