

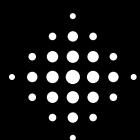


Australian Government

Department of Resources, Energy and Tourism

# FIRST OPPORTUNITIES IN DEPTH: THE MINING INDUSTRY A LOOK AT RESULTS FROM 2006–2008

## FOR THE ENERGY EFFICIENCY OPPORTUNITIES PROGRAM



**National Framework**  
for Energy Efficiency

**Energy Efficiency**  
Opportunities

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The report may be downloaded from [www.energyefficiencyopportunities.gov.au](http://www.energyefficiencyopportunities.gov.au).



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# EXECUTIVE SUMMARY

This report provides a detailed picture of the energy use and energy savings potential of the important large mining businesses that are participating in the Australian Government's Energy Efficiency Opportunities program.

Energy Efficiency Opportunities encourages Australia's large energy-using corporations to identify and implement projects that will save energy, lower their business costs and reduce greenhouse gas emissions.

The first tranche of 199 businesses that registered with the program in 2006 submitted reports on their first energy efficiency assessments in December 2008. An overview and analysis of the reports was published in *First Opportunities: A Look at Results from 2006-08* in March 2010.

The purpose of this new report, *First Opportunities in Depth: the Mining Industry*, is to look more closely at the energy use and energy savings at more detailed sub-sector levels within the mining industry. It is part of a series of reports that similarly focus on particular industry sectors.

The document examines the energy use and savings data reported by 232 business entities that used more than 0.5 petajoules (PJ) of energy per year and whose primary business activity was mining. The entities were part of the 199 corporate groups that also operated in, and reported on, activities in other industrial sectors.

The mining industry data is presented in aggregate, by industry sub-division, and energy savings by energy source and equipment type. It quantifies the potential benefits of implementing energy savings projects in terms of energy savings, financial benefits and the potential to reduce greenhouse gas emissions.

The information is analysed and presented using the sub-divisions for mining set down in the Australian and New Zealand Standard Industry Classification (ANZSIC) system.

The report highlights the energy intensive nature of mining activities. The large energy-using mining entities accounted for 18 percent of total energy use for the Energy Efficiency Opportunities program. When compared with the energy used by Australia's entire mining industry, the businesses accounted for about 70 percent of energy end-use for the mining industry.

In turn, to give an indication of the magnitude of the program itself, the 199 registered corporations together represent 31 percent of Australia's total energy use and 62 percent of the end-use energy used by all Australian business.

The analysis of the data shows that the mining businesses consumed 314.5 PJ of energy in 2007-08.

The three largest energy-using mining industries were:

- metal ore mining, which used 112.0 PJ of energy,
- oil and gas extraction, which consumed 96.6 PJ, and
- coal mining, responsible for 64.5 PJ.

The mining entities reported energy savings opportunities that could save 17.2 PJ of energy per year, which represented 25 percent of the energy savings identified for the Energy Efficiency Opportunities program overall. The three industries identifying the largest energy savings opportunities were:

- oil and gas extraction, which found energy savings projects that could reduce energy use by 11.50 PJ,
- metal ore mining, which identified 3.60 PJ in potential energy savings, and
- coal mining, with 1.43 PJ in savings.

The miners reported that 60 percent of their energy use had been assessed using the program's energy efficiency assessment framework. This was higher than the 57 percent assessment average for all industries across the program. The metal ore miners reported the highest assessment coverage, at 78.3 percent, followed by coal miners, with 73 percent.

The high level of assessment coverage of the mining businesses' energy use corresponded to identifying energy savings of 9.1 percent of assessed energy. The energy savings also represented 5.5 percent of total energy consumed by the businesses.

The mining businesses reported they could potentially achieve net financial benefits of \$257.3 million as a result of the energy savings projects. This was the highest level of financial savings of any industry sector, representing 35 percent of the \$735.8 million in financial benefits estimated by the corporations for the program as a whole.

The implementation rates for identified savings were particularly high, particularly in the less than two year category of financial payback. More than three-quarters, or 77 percent, of projects that had a financial payback of less than two years had been, or were in the process of being, implemented. A further 47 percent were identified for implementation in the 2-4 year payback category.

The miners reported that the implemented projects represented a reduction in energy use of 11.5 PJ or two-thirds of all the energy savings identified in the mining industry.

In total, the energy savings identified by the 232 business entities involved in mining equated to a potential reduction in energy-related greenhouse gas emissions of more than 1.4 million tonnes of carbon dioxide-equivalent (CO<sub>2</sub>-e) per annum.

# 1. INTRODUCTION

The Energy Efficiency Opportunities program was set up with the aim to improve the energy efficiency of the country's largest energy users who together account for a major share of national energy use. Their performance is critical to achieving Australia's energy and climate change goals.

The program uses a whole-of-business approach and is designed to break down the many information, organisational and cultural barriers that inhibit the adoption of better energy efficiency practices and projects. It is underpinned by the *Energy Efficiency Opportunities Act 2006*, which came into effect on 1 July 2006.

Energy Efficiency Opportunities requires large energy-using businesses to conduct a detailed assessment of their energy use and to identify and evaluate opportunities to cost-effectively improve their energy efficiency.

Participation in the program is mandatory for corporations using more than 0.5 PJ of energy per year. Currently 230 plus corporations have registered for the program; 199 of these registered in 2005-06 because of their energy use and consequently first reported their results at the end of 2008.

Corporations must use the program's assessment framework to assess their energy use and identify energy savings opportunities. The framework takes a whole-of-business approach to energy efficiency, addressing many of the factors that influence energy use across the business.

Corporations report to both the public and to government on the results of their energy efficiency assessments and the opportunities that exist for projects with a financial payback of up to four years.

The reports must detail the opportunities they have identified to save energy, quantify the energy savings the opportunities could deliver and state the corporation's business response to the opportunities.

As corporate structures vary, the legislation mandates that the controlling corporation of a corporate group registers with the program. That corporation is then responsible for the energy use and reporting for all its major business entities, including subsidiaries, joint ventures, partnerships, business units, sites and activities.

In their first reports to government, the 199 corporations reported data for 1099 separate entities. Of these, 232 business entities were primarily involved in mining activity; this report presents the data submitted by these mining entities.

The corporations outlined their level of energy use, the proportion of assessed energy and the energy savings opportunities that they identified through their first energy efficiency assessments. They also provided information on the potential energy savings, financial benefits and reductions in greenhouse gas emissions that could accrue from implementing the energy savings opportunities that had a financial payback of up to four years.

Energy Efficiency Opportunities operates in five-year assessment cycles. During the first five-year cycle, corporations must assess 80 percent of their total energy use and all sites that use more than 0.5 PJ of energy per year. In the second cycle, corporations will assess 90 percent of their total energy use.

Corporations are taking the following five steps during the program's first cycle of 2006 to 2011.

**Step 1.** Determine whether the corporation has to participate in the program, ie whether it used more than 0.5 PJ of energy within the trigger year of 2005-06.

**Step 2.** Register within nine months of the trigger year, by March 2007.

**Step 3.** Prepare and submit an assessment and reporting schedule by December 2007.

**Step 4.** Conduct first energy efficiency assessments of each key division, activity or business unit by June 2008 or within two years of the trigger year.

**Step 5.** Report on assessment outcomes and business response by December 2008.

The legislation also has provision for verification to ensure that corporations have undertaken an assessment to the standard required and reported accurately on the results of the assessment. Verification will start in 2010.

The aim is to give an in-depth profile of the energy use and savings potential of Australia's important top energy users.

It should be read in conjunction with the main *First Opportunities* report, published in early 2010, which describes the program in detail, lists the participating corporations, details the methodology used to analyse the data, and provides examples of energy savings opportunities. It can be found at the program website: [www.energyefficiencyopportunities.gov.au](http://www.energyefficiencyopportunities.gov.au)

## 1.1. THE MINING INDUSTRY AND ENERGY EFFICIENCY OPPORTUNITIES

Mining activity in Australia is relatively diverse and primarily involves extracting minerals, oil, gas and coal from the ground, either through open pit mining on the earth's surface or using underground mining methods.

The energy intensity of mining depends upon the type of mineral being extracted, as well as the type of production processes and the extraction technologies used by the mining business. Such factors can place limits upon the energy saving opportunities that can be identified per unit of output produced.

The ANZSIC system classifies mining according to the following sub-divisions:

- coal mining,
- oil and gas extraction, metal ore mining, non-metallic mineral mining and quarrying, and
- exploration and mining support services.

This document presents the mining-related data according to these sub-divisions with the exception of the final two, which have been merged to prevent the publication of commercial-in-confidence information. These are referred to as a single sub-division of 'other mining and services'.

The Energy Efficiency Opportunities program has a range of registered corporations that are involved in mining activity. Some mine metal ores such as iron, bauxite, copper, nickel and gold, and others extract non-metallic minerals such as sand and gravel.

The program also captures coal mining companies, and oil and gas companies that extract these resources from underground. Exploration and mining support services are also classified as a mining sub-industry within the ANZSIC system.

Several corporations undertake mining and manufacturing activity within large vertically integrated production processes. This can create the perception of a blurred demarcation between the two broad activities.

The ANZSIC system classifies extraction methods such as blasting, hauling and separating particles into minerals and waste as mining activities. Nickel mining and ore processing provides a good example. Extracting laterite ore from the ground and processing it into nickel is considered to be a mining activity, while refining or smelting the nickel into nickel metal or nickel matte to make stainless steel is considered to be manufacturing.

The ongoing treatment of minerals such as smelting or refining are classified as manufacturing activities rather than mining. The energy use and energy savings characteristics of these activities are analysed in the companion report: *First Opportunities In Depth: The Manufacturing Industry*.

More information about the methodology used in the statistical analysis of the data can be found in Appendix B: Method in the main *First Opportunities* report, as mentioned.



## 2. ENERGY USE

The 232 business entities registered with the program and undertook mining activity in 2007-08 together consumed 314.5 PJ of energy. The two largest energy-using sub-divisions within the mining industry were metal ore mining and oil and gas extraction.

The metal ore miners used 112.0 PJ of energy, accounting for 35.6 percent of mining industry energy use, as shown in Table 1. They were closely followed by entities involved in oil and gas extraction, which reported 96.6 PJ of energy use, equivalent to 31 percent of mining energy use.

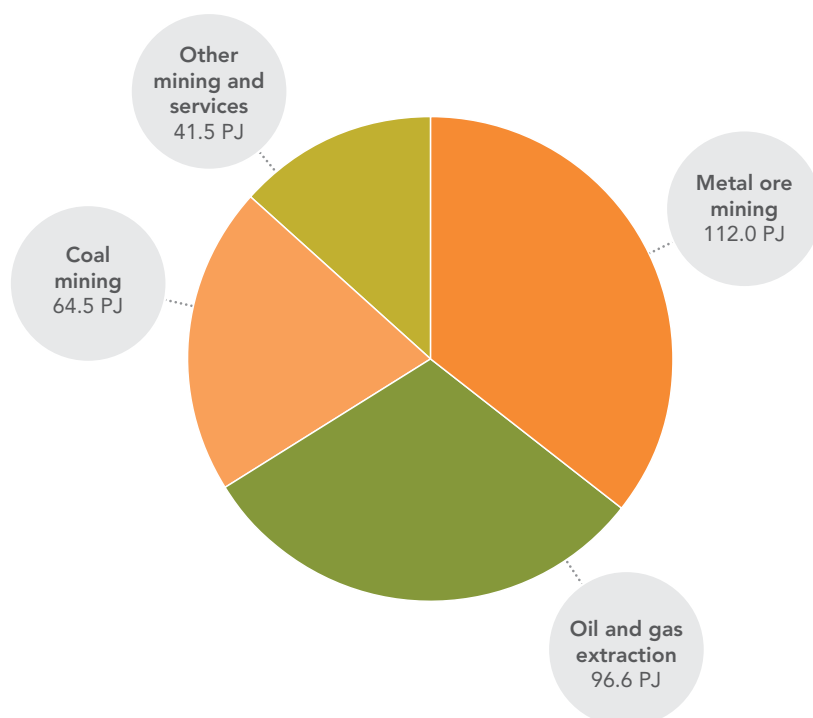
**Table 1: Total energy use and energy savings by mining sub-division**

Mining sub-division	Number of entities	Total energy use (PJ)	Share of mining energy use (%)
Coal mining	74	64.5	20.5
Oil and gas extraction	50	96.6	30.7
Metal ore mining	66	112.0	35.6
Other mining and services	42	41.5	13.2
<b>Total mining</b>	<b>232</b>	<b>314.5</b>	<b>100.0</b>

The 74 entities operating in coal mining accounted for around a fifth of mining industry energy use, or 64.5 PJ of energy.

The 42 businesses within the remaining mining sub-divisions used 41.5 PJ, equivalent to 13.2 percent of all energy consumed by the mining participants in the program. The proportionate share of energy use is shown graphically in Figure 1.

**Figure 1: Energy use by mining sub-division 2007-08**



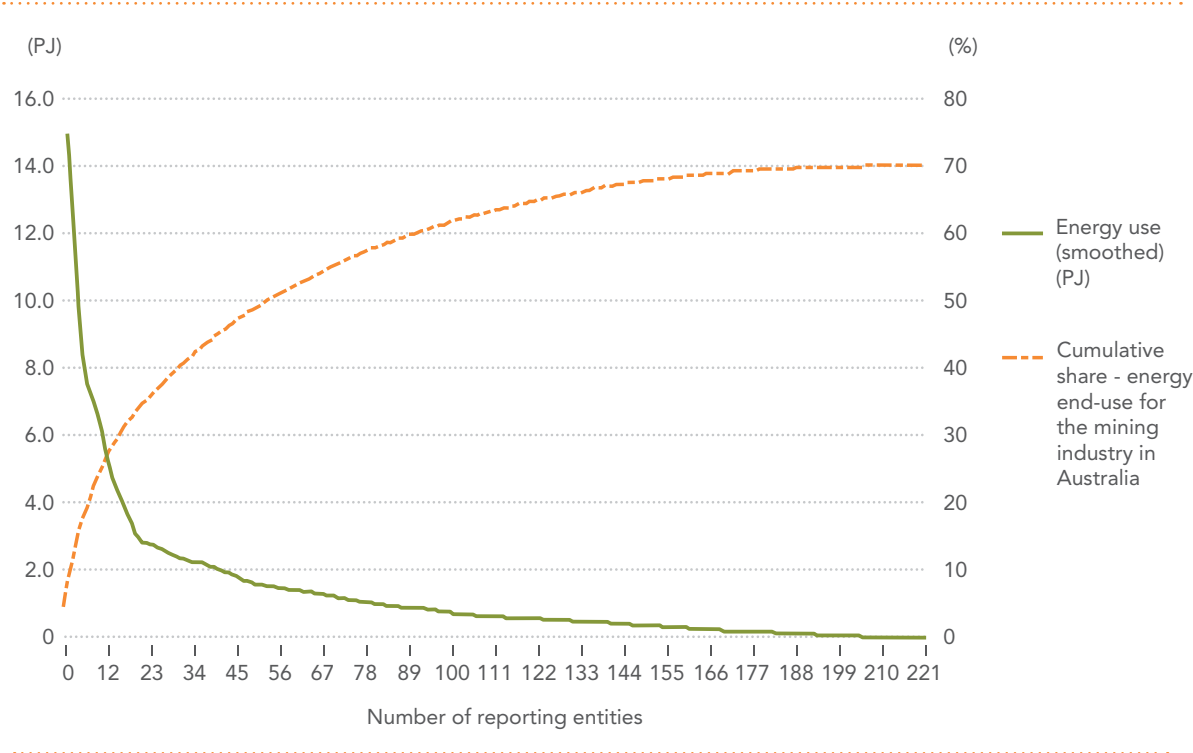
In a similar way to the distribution of energy use in the program as a whole, energy use in the mining industry was concentrated among a small group of 15 to 20 large businesses. The distribution of energy use among the 232 mining entities is shown in the solid curve in Figure 2.

Of these reporting entities:

- 82 used more than 1.0 PJ of energy per year,
- 42 used more than 2.0 PJ, and
- 12 used more than 5.0 PJ.

The broken curve in Figure 2 shows cumulative energy use of mining entities reporting under the program relative to the total energy end-use of Australia’s entire mining industry, which totalled 449.7 PJ in 2007-08. The mining entities’ energy use accounted for about 70 percent of energy end-use for the mining industry in Australia.<sup>1</sup>

**Figure 2: Distribution of energy use by mining entities**



Note: Energy use – ranked in descending order (smoothed to five-point moving average)

<sup>1</sup> Energy end-use refers to energy consumed in the final or ‘end use’ sectors of the economy (i.e. residential, government, business). It excludes energy consumed or lost in the energy conversion sector (e.g. in electricity production). In contrast, total Australian energy use includes the energy lost or used up in converting primary energy (e.g. in the form of coal or gas) to electricity for consumption in another sector of the economy.

### 3. LEVEL OF ENERGY USE ASSESSED

The mining industry achieved a reasonably high assessment of their energy use, with the mining entities having assessed about 60 percent of their total energy use by June 2008. Nearly a third of the miners, or 70 business entities, had undertaken energy assessments covering 100 percent of their energy use.

Under program regulations, in the first assessment cycle corporations are required to assess 80 percent of the energy use across the corporate group and 100 percent of energy use at sites using more than 0.5 PJ per year. Corporations that registered in 2006 have until 2011 to meet this requirement. The level of assessed energy use, or assessment coverage, reported for the program as a whole in December 2008 was 57 percent.

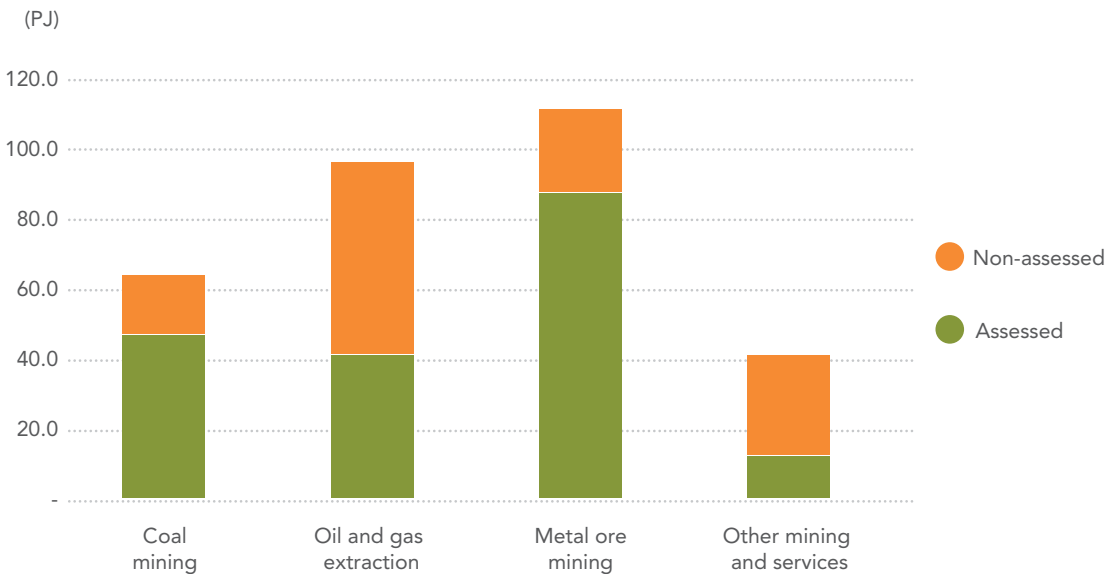
The largest energy-using sub-division in the mining industry, metal ore mining, had the highest energy assessment coverage at 78.3 percent, as seen in Table 2. Coal mining had the second highest coverage of 73 percent. Oil and gas extraction reported a relatively low assessment coverage of 43 percent; however, a high proportion of energy savings were identified from the assessment process (as discussed in Section 3).

**Table 2: Assessed energy use as a proportion of total participants' energy use by mining sub-division**

Mining sub-division	Energy use (PJ)	Assessed energy use (PJ)	Share of total assessed energy use (%)	Assessment coverage (%)
Coal mining	64.5	47.3	25.1	73.4
Oil and gas extraction	96.6	41.1	21.8	42.6
Metal ore mining	112.0	87.6	46.5	78.3
Other mining and services	41.5	12.5	6.6	30.1
<b>All mining</b>	<b>314.5</b>	<b>188.5</b>	<b>100.0</b>	<b>59.9</b>

The lowest assessment coverage, of 30.1 percent, was reported by entities operating in the other mining and services sub-division. Figure 3 provides a graphical summary of the level of assessed energy use.

Figure 3: Assessed and unassessed energy use by mining sub-division



## 4. ENERGY SAVINGS IDENTIFIED BY CORPORATIONS

The corporations were required to report on the energy efficiency opportunities that they identified during their energy efficiency assessments and the energy savings that could arise if they implemented these energy savings projects.

The mining businesses identified 17.2 PJ of energy savings as a result of their assessment process. Businesses involved in oil and gas extraction dominated the identification of energy savings, with their opportunities accounting for 11.5 PJ or just over two-thirds of total energy savings for the entire mining division.

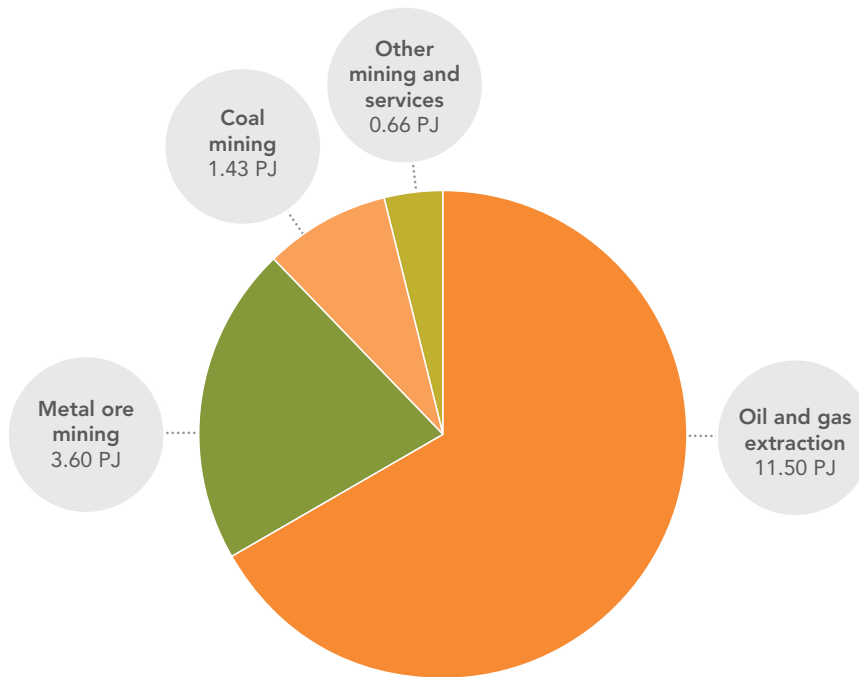
The level of energy savings identified by the miners is shown in Figure 4 and Table 3.

**Table 3: Identified energy savings by mining sub-division as a share of total energy use, energy savings and assessed energy use**

Mining sub-division	Energy savings identified (PJ)	Share of total energy savings identified (%)	Energy savings as a share of total energy use (%)	Energy savings as a share of assessed energy (%)
Coal mining	1.43	8.3	2.2	3.0
Oil and gas extraction	11.50	66.9	11.9	28.0
Metal ore mining	3.60	20.9	3.2	4.1
Other mining and services	0.66	3.8	1.6	5.3
<b>Total mining</b>	<b>17.18</b>	<b>100.0</b>	<b>5.5</b>	<b>9.1</b>

The metal ore miners identified the second largest share of energy savings at 3.6 PJ or 21 percent of savings. About 1.4 PJ of energy savings were found in projects reported by the coal mining industry, or 8 percent of total savings in mining. The remaining 'other' category accounted for almost 4 percent of the industry's identified savings.

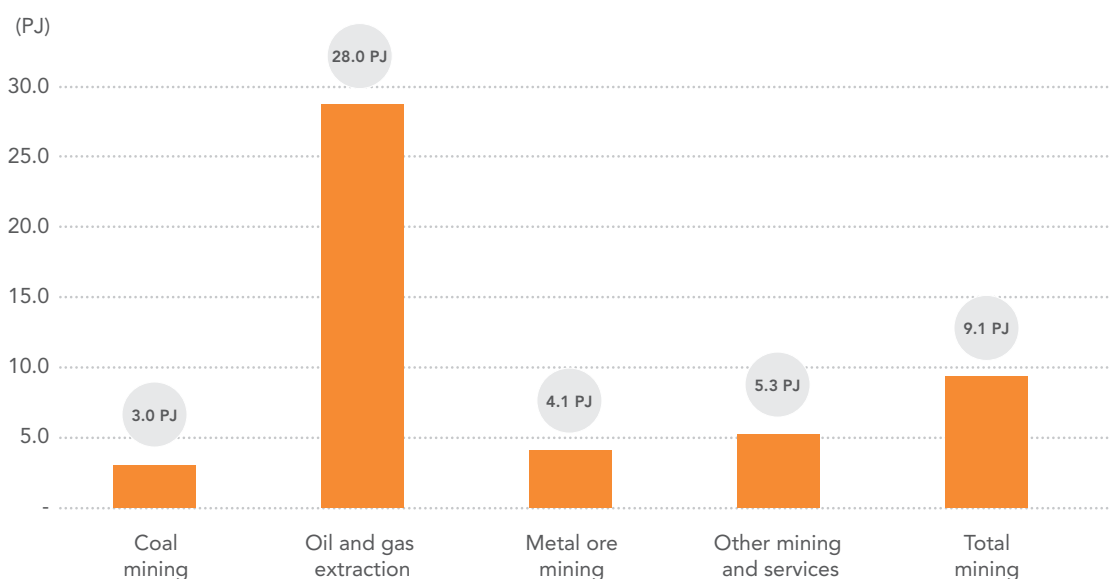
**Figure 4: Energy savings per year identified by mining sub-division 2006-08**



The 17.2 PJ of energy savings identified by the mining entities was equivalent to 9.1 percent of the energy use assessed by the group as a whole (see Figure 5). Again, this result was heavily influenced by oil and gas extraction. The sub-division reported energy savings equivalent to 28 percent of assessed energy, even though the oil and gas entities' level of assessment coverage was relatively low.

In the remaining mining sub-divisions, the level of energy savings as a percentage of assessed energy was significantly lower. Coal mining reported 3 percent energy savings, metal ore mining 4.1 percent and other mining and services 5.3 percent.

**Figure 5: Identified energy savings as a percentage of assessed energy use by mining sub-division**



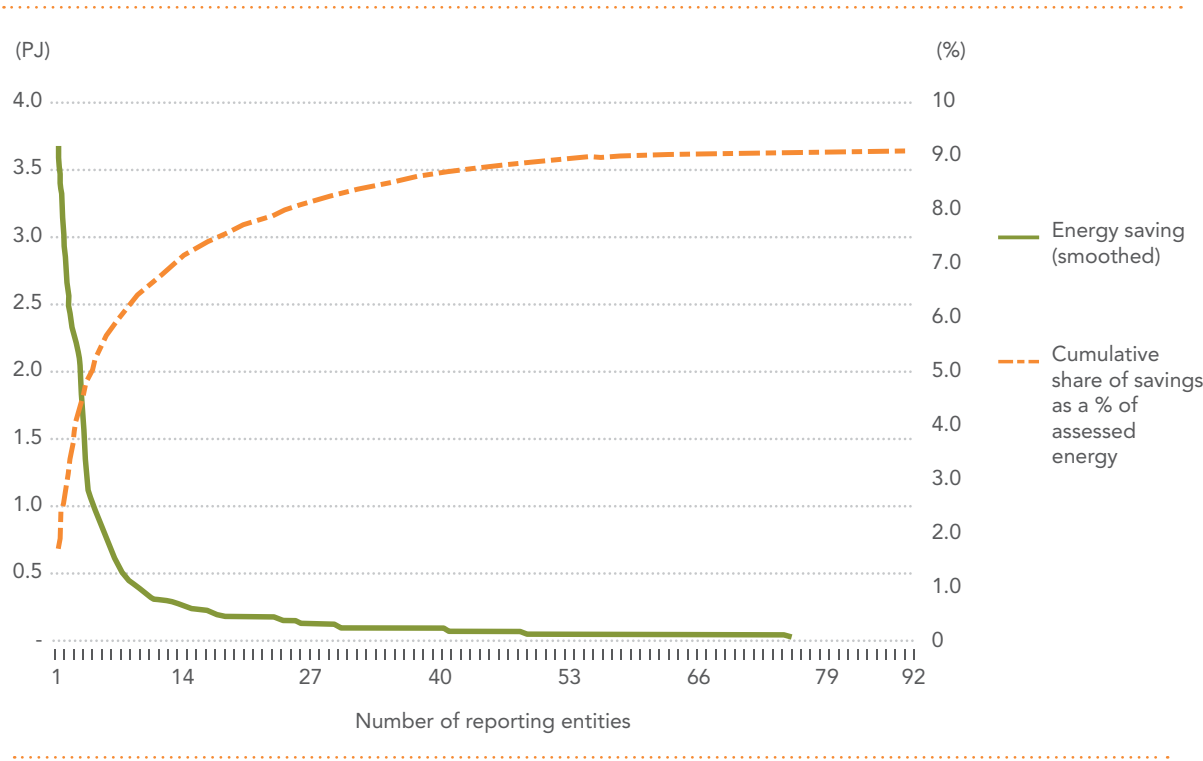
The distribution of identified energy savings across the 232 mining entities is shown in Figure 6 overleaf. Of these:

- seven identified 0.5 PJ or more of energy savings,
- 20 identified between 0.1 and 0.5 PJ, and
- 65 identified less than 0.1 PJ or more.

### 4.1. FINANCIAL BENEFITS OF IDENTIFIED ENERGY SAVINGS

The mining industries reported they could potentially achieve net financial benefits of \$257.3 million a year as a result of the energy savings projects that they identified through their energy efficiency assessments, as shown in Table 4.

**Figure 6: Distribution of identified energy savings by mining sub-division**



Note: Data have been smoothed to avoid disclosure of company-specific data.

This was the highest level of financial savings of any industry sector, representing 35 percent of the \$735.8 million in financial benefits estimated by the 199 corporations for the program. (An analysis of the financial savings identified across different industries appears in Table 5 in the main *First Opportunities* report.)

The net financial benefits are the savings the corporations expect to make in ongoing costs and benefits in the first four years of an energy project’s implementation, less the initial investment and assessment costs involved. The figure is divided by four to give an annualised sum. Net financial benefits include all financial savings and costs, not just financial savings from reduced energy use.

**Table 4: Net financial benefits from energy savings opportunities**

Mining sub-division	Energy savings (PJ)	Financial savings (\$ million/yr)	Financial savings (\$/GJ)
Coal mining	1.37	56.2	41.08
Oil and gas extraction	11.17	np	np
Metal ore mining	3.60	77.2	21.46
Other mining and services	0.66	np	np
<b>Total mining</b>	<b>16.80</b>	<b>257.3</b>	<b>15.32</b>

np = data not published to maintain confidentiality of commercially sensitive information

Under program rules, any commercial-in-confidence information provided by individual corporations cannot be published by the Government in a way that could be identified. However, the data is published in aggregated form for program purposes.

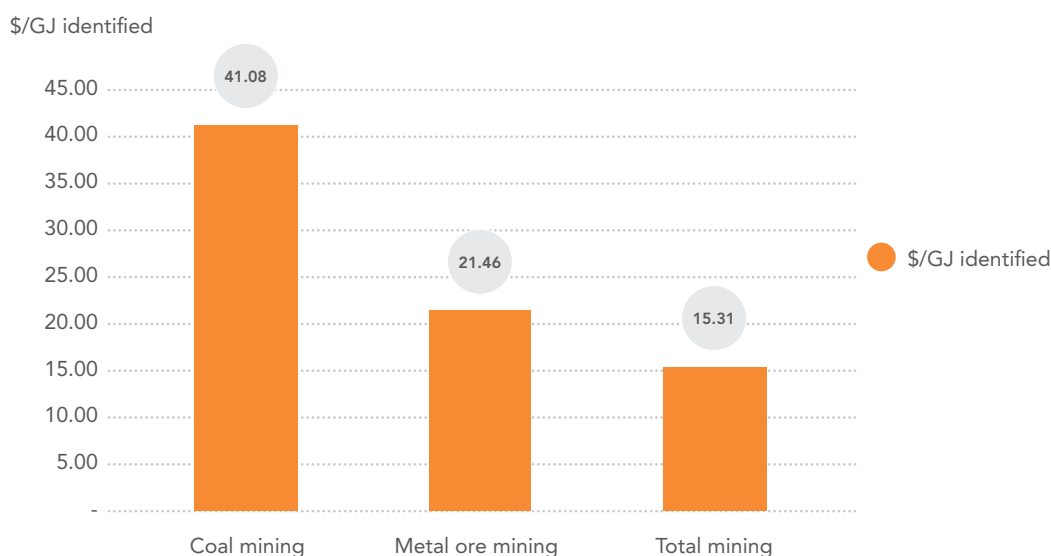
Around half of the financial information reported by the mining entities was confidential and, therefore, some data in Table 4 have not been published. Of the publishable information, the metal ore miners identified \$77.2 million of financial benefits and the coal miners \$56.2 million.

The net financial benefits of the energy efficiency opportunities identified by the miners were also expressed on a per unit (gigajoule) basis in Table 4 and graphically for some sub-divisions in Figure 7. The dollar-per-gigajoule figures can vary across an industry because of factors such as differences in energy pricing, fuel types, production technologies and other business costs and benefits attributed to energy saving projects.

On average, the mining businesses together identified financial savings of \$15.31 per GJ if they were to implement their energy efficiency projects.

The coal miners reported the highest financial benefits of \$41.08 per GJ saved, while the metal ore miners identified savings of almost half that amount of \$21.46 per GJ saved. The financial savings within the other mining sub-divisions, which cannot be itemised because of confidentiality reasons, were all moderately high compared with other industry sectors.

**Figure 7: Net financial savings from identified opportunities**



## 5. BUSINESS RESPONSE TO ENERGY SAVINGS BY PAYBACK PERIOD

Under program rules, corporations are required to report whether they would proceed with implementing the energy savings opportunities that they identified during their energy efficiency assessments.

Their business response is reported under the following five categories: under investigation, to be implemented, implementation commenced, implemented and not to be implemented. The categories allow the program to differentiate the *potential* energy and emissions savings of projects that might be implemented from the *actual* savings of projects already completed.

In assessing their business response, the corporations used two separate payback categories – projects with a payback of less than two years and a payback of 2-4 years. A payback period refers to the time taken for an investment to yield a positive return. Some corporations also choose to voluntarily report their response to projects with a payback of more than four years; however, this data has not been collated in Table 5 to ensure consistency in the figures.

Together, the mining entities identified potential financial savings of \$233 million for projects in the less than two year category that they were to implement or had already implemented. This represented 44 percent of all financial savings identified by corporations in these categories across the program - and the highest of any industry sector, as highlighted in Table 8 of the main *First Opportunities* report.

Of the 17.2 PJ of savings identified by entities in the mining industry for all payback categories, 14.91 PJ have been identified in the less than two years category. This represents around 87 percent of total identified savings from mining (see Table 5).

**Table 5: Identified energy and financial savings by payback period and mining sub-division**

Payback period	Mining sub-division	Energy savings (PJ)	Financial savings (\$ million/yr)	Financial savings (\$/GJ)	Proportion of energy savings to be adopted* (%)
<b>0 - &lt; 2 years</b>	Coal mining	0.93	51.3	55.35	65
	Oil and gas extraction	np	np	np	83
	Metal ore mining	2.98	60.5	20.29	58
	Other mining and services	np	np	np	89
	<b>Total mining</b>	<b>14.91</b>	<b>233</b>	<b>15.62</b>	<b>77</b>
Payback period	Mining sub-division	Energy savings (PJ)	Financial savings (\$ million/yr)	Financial savings (\$/GJ)	Proportion of energy savings to be adopted* (%)
<b>2 - 4 years</b>	Coal mining	0.44	4.9	11.10	31
	Oil and gas extraction	np	np	np	53
	Metal ore mining	0.61	16.7	27.15	52
	Other mining and services	np	np	np	46
	<b>Total mining</b>	<b>1.88</b>	<b>24.3</b>	<b>12.90</b>	<b>47</b>

np = data not published to maintain confidentiality of commercially sensitive information

\* 'Adopted' refers to the business response categories of 'to be implemented', 'implementation commenced', and 'implemented'.

The energy savings found in the less than two year category generally coincided with the higher net financial returns of \$15.62 per GJ identified compared with those found in the 2-4 year payback category, where the financial savings were \$12.90 per GJ. For example, the net financial return per GJ saved by the coal miners was \$55.35 in the less than two year category and \$11.10 in the 2-4 years category. With the exception of metal ore mining, the other detailed financial information within both payback categories has not been published for commercial-in-confidence reasons.

The mining industry's saving results by payback period were consistent with the results reported across other industries, and outlined in the main *First Opportunities* report. The one exception was metal ore mining, where financial savings were higher in the 2-4 year category than the less than two year category (\$27.15 per GJ compared with \$20.29 per GJ respectively). In all industries, the dollar per gigajoule savings were higher in the less than two year payback category, although the results were similar in general manufacturing.

## 6. GREENHOUSE GAS EMISSIONS

The greenhouse gas emissions produced by the mining entities were calculated based on their use of different types of fuels, such as electricity, natural gas and diesel. The reported figures for both energy use and energy savings were converted into emissions using National Greenhouse Accounts (NGA) factors produced by the Department of Climate Change and Energy Efficiency.

As the emissions only relate to the corporations' use of energy, they are referred to as energy-related emissions to distinguish them from total emissions data published in the National Greenhouse Gas Inventory. (Energy-related emissions include only the greenhouse gas emissions arising from the direct combustion of energy and the use of purchased electricity.)

The energy savings reported by the mining entities equated to a potential reduction in greenhouse gas emissions of 1,407 kilotonnes of carbon dioxide-equivalent (ktCO<sub>2</sub>-e), as seen in Table 6. Around 823 ktCO<sub>2</sub>-e were attributable to direct emissions and 584 ktCO<sub>2</sub>-e to indirect emissions.

The energy savings of oil and gas entities produced the largest emissions reductions of any mining sub-division, accounting for 42.8 percent of reductions, or 601.9 ktCO<sub>2</sub>-e. All of these emissions reductions were of direct emissions due to the entities' own use of natural gas. (The emissions estimates excluded fugitive emissions, as these are outside the scope of the program.)

The metal ore miners identified energy savings that would produce the second largest reductions in emissions, of 37.2 percent or 524 ktCO<sub>2</sub>-e. Direct emissions accounted for about 24 percent and were attributable to the identified savings of diesel and natural gas. Reductions of indirect emissions attributable to electricity savings accounted for three-quarters of the total emissions reductions in metal ore mining.

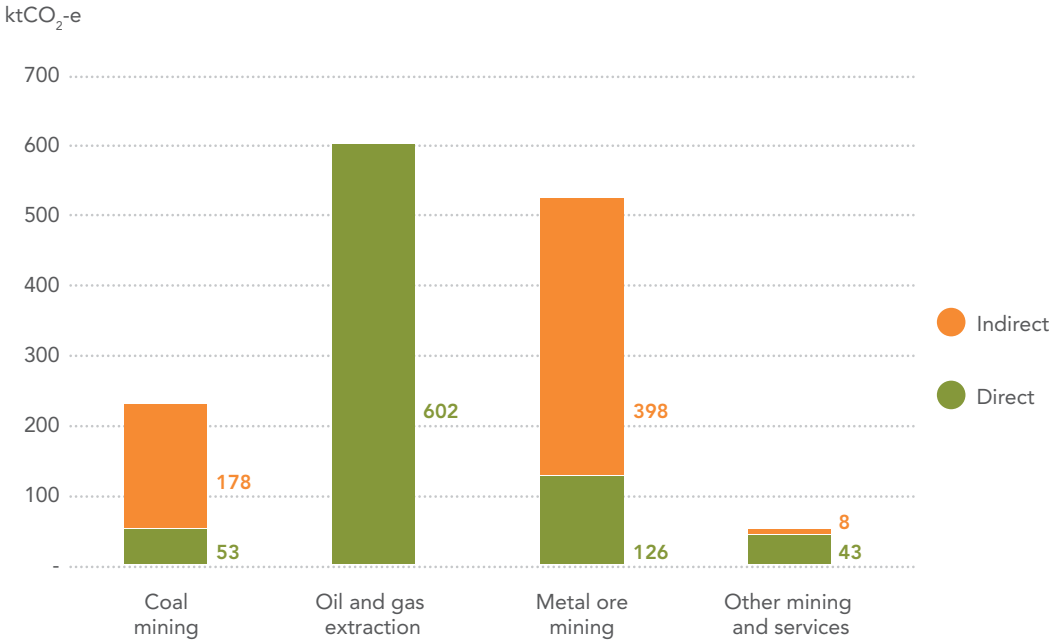
**Table 6: Reductions in greenhouse gas emissions by mining sub-division**

Mining sub-division	Reductions in energy-related emissions (kilotonnes CO <sub>2</sub> -e)			Share of emissions reductions (%)
	Direct	Indirect	Total	
Coal mining	52.7	178.0	230.6	16.4
Oil and gas extraction	601.9	-	601.9	42.8
Metal ore mining	125.7	398.2	524.0	37.2
Other mining and support services	43.1	7.5	50.6	3.6
<b>Total mining</b>	<b>823.4</b>	<b>583.7</b>	<b>1,407.0</b>	<b>100</b>

The coal mining sub-division potentially would reduce its energy-related emissions by 16 percent, or 230.6 ktCO<sub>2</sub>-e, if it proceeded with its energy savings projects.

Most of the reductions (77 percent) were in indirect emissions attributable to electricity savings. These emissions reductions data by emission type are shown graphically in Figure 8.

**Figure 8: Reductions in greenhouse gas emissions by mining sub-division**



## 7. ENERGY SAVINGS BY OPPORTUNITY CATEGORY AND EQUIPMENT TYPE

In their reports to government the participating corporations were asked to voluntarily provide extra information on the energy savings opportunities that they had identified and the type of equipment that was involved.

While the overall response rate was low across the program, the mining businesses provided a high level of information about their energy savings projects, which accounted for almost half – or 48.8 percent - of the total energy savings in mining.

The miners reported on their energy savings opportunities in the following categories:

- staff operation,
- maintenance procedures,
- management systems,
- energy measurement,
- process control,
- retro-fitting (same but more efficient technologies),
- new technologies, and
- research and development.

Table 7 and Figure 9 show the level of energy savings, and the proportion of total identified savings, according to the types of energy efficiency opportunities being identified and implemented by the mining businesses.

Projects that focused on process control provided the largest amount of energy savings, or 3.46 PJ, accounting for 41.1 percent of all savings opportunities identified by the mining entities.

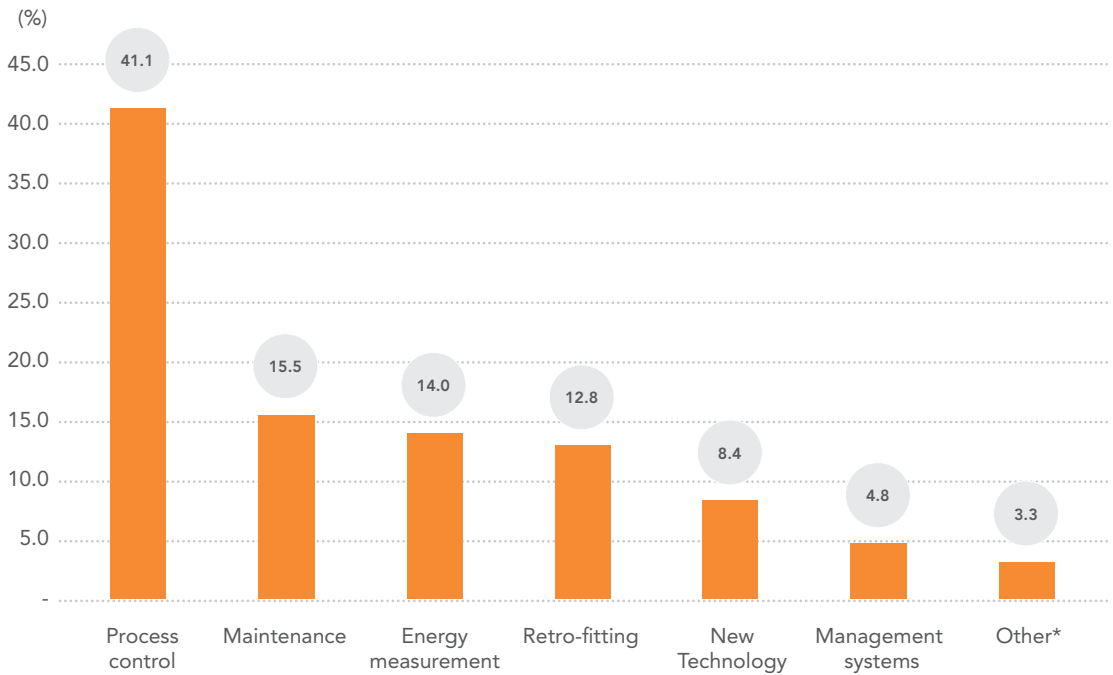
**Table 7: Identified energy savings by opportunity category**

Description of opportunity	Energy savings (PJ)	Share of total identified savings (%)
Process control	3.46	41.1
Maintenance	1.31	15.5
Energy measurement	1.17	14.0
Retro-fitting	1.08	12.8
New technology	0.70	8.4
Management systems	0.41	4.8
Staff operation	0.21	2.5
Research and development	0.07	0.8
<b>Total mining</b>	<b>8.40</b>	<b>100.0</b>

The miners' energy savings were fairly evenly distributed among the next three largest categories of savings opportunities: maintenance, which had savings of 1.31 PJ, energy measurement (1.17 PJ) and retro-fitting (1.08 PJ).

Projects that involved management systems, staff operation, and research and development recorded the lowest energy savings, accounting for 0.41 PJ, 0.21 PJ and 0.07 PJ of energy savings respectively.

**Figure 9: Identified energy savings opportunities by opportunity category**



\*'Other' includes staff operation and research and development

In describing the equipment they used in their energy savings projects, the miners were asked to report according to the following categories:

- boilers,
- thermal equipment,
- chemical,
- mobile equipment,
- electrical only equipment,
- non-mobile combustion engines,
- renewable energy electricity generation, and
- other.

The largest equipment category in the mining industry was 'other', as shown in Table 8 and Figure 10, which covers equipment not covered by the other categories. It accounted for 3.83 PJ of energy savings, or 45 percent of total savings reported by equipment type.

By far the majority of this 'other' category - or just over 3 PJ of the energy savings - were attributed to flare and unaccounted losses reported in the oil and gas extraction industry. The level of savings achieved in this area raises the question of whether it should become an equipment-related category of its own for future reporting.

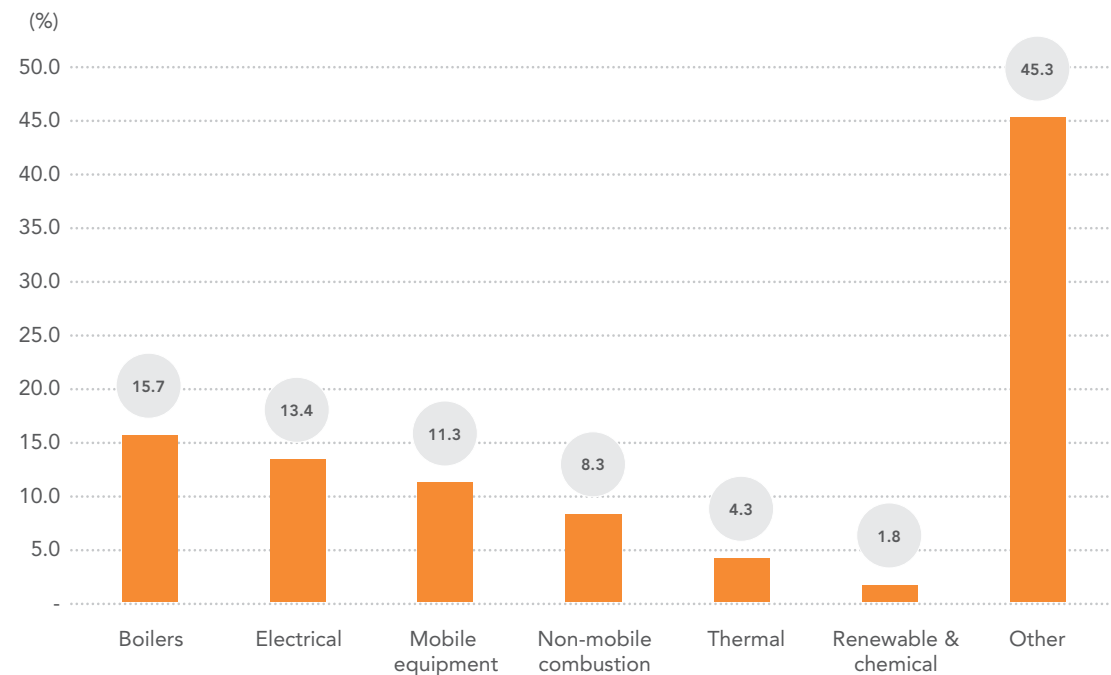
**Table 8: Identified energy savings opportunities by equipment category**

Equipment type	Energy savings (PJ)	Share of total identified energy savings (%)
Boilers	1.32	15.7
Thermal	0.36	4.3
Chemical	0.05	0.6
Mobile equipment	0.96	11.3
Electrical	1.13	13.4
Non-mobile combustion	0.70	8.3
Renewable	0.10	1.2
Other	3.83	45.3
<b>Total mining</b>	<b>8.45</b>	<b>100.0</b>

Around 1.3 PJ of identified savings were associated with boilers (for steam), representing 16 percent of total equipment savings in mining. Energy savings projects that involved electrical equipment saved 1.13 PJ and mobile equipment 0.96 PJ, accounting for 13.4 percent and 11.3 percent of equipment-related savings respectively.

Savings opportunities relating to renewable energy (0.10 PJ in savings) and chemical processing (0.05 PJ) recorded the lowest levels of energy savings of any of the equipment categories. In combination, these two represented 1.8 percent of total equipment-type savings reported by the mining entities.

**Figure 10: Identified energy savings opportunities by equipment category**





## 8. ENERGY USE AND ENERGY SAVINGS BY FUEL TYPE

The Energy Efficiency Opportunities program requires corporations to report on energy use and energy savings by fuel type because fuel is an important influence over energy costs and has an impact on the financial benefits that can be gained from energy savings projects. Different fuels also have varying levels of greenhouse intensity.

The coal mining businesses reported that diesel fuel accounted for around three-quarters of the fuel used and just over half of all reported energy savings. Electricity, by contrast, represented just over 20 percent of energy use within coal mining, and nearly half of all reported savings opportunities.

For oil and gas extraction, the entities reported that more than 90 percent of the fuel used was natural gas. This fuel type also accounted for more than 90 percent of identified energy savings. This was consistent with the findings in Table 8, which showed significant savings related to flare and unaccounted losses.

By contrast, the metal ore miners reported that electricity accounted for just under 20 percent of fuel used, yet almost half of all identified opportunities related to electricity savings. Diesel accounted for 47 percent of energy use and 32 percent of identified savings. Natural gas accounted for 31 percent of energy use within the sub-division and 24 percent of identified energy savings.

Combining the savings data by equipment type with energy savings by fuel type showed that process control and efficiencies in electrical equipment provided notable savings opportunities in the mining industry.

The use of fuel in the mining industry can be distinguished from that across the Energy Efficiency Opportunities program as a whole, where natural gas accounted for 31.5 percent of energy use, electricity 17.4 percent, coal 14.7 percent, and diesel 10.8 percent. These top four fuel types accounted for about 74 percent of fuel reported by registered corporations in the program.

Figures for all industry sectors can be found in the main report, *First Opportunities: A Look at Results from 2006-08*, at the program website: [www.energyefficiencyopportunities.gov.au](http://www.energyefficiencyopportunities.gov.au)





