

## Industry Case Study

# XSTRATA COAL

Xstrata Coal New South Wales (XCN) signed up as a trial company for the Australian Government's Energy Efficiency Opportunities program in 2005. At that time, it was also required to submit Energy Savings Action Plans to the NSW Department of Energy, Utilities and Sustainability.

The company maximised the business opportunities when doing its assessment by going well beyond a compliance approach, and achieved improvements in energy efficiency by promoting cultural change in the way energy was managed in the business. Individual sites were given ownership of the process and responsibility for identifying and implementing energy efficiency projects. The management team was also aware that success would require the support of an enthusiastic and effective corporate energy champion.

As a result, the company designed a flexible energy assessment process that would meet the needs of both programs and optimise business outcomes.



### BUSINESS BENEFITS ACHIEVED SO FAR

XCN conducted energy efficiency opportunities assessments at eight mines in NSW over a 12 month period. These resulted in the development of a series of action plans which included 47 cost-effective projects to be implemented immediately, and additional projects which required more detailed evaluation.

Direct benefits have been quantified for 32 projects by January 2007.

They include:

- an energy saving of 13,686 GJ, which is a reduction of more than 1 per cent in energy use across the sites; and
- greenhouse gas reduction of at least 3,700 tonnes of CO<sub>2</sub> equivalent per year.

In addition, XCN expects the program to achieve a further reduction in energy costs of:

- at least 1 per cent year-on-year over the next 5 years as the remaining 15 cost effective projects are evaluated and approved, and other assessments are conducted; and
- between 3-5 per cent in the medium term as energy efficiency is integrated into future design decisions and business systems such as procurement and the development of KPIs.



### About the company

Xstrata Coal is the world's largest producer of export thermal coal and a significant producer of coking coal. It has interests in over thirty coal mines in Australia (New South Wales and Queensland), South Africa and Colombia, employing around 10,000 people including contractors.

Xstrata Coal New South Wales (XCN) operations include both underground and open cut mines in the Hunter Valley and western coalfields (in the Mudgee-Lithgow area).

Top: Ulan underground coal mine in the western coalfields has the longest longwall mining machine in Australia, enabling XCN to mine coal more efficiently

## Designing the assessment process

To optimise business outcomes from the assessment, it was critical that the company considered the business context. For example, XCN has an autonomous business model, with each operating manager responsible for how their site meets corporate goals and targets.

XCN therefore designed the energy assessment process to:

- support site autonomy;
- fit with and support existing site systems;
- be able to address a broad suite of technologies; and
- work with limited resources on site.

Some uniformity was required in order to reduce the time taken to deliver the process at the sites, as well as to limit reporting time.

For these reasons, XCN decided to embed into the business an effective assessment process for identifying, evaluating and managing energy efficiency opportunities, rather than undertaking conventional energy audits. In this way it was possible to support and ensure rigour and uniformity, while retaining the flexibility required to meet the needs of each site.

The process was also designed to enhance site 'buy-in' and ownership of energy management and energy efficiency projects. In the context of its 'beyond compliance' commitment, XCN is dedicated to supporting cultural change in energy management across the group. In order to support this change, it was necessary to adopt a process which demonstrated to the sites the significant role they had to play to achieve their own success and to build and maintain momentum on the sites. This was only possible through a process-based approach.

The XCN energy assessment process was designed with two significant aspects:

- strong corporate leadership and commitment; and
- a facilitated site workshop process.

Each of these elements are summarised below.

## Corporate leadership

### Appointment of an energy champion

XCN's corporate commitment was demonstrated through the appointment of an energy efficiency project champion at corporate level – Tony Egan. Appointed as Manager Projects, Tony's role is considered operational, not environmental.

As an effective change agent, the Manager Projects was able to facilitate, persuade and assist sites according to their needs, while understanding and working within individual site constraints. Most importantly, he was able to build and sustain momentum in the program. Responsibilities included attending every one of the site meetings over the eight months of the assessments, demonstrating that corporate commitment is necessary to deliver projects that will be implemented.

## The project team

Tony Egan led the project team with input from the XCN Group Environmental and Community Manager, David O'Brien, and support from the Xstrata Coal Environment and Sustainability corporate group. XCN also included external energy consultants on the team.

Together, the team had:

- a thorough understanding of the company and the operating culture of each site;
- expertise in the internal systems of the company;
- strong facilitation skills;
- expertise in energy analysis including a full understanding of the potential energy efficiency opportunities inherent in the mining process; and
- experience in, and knowledge of, mining and minerals processing.

XCN adopted a process in which site personnel are regarded as the experts, best placed to understand the energy efficiency opportunities within site processes. They are often the best people to quantify potential savings.

## Management review

Corporate commitment to the XCN energy assessment process was demonstrated by the entire XCN corporate management team taking part in an energy management diagnostic. This enabled the management team to better understand how management systems across the group could support or hinder the assessment and implementation of energy efficiency opportunities.

Management met to review and discuss the progress of the XCN assessment process at key points in the process. Since the focus was on maximising business benefits from the assessments, the meetings encouraged open and frank discussions, enabling feedback to be provided to the managers on how their operations were performing, and to elicit support for the process. Once these managers understood the role they could play and the value they could add, they were extremely active in supporting their sites and assisting them to achieve real savings.

## Site activities

### Data collection

An external consultant initially spent a day at each site to gather as much energy and production data as possible. This information provided baseline data for reporting purposes. It also provided workshop participants with some understanding of how and where energy is used on the site.

### Workshops

The objectives of each workshop were to:

- conduct an energy management diagnostic to assess the maturity of energy management on the site; and
- raise as many energy opportunities as possible for the site, including 'blue sky' ideas, management initiatives, process change and new technology options.



XCN considers that site personnel are best placed to understand the energy efficiency opportunities within site processes

Outcomes of the workshop included:

- an understanding of energy management on the site;
- a list of all possible energy efficiency opportunities with associated site project owners for each project (typically 30 to 50 projects per site);
- identification of case studies highlighting good practice in energy management and energy efficiency; and
- a site-selected energy champion.

The role of the site champion was significant. Across the eight sites, champions ranged from electrical engineers to environmental coordinators and operations managers. Allowing the site to select its own champion resulted in the best person for the job being appointed.

### Initial investigation

At the end of the workshop each opportunity was assigned a 'project owner'. Project owners completed preliminary investigation questionnaires to assist in evaluating opportunities against a range of criteria.

A meeting report was circulated to workshop participants within a week of the workshop, and preliminary investigations were conducted within four weeks to ensure momentum continued and energy efficiency remained top-of-mind at the sites.

### Opportunities pre-screening

Once preliminary investigations had been completed, the Manager Projects and an external consultant helped site staff to rank and prioritise the opportunities. This was achieved using multi-criteria decision support tools which were based on objectives aligned with the attributes of a successful XCN project. Each of these meetings at the site delivered:

- an agreed reduced or prioritised set of projects that represented the real opportunities on the site (typically 20 – 30), i.e. opportunities that provided the greatest business benefits and could either be acted on immediately or investigated over time; and
- an action plan for how each opportunity needed to be investigated in order to calculate the costs and benefits in more detail.

One of the largest users of energy on open cut mine sites is the drag line, which removes rock and dirt for transport by truck



## Detailed investigation

The action plans for each project were either:

- detailed investigations to be conducted by site personnel; or
- detailed investigations to be conducted by consultants, contractors or suppliers.

Most of the investigations were conducted by site personnel, which supported the initial XCN thinking that site staff are experts in their own processes.

The site energy champions ensured that detailed investigations were being conducted according to plan. The external consultants helped to compile a set of projects likely to proceed, and documented projects that were not likely to go ahead, with the reasons.

Final decisions on projects were made when the Manager Projects returned to each site for a final meeting. Projects likely to proceed were assessed in some detail to ensure the decision to progress the project was sound, and these projects were ranked and prioritised.

Projects not likely to proceed were tested in even more detail to ensure that the reasons for not progressing a project were valid.

Once the site had agreed on the list of projects as well as the project owner, costs, benefits, and proposed timing for the delivery of each project, action plans were finalised and delivered to corporate management for approval.

## Transfer of learning between sites

One of the key elements of the XCN process was the transfer of learning between sites. This was facilitated by:

- developing a list of opportunities identified at all sites for use at future workshops. This enhanced the opportunities scoping stage of the process, and ensured that work was not duplicated; and
- compiling case studies of previous successful projects and adding them to opportunity lists at each site. This enabled sites to learn from previously successful initiatives within the group.

The transfer of learning between sites challenged assumptions about energy management. It also helped to capture the knowledge that exists within XCN, and will ensure that knowledge is not lost to the site or the group as people move positions or companies.

## Opportunities identified

The sites identified a total of 175 opportunities in the initial series of workshops. Following prioritisation and ranking, 125 projects were identified as having potential.

These projects were then divided into four categories:

1. unsuitable projects (18);
2. projects with potential but requiring more investigation (44);
3. management projects to be implemented (16); and
4. operational projects to be implemented (47).



Projects likely to proceed were assessed in some detail to ensure the decision to progress the project was sound



Mining involves many processes such as removing dirt and rocks, and conveying and washing coal. Changes to processes can result in 'quick-win' energy efficiency projects with short payback periods, and often result in additional productivity benefits

## Unsuitable projects

These projects were evaluated in sufficient detail to determine that they would be unsuitable because they would not meet the required four-year payback; they carried a safety risk; or they would have a negative environmental effect.

## Projects with potential

These projects showed promise, but required additional time to completely assess their potential. For these projects a set of actions were developed and a date identified by which a business decision needed to be taken. Having this set of more complex projects continuing to require attention will ensure the program does not lose momentum once the first flush of energy actions is completed, and that energy remains a priority over the next three-five years.

## Management projects

It is difficult to estimate the savings associated with these projects as their benefits tend to be indirect. However, their potential contribution to cultural change is significant, and such projects demonstrate a strong site commitment to improving energy management. Examples include the inclusion of an energy efficiency page in the process control system, and the development and delivery of training and awareness programs.

## Operational projects

Of the 47 projects in this category, it has been possible to quantify the energy efficiency savings of 32 projects. The remaining 15 projects are process-based projects that require more information to quantify savings.

The 32 projects which have been evaluated will deliver an energy cost reduction of around 1 per cent across the group of sites. This is a relatively significant outcome given that all of these projects will be implemented, and that a further 15 projects still remain to be quantified. As XCN conducts more assessments, ensures that sites implement agreed projects and identifies further energy efficiency opportunities, XCN expects to achieve a year-on-year saving of at least 1 per cent over the next five years.

There are two categories of operational projects:

1. **Process change projects**, such as automating lighting controls, improving control of conveyors and automating equipment shut down at the end of shifts
2. **Technology change projects**, that range from installation of energy efficiency technologies such as high efficiency motors and variable speed drives, to replacement of main stream technology and unit processes with more efficient elements.

**Process change projects** can be implemented using site discretionary funds and site resources. These projects usually have very short payback periods of six months to two years, with the value of the savings ranging from \$20,000-\$65,000 per year. Although non-material sums, these are regarded as incremental change projects and are often 'quick-win' projects that can assist in building momentum in energy efficiency programs.

**Technology change projects** usually require some capital investment. For this reason, these projects are usually implemented only with corporate capital, and need to compete in the budget process with other capital projects. They can take a significant amount of time to be delivered.

However, these are the projects with the potential to deliver significant improvements in energy efficiency. Their payback times are usually longer than process change projects, ranging from two to four years. It is often the combined energy and productivity improvements that typically deliver the financial return required for the project to be budgeted.

These projects range in cost from \$50,000 to \$8 million. Their average reduction in energy use per dollar spent is 1MJ. The range is between 0.5MJ/\$ and 9MJ/\$. This illustrates the fact that the majority of these projects are productivity projects which also have energy efficiency outcomes. These outcomes have been enhanced by ensuring the projects are designed in line with energy efficiency goals.

The major step change improvements in energy efficiency will only result from design processes which pay due attention to energy efficiency. XCN has demonstrated its commitment to improved energy outcomes by ensuring all major design projects both underway and in the pipeline have energy efficiency integrated into its design parameters.

## Costs and benefits of the assessment

Direct costs to XCN included the cost of the project manager and consultants. The direct costs of the assessments were paid for by the cost savings achieved in the first year. Future savings are expected to directly deliver ongoing financial benefits to the company.

XCN will be able to better quantify indirect costs and benefits when the program has been operating at all XCN's sites for several years.

## Lessons learnt

### Integrating assessments into core business systems

XCN integrated energy efficiency in the business from the outset by integrating energy efficiency into the mainstream driver of reduced production costs.

The assessment process was also adapted to site-specific requirements and processes as well as site resource constraints and different modes of operation. This ensured that assessments were seen as an opportunity and a part of normal business, rather than an impost.

### Communications strategy

The program was communicated to the sites in different ways. The initial introduction was made by the corporate project champion, which was extremely important. The significance of energy efficiency to the company was reinforced by including it on the agenda at monthly managers' meetings and by asking site managers to report monthly on the progress of their assessments.

Also significant was ensuring that sites understood what was expected of them and when information needed to be delivered. Using the site energy champion as the contact point for communications on the progress of the program was important. The site energy champions collected site information and responded to questions from consultants.

Workshop outcomes and meeting minutes were made available to site personnel



Trucks are a core technology at any mining site and have the potential to provide significant energy savings. Technology changes usually require capital investment



Leadership by operational managers ensures that assessments are integrated into existing business systems and the maximum benefits from assessments are gained

as soon as possible after meetings were held. This supported employee engagement and helped them to understand what was required of them.

The corporate energy champion ensured that site and corporate personnel were well-informed of progress. Often this meant attending meetings at sites when this was considered to be the most effective communication method.

### Maximising outcomes

XCN is maximising the business benefits of assessments by:

- developing and communicating in-house knowledge to reduce costs and avoid duplicating effort;
- developing case studies to support information sharing;
- using sites to trial new opportunities before implementing them at other sites;
- focusing on productivity gains as well as energy costs; and
- viewing energy efficiency as an opportunity and not an impost.

XCN is focusing on systemic change and a cultural shift in energy management. Its aim is long term sustainable improvement, not just short term financial gains.

### Next steps

In order to meet its Energy Efficiency Opportunities requirements, Xstrata Coal needs to complete assessments at their remaining four NSW sites and then at six Queensland sites. Once this has been completed all sites will have a set of projects which will have been quantified, and a set of projects which require more detailed investigation.

The corporate management team will continue to monitor the progress of these activities. They also plan to return to sites to conduct smaller opportunities identification exercises at least once a year, ensuring energy efficiency remains a priority.

Sites will conduct energy management diagnostics at regular intervals to assess progress, with particular attention to sites that have the most potential to improve energy management. Operations managers will be required to report their progress on a regular basis. XCN will track improvements in its energy KPIs to assess program outcomes and determine the value of the program.

The energy efficiency opportunities assessments also have wider impacts within the company. The opportunities identified in NSW are already being used by XCN to design new, best-practice mines. The company also intends to conduct assessments at its South African sites because of the business benefits.

The Department of Industry, Tourism and Resources thanks Xstrata Coal for its involvement in the trial to test and develop aspects of the Energy Efficiency Opportunities program, and for sharing its results and the lessons learned. This case study may not represent the full assessments conducted by the company.

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