

# final report

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## **Energy efficiency opportunities program report (Federal Government)**

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## Contents

Executive Summary .....	3
1. EEO Opportunities Overview – public documents .....	4
1.1 Energy Efficiency Opportunities (EEO) Program .....	4
1.2 Companies involved .....	5
1.3 How assessment was conducted .....	5
1.4 Total Energy Usage.....	7
1.5 Opportunities identified .....	10
1.6 Opportunities identified - detail .....	14
1.7 Other information .....	17
1.8 Hypothetical before and after key performance indicators .....	18
2. EEO Opportunities – site feedback .....	19
2.1 Overall progress of assessments .....	19
2.2 Energy and Mass Balance .....	20
2.3 Opportunity identification, assessment and business response .....	20
2.4 Tracking progress .....	21
2.5 Learnings. ....	21
2.6 Verification compared to DRET guidelines .....	21
2.7 Comparison to other industry sectors .....	22
3. References .....	26
Appendix 1. Typical approaches used by organisations .....	27
Appendix 2. Examples from meat processing companies .....	29
Appendix 3. Examples from other industries .....	38

## **Executive Summary**

The Energy Efficiency Opportunities Program was established by the Federal Government to ensure that the largest energy using corporate groups in Australia were reporting on their energy use and investigating ways of improving their energy efficiency. The Energy Efficiency Opportunities Act (EEOA) came into effect on 1 July 2006, and corporate groups that consumed over 0.5 PJ of energy in the 2005-2006 financial year were required to register. There have been 2 public reports (December 2008 and December 2009), which are analysed in this report.

The order of energy consumption over the two reporting periods, from largest to smallest, is as follows:

- Swift Australia Pty Ltd (40% of industry total)
- Teys Bros (Holding) Pty Ltd (22% of industry total)
- Nippon Meat Packers (19% of industry total)
- Cargill Australia Ltd (18% of industry total)

The order of energy efficiency over the two reporting periods, from most efficient to the least efficient, is as follows:

- Teys Bros (Holding) Pty Ltd (17% better than industry benchmark)
- Swift Australia Pty Ltd (3,410 MJ/tHSCW average, 1% worse than industry benchmark)
- Nippon Meat Packers (4,828 MJ/tHSCW average, 42% worse than industry benchmark)
- Cargill Australia Ltd (5,239 MJ/tHSCW, 55% worse than industry benchmark)

It is important to keep in mind that these are preliminary analysis and factors that can influence the energy KPI include:

- Amount of value adding at sites (has a major impact)
- Boiler fuel type (gas fired boilers, such as Teys Beenleigh, are inherently more efficient than coal fired boilers)
- Amount of energy efficiency opportunities already implemented (Tey's were previously part of the Greenhouse Challenge Plus program)

The red meat sector identified 486,388 GJ of potential energy savings as a result of the assessments. Swift Australia identified the largest percentage of the total energy savings (59.7%), Nippon and Cargill had similar savings (23 and 16% of total savings respectively) and Teys identified 1% of the total industry savings. The identified savings ranged from 2.5 to 42% of the assessed energy use, and from 0.6 to 14% of the respective companies total energy use.

When the potential opportunities compared to total energy use as reviewed, it appears that the red meat industry has greater potential for energy saving when compared to mining, transport or other industries in general. However, compared to mining, the savings had a much higher payback period – 66% of red meat industry savings had a payback period of more than 4 years, whereas 87% of mining savings had a payback of less than 2 years and 62% of all EEO reporters. This means that, if the potential energy saving of the industry is to be realised, support will be required to shift the payback periods from > 4 years to preferably <2 years.

# 1. EEO Opportunities Overview – public documents

## 1.1 Energy Efficiency Opportunities (EEO) Program

The Energy Efficiency Opportunities Program was established by the Federal Government to ensure that the largest energy using corporate groups in Australia were reporting on their energy use and investigating ways of improving their energy efficiency. The top 250 corporate groups in Australia account for about 40 per cent of Australia's total energy use.

The Energy Efficiency Opportunities Act (EEOA) came into effect on 1 July 2006, and corporate groups that consumed over 0.5 PJ of energy in the 2005-2006 financial year were required to register by 9 months after the end of the trigger year (ie by 31 March 2007). Once the corporation had registered, they had to submit an Assessment and Reporting Schedule within 18 months of the end of the trigger year (ie by 31 December 2007) which detailed how and when they were going to assess the corporations total energy use. The EEOA is a five year cycle, with the first five year cycle requiring assessment of 80% of a corporate groups total energy use, and the second five year cycle requiring assessment of 90% of the corporate groups total energy use.

If a corporate group was under the 0.5PJ threshold but acquires businesses or increases energy consumption, then the five year cycle starts whenever they trip the 0.5PJ threshold for the first financial year. The Federal Government has consistently indicated that they will be checking the data reported as part of the EEO program with data reported as part of other programs, such as the National Greenhouse and Energy Reporting Scheme.

The EEOA documentation details how companies must undertake energy assessments and uses a management system or whole of business approach. Rather than looking just at energy use and opportunity identification and analysis, companies must also address key elements such as leadership, allocation of human resources, decision making and communicating outcomes. Each of the 6 key elements has a number of key requirements, each of which have a required level of evidence or supporting documentation. One key requirement is an energy –mass balance or equivalent. The requirements go well beyond just doing an energy audit that complies with the Australian Standard.

Key documents provided by the Federal Government include Industry Guidelines, an Assessment Handbook, an Energy Savings Measurement Guide and the Verification Handbook. EEOA requirements include government reporting and annual public reporting on energy use and the outcomes of assessments. Companies must report on projects with payback of 0-2 years, 2-4 years and over 4 years.

The energy supply sector (electricity generation) is exempt from participating in the Energy Efficiency Opportunities program.

**1.2 Companies involved**

In their first reports to government, 199 corporations reported data for 1099 separate entities. Of these, 81 were in general manufacturing and 4 corporations were red meat processing entities (ANZSIC Code 1111), namely Cargill Australia Ltd, Nippon Meat Packers Australia Pty Ltd (NMPA), Swift Australia Pty Ltd and Teys Bros (Holding) Pty Ltd. AJ Bush & Sons (Manufactures) Pty Ltd, who are renderers, are also registered.

**Table 1: Summary details of participating companies**

<b>Company</b>	<b>2007 throughput (t)</b>	<b>No plants</b>	<b>Species</b>	<b>Employees</b>
Cargill Australia Ltd	152,000	2	Beef	1,100
Nippon Meat Packers Australia Pty Ltd	164,200	3	Beef	1,650
Swift Australia Pty Ltd	453,000 for 1 <sup>st</sup> report	4	Beef	4,800
	616,072 for 2 <sup>nd</sup> report	10	Beef + Multi	6,700
Teys Bros (Holding) Pty Ltd	344,933	6	Beef	2,700

Source: 2007 Meat and Livestock Australia “Top 25 Red Meat Processors”

Note that only 4 of the Teys Bros plants were operating at the time that the data was collected.

**1.3 How assessment was conducted**

Part of the public report included a section which required a description of how the corporation carried out its assessment. These are summarised below.

**Table 2: How EEO Assessments were conducted**

<b>Company</b>	<b>Details of how EEO Assessment were conducted</b>
Cargill Australia Ltd	<ul style="list-style-type: none"> <li>Level 2 energy audit at Wagga Site by Hydro Tas in 2008 as part of MLA Industry Energy Efficiency project – assessed current energy use, key activities and improvements, in order to “fulfil the key requirements of EEO”</li> </ul>

Company	Details of how EEO Assessment were conducted
<p>Nippon Meat Packers Australia Pty Ltd</p>	<ul style="list-style-type: none"> <li>• Energy reduction (ER) team or EEO committee formed at each site, with representation from management, plant operations (production, engineering, maintenance and quality) and external consulting engineers.</li> <li>• Plant energy usage and production data is analysed on a monthly basis, monthly meetings to track energy use attended by site general manager</li> <li>• ER Team identified ongoing and future projects, had them reviewed and approved by senior management. At Wingham Beef Exports (WBE)BE, core assessment team conducted weekly 1 hour inspection of various process areas, debrief identified opportunities and ranked according to preliminary payback period. Remaining opportunities consolidated into a list for more detailed assessment. Have developed an Investigation Form that is given to Area Supervisors, forms are collected weekly and reviewed at fortnightly meetings.</li> <li>• If opportunity has payback period of less than 2 years, the site General Manager passes site information to Group Engineer, who reviews and raises capital for approval with the Group Managing Director, if successful is incorporated into company capital budgeting cycle and implementation depends on availability of capital</li> <li>• For opportunity with payback period 2-4 years, kept in the system and reviewed annually eg motor replacement – review again at the end of the motor life</li> <li>• Outcomes and commitments communicated by senior management to staff on site, Site Champion forwards monthly reports to Group Engineer and Group Managing Director</li> <li>• For Oakey, has Level 2 Energy Audit as part of the MLA Industry Energy Audit Project</li> <li>• Reports prepared by site champion, reviewed by site EEO committee, reviewed and approved by Site Managing Director and Group Engineering Manager</li> </ul>
<p>Swift Australia Pty Ltd</p>	<ul style="list-style-type: none"> <li>• Beef City plant had Level 2 Energy Audit as part of the MLA Industry Energy Audit Project, ensured that “the intent and key requirements of the EEO legislation have been met”</li> <li>• Detailed technical and financial feasibility assessments were conducted on opportunities identified as part of initial assessment, were then considered by Swift Management</li> <li>• Tasman Group Services purchased by Swift during 2008, required amendment to Assessment and Reporting Schedule (another six meat processing facilities). TGS Brooklyn had also had a Level 2 Energy Audit as part of the MLA Industry Energy Audit Project</li> <li>• Progress on implementation of Swifts assessments is reported annually to the Corporate Environment Committee</li> </ul>

Company	Details of how EEO Assessment were conducted
Teys Bros (Holding) Pty Ltd	<ul style="list-style-type: none"> <li>• Beenleigh, Biloela and Naracoorte had been part of the Greenhouse Challenge Plus Program since the early 2000's, so had been reporting annually on energy use, greenhouse emissions and changes in key performance indicators, in the later years via OSCAR, the online reporting tool. Rockhampton was purchased in 2002 and started operating in mid 2004, in preparation for its assessment a carbon footprint project was completed in December 2008</li> <li>• Teys has ensured that in the design and implementation of its assessments, the intent and key requirements of the EEO legislation have been met</li> <li>• First assessment (Beenleigh) completed in March 2009, Rockhampton in December 2009</li> <li>• Evaluation of assessments enabled learnings to be incorporated into the next assessment, ensuring continuous improvement to the assessment process</li> <li>• 36 months of data used for Beenleigh and Rockhampton site assessments</li> <li>• Site team formed, with representatives from management, environment, operations, maintenance, engineering and quality.</li> <li>• Detailed background report prepared for each site, which covers energy use, key performance indicators compared to industry averages, daily and monthly trends in KPI, regression analysis on electricity and boiler fuel compared to production, energy-mass balance, business contextual information, key site processes and activities (as per key requirements 3.1, 3.2 and 3.3)</li> <li>• Results of background report presented to site team, used to highlight area for focus as part of assessment</li> <li>• Site team brainstormed opportunities, based on existing industry information and results from assessments at other sites. Site team then interviews representatives from different plant areas to identify opportunities. Opportunities are ranked using whole of business approach, high priority opportunities undergo further assessment (as per key requirements 4.1, 4.2, 4.3, 4.4 and 4.5). Implementation for projects with small capital requirement and short payback can start at this stage.</li> <li>• Site team reviews outcome of more detailed assessment, decides on opportunities to recommend to board, information presented to board. Site team reviews outcomes of board meeting, allocates responsibility for projects and decides on implementation schedule. Regular meetings to track progress (as per key requirements 5.1, 5.2 and 5.3). Decisions about outcomes are communicated back to staff through representatives on site team.</li> </ul>

**1.4 Total Energy Usage**

Cargill, Swift and Teys reported as a total corporate group, so the total consumption for the first report is calculated from the reported energy use and the percentage of the corporate total it represents. For the second report, the total corporate energy use is included in the public report.

Nippon Meat Packers Australia submitted separate public reports for each of their three sites – Thomas Borthwick and Sons Pty Ltd (TBS), Wingham Beef Exports (WBE) and Oakey Abattoir (OA).

During 2008, Swift Australia Pty Ltd purchased Tasman Group Services, which was renamed Swift Australia (Southern) Pty Ltd and included in the corporate total.

The following table summarises the total energy use of each reporting red meat entity.

**Table 3: Energy use by company**

<b>Company</b>	<b>First report (Dec08)</b>	<b>Second report (Dec09)</b>
Cargill Australia Ltd	<b>Period:</b> Jun06-May08 <b>Usage:</b> 289,306 GJ Wagga 37% of total <b>Total 781,908 GJ</b>	<b>Period:</b> Jun08-May09 <b>Usage:</b> 281,261 GJ Wagga 35% of total <b>Total 810,882 GJ</b>
Nippon Meat Packers Australia Pty Ltd	<b>Period:</b> Jul06-Jun08 <b>Usage:</b> 166,670 GJ TBS (22%) 277,302 GJ WBE (36%) 326,840 GJ OA (42%) <b>Total 770,812 GJ</b>	<b>Period:</b> Jul08-Jun09 <b>Usage:</b> 167,781 GJ TBS (21%) 294,832 GJ WBE (36%) 352,003 GJ OA (43%) <b>Total 814,616 GJ</b>
Swift Australia Pty Ltd	<b>Period:</b> Jul06 – Dec08 <b>Usage:</b> 261,913 GJ Beef City 18.1% of total <b>Total 1,447,033 GJ</b>	<b>Period:</b> Jul08-Jun09 <b>Usage:</b> 281,335 GJ Beef City (16%) 408,128 GJ Brooklyn (23%) <b>Total 1,755,715 GJ</b>
Teys Bros (Holding) Pty Ltd	<b>Period:</b> Jul08-Dec08 No assessments completed	<b>Period:</b> Jan09-Jun09 <b>Usage:</b> 227,271 GJ Beenleigh (24%) <b>Total 964,768 GJ</b>
<b>Industry total</b>	<b>2,999,753 excluding Teys</b>	<b>4,345,981 GJ including Teys</b>

Source: EEO Public Reports

This indicates that the order of energy consumption over the two reporting periods, from largest to smallest, is as follows:

- Swift Australia Pty Ltd (40% of industry total)
- Teys Bros (Holding) Pty Ltd (22% of industry total)
- Nippon Meat Packers (19% of industry total)
- Cargill Australia Ltd (18% of industry total)

Meat and Livestock Australia (MLA) used to publish a list of the Top 25 Red Meat Processors and the most recent version is from 2007. If we use this as an indicator of total production, a comparison can be made of the above energy consumption figures with the most recent key performance indicators (KPI) from the MLA Industry environmental performance review (2005). **It is important to remember that tonnes of hot standard carcass weight is a measure of the production from the kill floor in a meat processing plant, and does not in any way indicate other processes or value adding at the site.** The more value adding, the higher the MJ/tHSCW will be, as it is not reflected in the tHSCW figure. **Comparing energy use key performance indicators should therefore be used with extreme caution.** Similarly, there may have been changes in the actual production rate between 2007 and the energy use data reported here, so these values are indicative only.



**Table 4: Calculated energy Key Performance Indicator for sites**

	Energy Use (MJ)		Energy use KPI (MJ/tHSCW)
MLA benchmark	n/a	n/a	3,389
Cargill Australia Ltd	781,908,000 (1 <sup>st</sup> )	152,000	5,144
	814,882,000 (2 <sup>nd</sup> )	(5.3% of industry)	5,335
Nippon Meat Packers Australia Pty Ltd	770,812,000 (1 <sup>st</sup> )	164,200	4,694
	814,616,000 (2 <sup>nd</sup> )	(5.72% of industry)	4,961
Swift Australia Pty Ltd	1,447,033,000 (1 <sup>st</sup> )	453,000 (15.8% of industry)	3,195
	1,755,715,000 (2 <sup>nd</sup> )	616,072 (21.5% of industry)	3,468
Teys Bros (Holding) Pty Ltd	964,768,000 (2 <sup>nd</sup> )	344,933 (12% of industry)	2,797
Average	3,964,521,000 (1 <sup>st</sup> )	1,114,133	3,558
	4,788,698,000 (2 <sup>nd</sup> )	1,277,205	3,749

This indicates that the order of energy efficiency over the two reporting periods, from most efficient to the least efficient, is as follows:

- Teys Bros (Holding) Pty Ltd (17% better than industry benchmark)
- Swift Australia Pty Ltd (3,410 MJ/tHSCW average, 1% worse than industry benchmark)
- Nippon Meat Packers (4,828 MJ/tHSCW average, 42% worse than industry benchmark)
- Cargill Australia Ltd (5,239 MJ/tHSCW, 55% worse than industry benchmark)

Only Teys Bros appear to be using less energy than the industry average. The purchase of the Tasman Group Services companies worsened the overall energy efficiency of Swift Australia and increased the average KPI for the industry as a whole, from 5 to 11% above the MLA KPI value. It is important to keep in mind that these are preliminary analysis and factors that can influence the energy KPI include:

- Amount of value adding at sites (has a major impact)
- Boiler fuel type (gas fired boilers, such as Teys Beenleigh, are inherently more efficient than coal fired boilers)
- Amount of energy efficiency opportunities already implemented (Teys were previously part of the Greenhouse Challenge Plus program)

As these are amongst the largest plants in the industry, it would be reasonable to expect that they would have more value adding and so values would be higher than the industry average.

As part of their second annual public report, Swift provided some voluntary contextual information. This indicated that Beef City Abattoir (Toowoomba, Qld) was using 2,960 MJ/tHSCW (13% lower than the industry average) and that Brooklyn Abattoir was using 4,720 MJ/tHSCW (39% above the industry average).

The four companies in total used 4.3PJ and account for about 44.47% of the industry production. Extrapolating this data, the whole industry would consume about 9.7PJ, which compares with mining sector consumption of 314.5PJ (32 times the amount). Only the post-2008 Swift Australia Pty Ltd used over 1 PJ of energy, although Teys Bros (Holding) Pty Ltd is close at 0.96 PJ. It is not clear from the reported data is any site consumes more than 0.5 petajoules of energy per year, the highest reported value thus far is 0.4PJ for Brooklyn (Swift Southern).

### 1.5 Opportunities identified

Participating companies were required to report on the outcomes of assessments in a summarised format, reporting on the number of savings and gigajoules of energy saving potential, with projects grouped by payback period (0-2 years, 2-4 years and over 4 years) and business response (under investigation, to be implemented, implementation commenced, implemented, not to be implemented). Data was not available in the public reports on greenhouse savings, net financial benefit or fuel type.

The red meat sector identified 486,388 GJ of potential energy savings as a result of the assessments.

**Table 5: Identified savings as share of total energy use, energy savings and assessed energy use**

Company	Energy savings identified (GJ)	Share of total energy savings (%)	Energy savings as a share of total energy use (%)	Energy savings as a share of assessed energy (%)
Cargill Australia Ltd	78,535	16.2	9.7	27.9
Nippon Meat Packers Australia Pty Ltd	110,585	22.8	13.6	13.6
Swift Australia Pty Ltd	290,534	59.9	13.2	42.1
Teys Bros (Holding) Pty Ltd	5,764	1.2	0.6	2.5
Total	486,388	100	10.1	24.1

Swift Australia identified the largest percentage of the total energy savings (59.7%), Nippon and Cargill had similar savings (23 and 16% of total savings respectively) and Teys identified 1% of the total industry savings. The identified savings ranged from 2.5 to 42% of the assessed energy use, and from 0.6 to 14% of the respective companies total energy use.

The following table summarised the data provided in the public report on the number of opportunities identified and the energy savings estimated in more detail. The values are provided exactly as they appear in the public report, any apparent errors have not been corrected. This indicates that although there is significant potential energy savings, most of them occur in the 2-4 year or more than 4 year payback category.

**Table 6: Opportunities identified as part of EEO Assessments**

Company	Site	Total No.	GJ		% total energy		Business Response
			0-2 years	2-4+ years	0-2 years	2-4 years	
Cargill Australia Ltd	Wagga 1 <sup>st</sup> report	17	46,000	27,600	16	10	3 under investigation 1 to be implemented 1 implementation commenced 1 implemented 9 not to be implemented
	Wagga 2 <sup>nd</sup> report	20	0	78,535	0	28	1 under investigation none to be implemented 2 implementation commenced 8 implemented 9 not to be implemented
Nippon Meat Packers Australia Pty Ltd	Thomas Borthwick 1 <sup>st</sup> report	21	15,108	11,431	9	7	4 under investigation 1 to be implemented 2 implementation commenced None implemented 14 not to be implemented
	Thomas Borthwick 2 <sup>nd</sup> report	21 + 4 new =25	2,417 + 9,442 new = 11,859	4,713 + 513 new = 5,226	1 + 5.6 new =6.6	3 + 0.3 new = 3.3	11 under investigation 1 to be implemented 2 implementation commenced 3 implemented 4 not to be implemented
	Wingham Beef Exports 1 <sup>st</sup> report	39	595	60 + 655 > 4 yrs = 715	0.21	0.02 + 0.24 >4 yrs = 0.26	9 under investigation 1 to be implemented None implementation commenced None implemented 29 not to be implemented
	Wingham Beef Exports 2 <sup>nd</sup> report	36 + 10 new =46	266 + 970 = 1,236	58,271	0.1 + 0.3 =0.4	19.8	13 under investigation None to be implemented 1 implementation commenced 14 implemented 8 not to be implemented

Company	Site	Total No.	GJ		% total energy		Business Response
			0-2 years	2-4+ years	0-2 years	2-4 years	
Nippon Meat Packers Australia Pty Ltd	Oakey Abattoir 1 <sup>st</sup> report	10	4,395	46,431	1	14	7 under investigation None to be implemented None implementation commenced 1 implemented 2 not to be implemented
	Oakey Abattoir 2 <sup>nd</sup> report	10 + 12 new  =22	28,443 + 4,168 new  = 32,611	0 + 656 new + 1,696 >4yrs = 2,352	9.3 + 1.2 new  = 10.5	0 + 0.2 new + 0.5 >4 yrs = 0.7	6 under investigation none to be implemented 1 implementation commenced 12 implemented 3 not to be implemented
Swift Australia Pty Ltd	Beef City Abattoir 1 <sup>st</sup> report	22	Not provided	Not provided	Not provided	Not provided	17 under investigation None to be implemented None implementation commenced 4 implemented 1 not to be implemented
	Beef City Abattoir 2 <sup>nd</sup> report	22	2,480	2,600 + 73,494 >4yrs  = 76,094	1	1 + 26 >4yrs  = 27	17 under investigation None to be implemented None implementation commenced 4 implemented 1 not to be implemented
	Brooklyn 1 <sup>st</sup> report	13	6,413	0 + 205,547 >4yrs  = 205,547	2	0 + 50 >4yrs  = 50	11 under investigation None to be implemented None implementation commenced 2 implemented None not to be implemented
Teys Bros (Holding) Pty Ltd	Beenleigh 1 <sup>st</sup> report	10	18	0 + 5,764 >4yrs	0	0 + 3 > 4 yrs	2 under investigation None to be implemented None implementation commenced 2 implemented 6 not to be implemented

This provides some interesting information as follows for **individual site or corporations**:

- The first five year cycle finished in June 2011 and corporations must have assessed 80% of their total energy use by then. After the end of the 0809 report, 42% had been assessed. Nippon Meat Packers have already assessed all 3 meat processing sites, it is unclear what proportion these represent of the NMPA total energy use.
- **Number of opportunities** identified ranged from 10 (2 sites) to 46 (one site)
- **Range of total energy use** of 0.5-53% was identified as potential energy saving projects, with an average of 14% for first report and 21% for second report. Data is skewed by
  - Brooklyn site, which had potential savings of 205,547 GJ with a greater than 4 year payback, which accounted for 53% of the site total energy consumption. This is assumed to be a cogeneration project plus other large energy savings
  - Beef City site, which had one potential saving of 71,622 GJ with a greater than 4 year payback, which accounted for 25% of the site total energy consumption. This is a biogas capture and cogeneration project.
- **Largest savings** tended to be biogas capture and cogeneration projects, which had paybacks of over 4 years, but which would deliver significant energy savings
- For some sites, more detailed investigation
  - increased the payback period of the project (Wagga)
  - decreased the potential energy saving (Thomas Borthwick)
  - changed projects from “not to be implemented” to another category (Thomas Borthwick, Wingham Beef)

This provides some interesting information as follows **for all sites**:

- of the total energy savings identified, **23%** of identified energy savings are to be adopted (implemented, implementation commenced and to be implemented categories), **73%** are under investigation and **4%** are not to be implemented. This compares with EEO total participation of **61%** to be adopted, **36%** under investigation and **3%** not to be implemented.
- 45% increase in the **number of opportunities** identified between the first and second report for all sites, consistent with continuous assessment at NMPA sites and two additional site assessments (Brooklyn and Beenleigh)
- **Number of projects** implemented increased by 420% from 10 to 52
- **Projects to be implemented and where implementation had commenced** increased and accounted for 1% of total energy use
- **Projects under investigation** accounted for 7% of total energy use, and were mostly in the >4 year payback category
- **Number of projects not to be implemented** dropped by 42% from 55 to 32 between first and second report, and potential energy saving from this category dropped by 41% from 30,860 GJ to 18,285 GJ
- **Average of total energy use** of 14-21% was identified as opportunity for saving for first and second reports respectively. For the second report, which is assumed to be more accurate
  - **3%** of the total energy use was provided by projects with a 0-2 year payback (or **14%** of total energy saving),
  - **4%** of the total energy use was provided by projects with a 2-4 year payback (or **20%** of total energy saving) and
  - **14%** of the total energy use was provided by projects with over a 4 year payback (or **66%** of total energy saving). This category of project was the biogas capture and cogeneration projects, which provided a substantial potential saving for each project.

This indicates that there is significant potential for projects in the red meat industry, but that most of it is over four years in payback, and so will require either a significant decrease in capital cost, subsidy or grant, or other change in economic signals to make them economic. As EEO focuses only on energy efficiency, it does not consider the potential impact of a carbon tax or equivalent price on carbon. A carbon tax is likely to increase the price of

electricity by 20-40% making most of the projects relating to electricity use efficiency more economic. The price of boiler fuels, such as natural gas and coal, would also increase under a carbon tax. This is likely to change the economic signals for cogeneration based on natural gas, possibly making it more economic.

**Table 7: Identified savings by business response and payback period (second report)**

<b>Business Response</b>	<b>&lt; 2 yrs (GJ) (required)</b>	<b>2-4 yrs (GJ) (required)</b>	<b>&gt; 4yrs (GJ) (voluntary)</b>	<b>energy saving (GJ)</b>	<b>% of total energy</b>
Under investigation	28,685	4,104	282,730	315,519	73
To be implemented	1,422	0	0	1,422	0.3
Implementation commenced	1,346	46,255	0	47,601	11
Implemented	24,244	25,359	0	49,603	11
Not to be implemented	3,232	11,300	3,753	18,285	4
<b>Total</b>	<b>58,929</b> <b>14% of total</b>	<b>87,017</b> <b>20% of total</b>	<b>286,483</b> <b>66% of total</b>	<b>432,429</b>	<b>100</b>

This analysis indicates that most (73%) of the potential projects are still under investigation, with only 11% implemented thus far.

**1.6 Opportunities identified - detail**

Companies were required to provide details of at least three significant opportunities found during the EEO assessment process. The details must include a brief description of the opportunity and may optionally include information such as costs of implementation, energy or financial savings and any other benefits such as greenhouse saving. Some of the values included in the following tables were provided by the corporation and some were calculated using provided information.

**Table 8: Significant opportunities with reported savings (ranked by energy saving)**

<b>Company/Site</b>	<b>Saving<sup>1</sup></b>	<b>Details</b>
Cargill/ Wagga	46,000 GJ	<ul style="list-style-type: none"> <li><b>Biogas</b> recovery and cogeneration using 1MW engine which is 20% of site usage</li> </ul>
Cargill/ Wagga	13,500 GJ \$94K pa	<ul style="list-style-type: none"> <li><b>Flash steam</b> recovery, increase in energy recovery leading to reduced natural gas use</li> </ul>
NMPA/ Thomas Borthwick	10,516 GJ \$62.5K pa 4 year payback	<ul style="list-style-type: none"> <li><b>Boiler economiser</b> - install economiser (water pre-heater) and low down heat recovery system on boiler, \$250K capital cost, 930 tCO<sub>2-e</sub> saving</li> </ul>
NMPA/ Thomas Borthwick	7,741 GJ	<ul style="list-style-type: none"> <li><b>Boiler Use</b> - reduce boiler operation by 1.5 hours per day</li> </ul>
Swift/ Beef City	7,700 GJ \$140K pa	<ul style="list-style-type: none"> <li><b>Biogas capture</b> and recovery from anaerobic pond, use in boiler or blood ring drier to offset natural gas use</li> </ul>
Swift/ Brooklyn	5,530 GJ \$22K pa 4-4.5 yr payback	<ul style="list-style-type: none"> <li><b>Boiler economiser</b> - rationalise boilers to one duty boiler after recovering dryer waste heat, install economiser on exhaust stack to increase feed water temperature by 25 °C, increasing boiler efficiency by 4%, assume economiser would cost \$100K</li> </ul>
NMPA / Oakey	1,696 GJ	<ul style="list-style-type: none"> <li><b>Procedure</b> with someone in charge of making</li> </ul>

<sup>1</sup> Some of these figures were provided in public reports and some were calculated from provided information

<b>Company/Site</b>	<b>Saving<sup>1</sup></b>	<b>Details</b>
Abattoir	\$37K pa	sure lights are turned off at end of cleaning shift, saving from gap between end of cleaning and start of production
NMPA/ Thomas Borthwick	1,052 GJ \$33.3K pa 1.5 year payback	<ul style="list-style-type: none"> <li>• <b>Lagging Refrigerant Pipes</b> – several of the pipes carrying refrigerant at sub zero temperatures are uninsulated and are being heated by the sun and surrounding area.</li> </ul>
NMPA/ Thomas Borthwick	972 GJ	<ul style="list-style-type: none"> <li>• <b>Reduce Plant Hot Water Usage</b> – plant water audit identified that 82°C steriliser water was distributed to process area 1 hour before production commenced. With improved management of each process station it was identified that this was not required until process start</li> </ul>
NMPA/ Oakey Abattoir	787GJ \$17.5K pa	<ul style="list-style-type: none"> <li>• <b>Modify procedure for beef chiller</b> – to ensure all chiller lighting is turned off on completion of loading of chillers and chiller doors are locked. This reduces heat load on refrigeration and electric demand</li> </ul>
NMPA/ Thomas Borthwick	729 GJ	<ul style="list-style-type: none"> <li>• <b>Condensate Return Pipe Lagging</b> – energy audit in rendering department identified an opportunity to increase condensate return temperature by insulating the return line to the boiler feed water tank.</li> </ul>
NMPA/ Wingham Beef (Wirrimbi)	164 GJ \$12.3K pa	<ul style="list-style-type: none"> <li>• <b>Wirrimbi Cold Store Refrigeration</b> – intermittent faulty in Howden Compressor results in refrigeration problems. Current motor is pre-MEPS<sup>2</sup> and very inefficient. New high efficiency motor with the same horse power has a maximum load of 150 amps (compared with current 175 amps) ie 14.3% reduction. This is equivalent to 15kW saving</li> </ul>
NMPA/ Wingham Beef	158 GJ \$11.9K pa	<ul style="list-style-type: none"> <li>• <b>Efficiency of Save-All Pumps at Wingham</b> – No 1 &amp; 2 Save-all pumps pump at 60 litres per second at 85 psi with a total head of 37 meters through the current 225mm effluent line. Effluent line can handle a greater flow and pressure. Replace one pump with a new Grundfos pump with greater flow rate, power saving of 175.68 kW per day</li> </ul>
NMPA/ Wingham Beef	144 GJ \$10.8K pa 6 month payback	<ul style="list-style-type: none"> <li>• <b>New 80W fluorescent bulbs in boning room</b> - replace 400 W metal halide units in areas that do not require 600 lux, saving includes lower refrigeration load due to lower heat loss</li> </ul>
NMPA/ Wingham Beef (Wirrimbi)	90GJ \$6.8K pa	<ul style="list-style-type: none"> <li>• <b>Blaster Freezer Floor Heating System</b> – currently there are 2 air heaters and a blower which heats and passes air through vents on the Freezers, there is also a heater in the control room. By redesigning the current pipe work arrangements, one of these heaters can be removed as well as redirecting air to the control room and the heater can be turned off and only used during periods of high humidity.</li> </ul>

<sup>2</sup> MEPS are Minimum Energy Performance Standards Regulations in Australia – current MEPS for motors require 67-94% efficiency, depending on size (larger motors have higher efficiency requirement).

<b>Company/Site</b>	<b>Saving<sup>1</sup></b>	<b>Details</b>
Swift/ Beef City	50GJ	<ul style="list-style-type: none"> <li>• <b>Improve cookers vapour recovery</b> through technologies such as multiple effect evaporators. Assuming 50% recovery rate, 50TJ of energy could be saved</li> </ul>
NMPA/ Oakey Abattoir	24.7GJ \$550 pa	<ul style="list-style-type: none"> <li>• <b>Fit motion and timing sensor</b> in cattle yards/loading area to turn lights off when area is not being used</li> </ul>
NMPA/ Wingham Beef	11GJ \$828 pa 2.3 year payback	<ul style="list-style-type: none"> <li>• <b>Variable speed drive on hot water pump</b> – fit variable speed drive on hot water pump system, capable of sensing requirements of plant, \$1.9K capital cost</li> </ul>

Some opportunities did not provide specific details of energy savings, but did provide other details. These have been included in the following table. There was insufficient detail provided to report on the greenhouse gas emissions from the industry as a whole, the **opportunity category** (process control, maintenance, energy measurement, retro-fitting, new technology, management systems, staff operation, research and development) or the equipment type (boilers, thermal equipment, chemical, mobile equipment, electrical equipment, non-mobile combustion engines, renewable electricity generation).

**Table 9: Opportunities identified without reported energy savings**

<b>Company/Site</b>	<b>Details</b>
Cargill / Wagga	<ul style="list-style-type: none"> <li>• <b>Power Factor Correction</b> – replace units, increase power factor from average of 0.85 to average of 0.93</li> </ul>
NMPA/ Thomas Borthwick	<ul style="list-style-type: none"> <li>• <b>Reduce Knife Sterilisation Temperature</b> – currently used at 82 °C, research overseas has shown that knife sterilisation can be achieved at 70°C. Lobby Government to change codes and export contracts accordingly. \$5K capital, 10% reduction in coal consumption, annual CO2 emissions saving of 1,318 t, estimated 1 month payback period</li> </ul>
NMPA/ Wingham Beef	<ul style="list-style-type: none"> <li>• <b>Replace butane boiler with bio-mass unit</b> – 4MW biomass boiler installed, cost \$1.5M, current butane costs \$1.4M per year, biomass cost \$174K per year, annual saving \$1.2M, payback period less than 2 years</li> </ul>
NMPA/ Oakey Abattoir	<ul style="list-style-type: none"> <li>• <b>Insulation of hot water tanks</b> – to reduce heat load on boiler and reduce energy costs. Cost of insulation \$32.5K, annual saving \$21.5K, payback period 1.5 years</li> </ul>
NMPA/ Oakey Abattoir	<ul style="list-style-type: none"> <li>• <b>Recover condensate from boning room heat shrink tunnels and steriliser water heat exchanger</b> – return to boiler feed tank, this will save on chemical treatment and water costs, returned condensate will be approx 95 °C thus further reducing energy costs and demands on boiler, \$25K installation costs, savings \$16.1 pa, 1.6 year payback</li> </ul>
Swift/ Beef City	<ul style="list-style-type: none"> <li>• <b>Biogas capture and cogeneration</b> plant, installed cost of \$1.2M, payback &gt; 4 years</li> </ul>
Swift/ Brooklyn	<ul style="list-style-type: none"> <li>• <b>Dryer Waste Heat Recovery</b> – heat reclaim from hot vapours currently rejected to atmosphere via cooling tower rather than used through heat exchanger to preheat water. Condensate is dumped into sewer. Capture heat from hot vapours, review optimum loading and part load efficiency of dryers through accurate measurement</li> </ul>
Swift/ Brooklyn	<ul style="list-style-type: none"> <li>• <b>Rendering vessel condensate recovery</b> – no condensate currently returned from rendering vessel. Recover condensate and flash steam, if risk of boiler feed water contamination is high, then a heat exchange and flash steam recovery vessel could be required</li> </ul>
Teys Beenleigh	<ul style="list-style-type: none"> <li>• <b>Biogas capture</b> from anaerobic pond and use in onsite boiler operation. Payback well in excess of 4 years</li> </ul>
Teys Beenleigh	<ul style="list-style-type: none"> <li>• <b>Solar heating</b> of boiler feed water. Payback well in excess of 4 years</li> </ul>
Teys Beenleigh	<ul style="list-style-type: none"> <li>• Turn off <b>lights</b> in carcass chiller using a change to standard operating procedure. Electricity saving and saving on load to refrigeration system due to heat loss from lighting</li> </ul>



### 1.7 Other information

Some corporations provided more information than others on opportunities, and in some instances this allowed an estimate to be made of various utility costs as follows:

- **NMPA Wingham Beef Exports (Wirrimbi) site pays about \$0.27 per kWh for electricity** (based on \$11,912.46 saving for 175.68 kW per day saving, assuming plant operates 250 days per year)
- **NMPA Thomas Borthwick pays about \$0.11 per kWh for electricity** (based on 263 tCO<sub>2</sub>-e saving -7 292,222kWh electricity, \$50K capital cost, 1.5 year payback -7 annual saving \$33.3K)
- **NMPA Oakey Abattoir pays about \$0.08 per kWh for electricity** (based on \$37K saving, 471,168kW saving)
- **NMPA Thomas Borthwick pays about \$160 per tonne for coal (or \$5.93 per GJ)** (based on 930 tCO<sub>2</sub>-e saving -7 390 t coal, \$250K capital cost, 4 year payback -7 annual saving \$62.5K)
- **Swift Brooklyn pays about \$4 per GJ for natural gas** (\$22K saving for 5,530 GJ)
- **Cargill Wagga pays about \$6.96 / GJ for natural gas** (based on \$94K saving for 13,500GJ)

**1.8 Hypothetical before and after key performance indicators**

It is possible to review key performance indicators after all the identified opportunities have been implemented. This uses the production figure from 2007 from the MLA Top 25 Processors as a general indicator of production for each corporate group, and the production rate for each plant is assumed to be the same as the site percentage of total energy use, which basically assumes that all plants within a corporate group have the same efficiency.

**Table 10: Comparison of KPI before and after all opportunities implemented.**

	<b>KPI before*</b> <b>(MJ/tHSCW)</b>	<b>KPI after</b> <b>(MJ/tHSCW)</b>	<b>%</b> <b>improvement</b>	<b>Compared to</b> <b>benchmark</b>
Cargill	5,144	3,835	25	13% worse
NMPA	4,694	3,877	17	14% worse
Swift	3,195 <sup>a</sup> / 3,468 <sup>b</sup>	2,236 <sup>a</sup> / 2,065 <sup>b</sup>	30 <sup>a</sup> / 40 <sup>b</sup>	34% / 39% better
Teys	2,797	2,726	3	20% better

\* based on first report, which is closest to 2007 production figures

a = before inclusion of Tasman Group Services (Swift Southern), b = after inclusion of Tasman Group Services (Swift Southern)

This indicates that if all the identified projects were implemented, the percentage improvement in efficiency would range from 3 to 42%, and two corporate groups would then have KPI's better than the industry average. Although the absolute value may not be accurate (due to using 2007 production data) it does provide an indication of the amount of potential improvement to the sites.

**Table 11: Comparison of KPI before and after all opportunities implemented for sites**

<b>Site</b>	<b>KPI before</b> <b>(MJ/tHSCW)</b>	<b>KPI after</b> <b>(MJ/tHSCW)</b>	<b>%</b> <b>improvement</b>	<b>Compared to</b> <b>benchmark</b>
Swift Brooklyn <sup>a</sup>	3,468	1,715	51	49% better
Swift Beef City	3,468	2,572	28	24% better
NMPA Wingham Beef <sup>a</sup>	4,694	1,778	64	48% better
NMPA Thomas Borthwick	4,694	3,877	17	14% worse
NMPA Oakey Abattoir	4,694	1,628	65	52% better

a = uses second report

This indicated a 17-65% improvement, with all but one site showing potential to improve well beyond the industry benchmark. If this same level of improvement could be replicated across all sites, it would be a significant reduction in the energy intensity of the red meat processing sector.

## 2. EEO Opportunities – site feedback

This section provides some key points each reporting corporation's experience of the EEO program and their assessments. Swift was included in the trial verification audits that were conducted during early 2010, and as a result the red meat industry has been identified as a potential high risk of non-compliance and so will be included in verification audits going forward.

### 2.1 Overall progress of assessments<sup>3</sup>

- Staging assessments so that learnings from one assessment could be included in the rollout at other sites was helpful.
- Having a key person or couple of people involved in the detail of the assessment at each site has allowed the process to evolve and continuously improve between assessments at sites
- Proving notification of assessment to people outside of core assessment team who were to be involved allowed them to think about the way they work for a different perspective, and assisted with identifying some “low hanging fruit” such as simple changes to procedures
- Sharing results from one site with others sites helped created a sense of competition between sites, in terms of being able to identify more savings at their site than previous assessments. Sites are already compared in terms of energy on a monthly basis, this provided another opportunity for plants to outperform each other
- Completing a gap analysis at the start of the process, to identify current practices and gaps between EEO requirements, helped to build on existing procedures and practices without duplicating them
- Decision was made not to include existing projects, such as metering upgrade project already identified, as part of EEO. Similarly, opportunities identified after the EEO assessment were not included in the EEO process. Idea was to identify new projects, existing and proposed future projects in assessment reports.
- Provided a structured, rigorous process to assess some issues which had been thought about for some time, but not acted on as they did not really “fit” into other programs such as quality or occupational health and safety (particularly procedural type opportunities). Environmental improvement plans have tended to focus on key compliance issues, such as odour, irrigation management etc rather than resource efficiency, although several Queensland plant have had significant pressure to reduce water consumption through Queensland EPA
- Some of the levels of documentation required as evidence by the EEO supporting documentation were not reflective of what would be used normally in the red meat industry. For example, rather than developing a communications plan, companies used existing structures such as meeting minutes, regular management meetings, informal “toolbox talks” etc
- Assessments identified a broad range of opportunities, however the capital required to execute some of the major findings was a barrier to execution. Payback period on some other items did not justify execution. This is likely to change with increasing utility costs in the future which will reduce payback periods
- Swift rapid expansion has impacted on the efficiency and effectiveness of providing internal resources to meet the EEO assessments reporting schedule. Subsequently, Swift has needed to engage external consultants to work with the site EEO teams to six sites to fulfil the requirements of assessing 80% of the groups' energy usage across the group. Swift are focusing on the development of Corporate EEO management procedures and developing site specific procedures defining the who, how, when, where and why for all 6 elements of the EEO

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<sup>3</sup> How assessments have gone, document learning for rest of industry

## 2.2 Energy and Mass Balance<sup>4</sup>

- Existing Meat and Livestock Australia work on energy and mass balance used as a guide
- Energy mass balance indicated
  - level of heat recovery/ heat integration of rendering with hot water production – 2 main heat users are thermally linked, so if one decreases (eg steam use in rendering) then the other (steam use in hot water production) increased
  - relatively small amount of refrigeration load being used for product load compared to space cooling/ air conditioning
- As all sites purchase electricity and boiler fuel from external suppliers, there was a high degree of accuracy relating to energy inputs
- Were different “operating modes” eg startup (when rendering not fully operational so hot water production from steam heat exchangers), normal operation (when all processes functioning) and then cleaning/shutdown, has raised the question of how useful energy mass balances are for plants that are not operating 24/7
- Difficulty with sourcing temporary steam meters meant that condensate flow rates were used to estimate steam rates, but in some instances occupational health and safety considerations or condensate drain location meant that flows were estimated rather than measured
- Increasing detail in metering more accurately identified areas of use, however this needs to be balanced with capital expenditure in installing the meters

## 2.3 Opportunity identification, assessment and business response<sup>5</sup>

- Ensuring that the site team has a diverse range of personnel was critical to its effective functioning – production, engineering, maintenance, quality and management
- Targeting high energy consuming processes helped focus the assessment team
- Some simple savings were found by assessing procedures, such as the way the boilers, hot water and lighting system were operated
- For projects with small capital outlay and short payback, implementation could often start prior to Management/ Board review
- Linked into existing capital budgeting process for larger capital items
- Development of a new form to allow the investigation of opportunities on an ongoing basis means that energy efficiency is now built into the way the business works on an ongoing basis
- Due to current financial situation, opportunities with payback greater than 2 years remain on a holding list but not likely to be implemented
- Having quality personnel involved assisted with tracking of process, given their compliance and auditing background
- Following the initial energy audit, the utilities reduction team in place at each site coordinated energy saving projects and process on process improvements to further improve resource use efficiency. The utilities reduction team was charged with seeking out and quantifying opportunities to be included into the utilities reduction plan for ranking in terms of priority
- Swift are continuously looking for improvement opportunities and is focusing on developing and integrating reporting and assessment framework that captures and feeds into all National and State regulatory reporting systems. Site EEO teams report into the site Environmental Steering Committee (ESC), which then reports into the Corporate ESC then to the Board

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<sup>4</sup> Issues with metering, accuracy, what information this provided plant about operations

<sup>5</sup> How opportunity identification, assessment and business response process was conducted

## 2.4 Tracking progress

- Use similar process to other compliance issues eg regular meetings, tracking of action items, allocation of timing and responsibility, regular review of progress with plant management to identify any issues proactively
- Documentation principally through meeting minutes, rather than separate system, use email system to distribute information
- Utility use (gas, electricity and water) are tracked through a scorecard system at weekly management meetings and then over a monthly period as well. Each utility is assessed against a target and actions are required where use is over target
- Establish key performance indicators across the company to improve identification of project deliverables and ensure that the company can measure the success upon commissioning of EEO

## 2.5 Learnings<sup>6</sup>

- Sharing results between sites was very effective and having common personnel involved at each site, rather than completely new team at each site, allowed learnings to be shared more effectively
- Detailed assessment enabled site to apply for funding for projects with over 4 year payback eg Cargill Wagga biogas cogeneration - \$2.9M funding from NSW State Government
- Tracking usage and reporting it out regularly helps focus business efforts towards managing use and gaining traction on improving efficiency
- Critical to the success of managing the EEO program is assigning resource and expertise at each site and supporting the teams with the means to monitor, measure and improve energy use

## 2.6 Verification compared to DRET guidelines<sup>7</sup>

The EEO legislation has provision for verification audits, to ensure that participating corporations have undertaken their assessments in a manner which complies with EEO legal requirements. The EEO act is administered by the Federal Department of Resources, Energy and Tourism and they have produced a verification model to monitor and verify the compliance of corporations that are participating in the Energy Efficiency Opportunities program. Verification of corporations registered for Energy Efficiency Opportunities (EEO) commenced in April 2010.

DRET has stated that verification will:

- validate corporations' compliance with EEO legislation when conducting energy assessments, identifying opportunities and reporting outcomes;
- monitor whether a corporation has carried out its assessment as set out in its approved Assessment and Reporting Schedule (ARS), or where approved by the Department, conducted an appropriate representative assessment if approved in its ARS.
- ensure the company meets the coverage requirements over the full period of the assessment cycle ie 80 per cent of total energy use and that all sites over 0.5 PJ have been assessed.
- assist the Department to identify corporations who may be undertaking better practices while participating in EEO and potentially provide recognition of their achievements

The verification model allows for two types of verification to occur – desktop and full verifications.

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<sup>6</sup> What worked well, what organisation learnt about energy assessment and managing energy efficiency program

<sup>7</sup> Identify areas with opportunity for improvement, areas of strength and weakness in terms of energy management

Each year approximately 100-120 corporations will be chosen to be subject to a **desktop verification**. Corporations will be required to submit a 'Verification Checklist and Information Request Form' to the Department where an assessment of the risk of non compliance will be undertaken, which is a 7 page document available on the Departments website which uses yes/no responses relating to key requirements. The results will contribute to the selection of companies to undergo a full verification and site visit.

A **full verification and site visit** will be conducted on a sample of companies that have undergone desktop verifications but the majority of companies selected will have been assessed as having a medium to high risk of non compliance. This is allowed for under Part 8 (Powers of Inspection) of the 'Energy Efficiency Opportunities Act 2006'.

Full verifications will involve a verification team being onsite to meet with key people involved in the implementation of EEO, discuss the procedures, protocols and systems developed to implement EEO and to view supporting documentation (evidence) of its implementation. Typically full verifications will occur over several days, however this will depend on the size, structure and geographical dispersion of the corporation and its operational sites.

DRET representatives will work closely with corporations throughout the verification process, including preparation and planning, undertaking the verification, drafting of the verification report for the corporation CEO and any associated actions required to address identified instances of non compliance. It is unclear whether any of the DRET verification team will have had Q fever vaccinations, although AMPC did inform them of this issue as part of their involvement in the Red Meat Community of Practice.

In general terms, because the current red meat industry participants in the EEO program all purchase all of their energy (electricity and boiler fuel) from external providers, the energy use is likely to be very accurate for the total plant. There is a high level of heat integration at most sites, where heat is recovered from rendering for hot water production with a small amount of steam used to top up the temperature, which means that energy efficiency is designed into the operation of the plant. Electricity use in particular varies depending on what equipment is installed at the plant and how the plant is operated. Many plants do not have a lot of metering inside the plant, but the plants themselves are relatively simple, with most of the electricity being used in the refrigeration plant and most of the steam being used in rendering. The process itself is quite simple, basically a disassembly process, without chemical reaction, or extremes in temperatures (maximum of 150°C in rendering vessels) and pressures (800-1,200kPa steam only for rendering) when compared to other industries.

## **2.7 Comparison to other industry sectors**

The Federal Government has prepared reports based on data reported by large energy-using corporations to the government and the public from 2006 - 2008. They feature aggregate results for the program and for different industries, examples of significant energy efficiency opportunities, and qualitative analysis on the types of opportunities participants are finding and adopting.

There is a report which covers all participants and separate, more detailed reports for the mining, transport, services and manufacturing sectors. EEO participants accounted for 31% of the total energy use in Australia for the 2007-2008 year, with 40% used by Government, 28% by electricity generation, 23% by other businesses and 17% by households.

Energy use by participants in the EEO program was concentrated among 20 or so corporations and a small group of key industries, namely metals manufacturing, air transport, petroleum refining and chemicals manufacturing. Manufacturers accounted for 63% of total energy use, with 35% used by general manufacturing<sup>8</sup> (includes food such as red meat) and 29% by metals manufacturing.

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<sup>8</sup> Includes food, wood, pulp and paper, petroleum refining, chemicals, glass, concrete, ceramics, machinery, vehicles and equipment manufacturing

The largest reported opportunity was BHP Billiton – the replacement of two steam turbine generator steam dump valves at the Kalgoorlie Nickel Smelter at 0.54PJ of savings, and Tasmanian Electro Metallurgical Company reported a 0.38PJ saving from recovering allows from waste sands. Together, these account for 20% of the total energy use of the red meat processing companies involved in EEO.

In the manufacturing section, metals manufacturing used 517 PJ or 46% of EEO Manufacturing energy use, basic chemicals and chemical products manufacturing used 186 PJ or 16.5% of EEO Manufacturing energy use, food product manufacturing used 140PJ or 12.4% of EEO Manufacturing energy use and petroleum refining used 124PJ or 11% of EEO Manufacturing energy use. The largest energy savings were metals manufacturing (17PJ or 0.07% of total energy use), basic chemicals and chemical products (6.3PJ or 3.4% of total energy use), petroleum refining (5.7PJ or 4.6% of total energy use) and non-metallic minerals (3.4PJ).

**Table 12: Comparison of red meat industry with mining, manufacturing and all EEO reporters**

Issues	Meat industry	Mining industry	Manufacturing Industry	All EEO reporters
Reporting companies	4 corporations 2% of total	232 entities <sup>9</sup> 21% of total	487 entities 98 corporate groups	199 corporations, 1,099 entities
Total energy use	4.3 PJ 0.2% of total	314.5 PJ 18% of total	1,127.3 PJ 63% of total	1,747 PJ
Reported savings	0.43 PJ 0.6% of total	17.2 PJ 25% of total	37.9PJ 56% of total	67.7 PJ
Savings as % of assessed energy	24.1% Range: 2.5 – 42.1	9.1% Range: 3 – 28	6.3% Range: 3.2 – 9.8	4
% savings in 0-2yrs	14	87	55	62
% savings in 2-4yrs	20	11	35	30
% savings in >4yrs	66	2	10	8
Net financial benefit	Not available	\$257.3M 35% of total	\$33.9M 4.6% of total	\$735.8M
Percentage assessed	42	60	53	57
To be adopted projects	0.1 PJ 43% <2 yrs 82% 2-4yrs	11.5 PJ 77% for <2yrs 47% 2-4 yrs	16.4PJ 59% for <2 yrs 32% for 2-4 yrs	70% for <2yrs

Note: percentages for industries relate to all EEO reporters.  
CIC = Commercial in confidence (not published).

This indicates that the red meat industry reported savings at three times the proportion of energy used, compared to 1.4 times for mining and 0.9 for manufacturing, meaning that there was a much higher percentage of potential savings relative to total energy use. This means that, per unit of energy consumed, **the red meat industry has greater potential for energy saving when compared to mining, manufacturing or other industries in general.**

However, compared to mining, the savings had a much higher payback period – 66% of red meat industry savings had a payback period of more than 4 years, whereas 87% of mining savings and 62% of all EEO reporters had a payback of less than 2 years. This means that, **if the potential energy saving of the industry is to be realised, support will be required to shift the payback periods from > 4 years to preferably <2 years.**

In terms of the percentage assessed, the meat industry was slightly lower than all EEO reporters.

In the red meat industry, a lower percentage of projects with less than a two year payback had been implemented or implementation had commenced compared to other industries. However, 82% of the projects identified in the red meat industry with a payback of 2-4 years had been implemented or implementation had commenced, which is higher than the <2 year rate for mining and all EEO reporters. None of the projects with over a four year payback have been implemented in the red meat industry. However, Cargill Wagga obtained a \$2.9M grant from the NSW State Government for their biogas capture cogeneration project, so if other projects of this type can source funding support, this could change in future reports.

Table 13 indicates that from the voluntarily provided information, the category where the largest savings were found was in improved process control. This could be applicable to meat processing plants, where control of the refrigeration system and boiler operation could be assessed.

**Table 13: Identified energy savings by opportunity category (all EEO reporters)**

Category	PJ (& % of total saving)
Process control	6.29 (35%)

<sup>9</sup> Business entity using more than 0.5 petajoules of energy per year



New technology	3.84 (21%)
Retrofitting	3.7 (20%)
Maintenance practices	1.43 (8%)
Energy measurement	1.18 (7%)
Staff operation	0.76 (4%)
Other	0.9 (5%)

In terms of equipment type, the largest savings for all EEO reporters came from boilers, and then electrical equipment, with thermal equipment, mobile equipment and non-mobile combustion engines in order of decreasing contribution.

Appendix 1 contains more details on typical approaches used by organisations. Appendix 2 contains some specific examples of projects from the meat industry, while Appendix 3 contains specific examples of projects from other industries that might be relevant to meat processing companies.

### 3. References

Department of Resources, Energy and Tourism, “First Opportunities: A look at Results from 2006-2008 for the Energy Efficiency Opportunities Program”, 2010

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”, 2010

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## Appendix 1. Typical approaches used by organisations

Type of opportunity	Typical solution	Sectors (systems)	Benefits
Addressing fixed energy use	<ul style="list-style-type: none"> <li>• Turning off equipment when not in use, or running low energy cycles</li> <li>• Vehicle idling management</li> <li>• Enforced shutdowns of computers, lighting</li> </ul>	All sectors	Any equipment that operates independently of output is likely to waste energy. Significant savings may be available at low cost, subject to other business constraints.
Waste heat recovery and use	<ul style="list-style-type: none"> <li>• Boilers (flash steam recovery, reheating)</li> <li>• Furnaces (preheating from flue gases)</li> <li>• Cogeneration of electricity or trigeneration</li> </ul>	All, other than transport	Reduces the additional energy required for heat generation for site processes. Cogeneration reduces costs of imported electricity and mitigates external electricity supply constraints. Reduced waste heat can also improve working conditions and safety for employees.
Improved control systems	Automated control systems <ul style="list-style-type: none"> <li>• Linkage to site SCADA (supervisory control and data acquisition) system</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturing (especially boilers, furnaces, dryers)</li> <li>• Mining (pumps, fans and compressors)</li> <li>• Commercial/ services (HVAC [heating, ventilation and air conditioning] systems, lighting, computer systems)</li> </ul>	Enables automatic adjustment of energy use to demand, and improves data acquisition when linked to the SCADA system. Also improves product quality and reduces scrap rates.
Improved operation of existing equipment	<ul style="list-style-type: none"> <li>• Changing operating parameters (e.g. temperature set points or flow rates)</li> <li>• Introducing demand adjustment (e.g. variable speed drives)</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturing (especially boilers, furnaces, dryers)</li> <li>• Mining (pumps, fans and compressors)</li> <li>• Commercial/ services (HVAC systems, lighting, computer systems)</li> </ul>	Over time, changes in demand mean that equipment can lose efficiency over time. Reassessment of operating parameters can yield significant savings at relatively low cost.
Changing production or processing methods	<ul style="list-style-type: none"> <li>• Grinding and crushing operations</li> <li>• Furnaces, ovens and kilns</li> <li>• Investigating alternative material</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturing, mining and transport</li> </ul>	Thorough energy assessments look at energy use from physical first principles, identifying large savings in energy use from revised processing methods.

<b>Type of opportunity</b>	<b>Typical solution</b>	<b>Sectors (systems)</b>	<b>Benefits</b>
	handling/transport modes		Capital costs can be higher for such projects.
Changing work scheduling	<ul style="list-style-type: none"> <li>• Adjusting scheduling to operate equipment at the target capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturing (boilers, furnaces etc)</li> <li>• Transport and mining (loading rates for vehicles)</li> </ul>	Equipment is typically most productive and efficient when used at full capacity. Significant energy savings and productivity improvements can be made by rescheduling work to align with equipment characteristics, subject to other operational constraints.
Behavioural changes	<ul style="list-style-type: none"> <li>• Workplace training and promotion of energy efficient practices</li> </ul>	All sectors, particularly transport (eco driving programs, throttle control), and services (turning off lighting and computers)	Behavioural change programs can produce significant energy savings, especially in transport, and can build employee morale (services).
Measurement and monitoring	<ul style="list-style-type: none"> <li>• Sub-metering</li> <li>• Linkage to SCADA systems</li> <li>• Improved calibration practices</li> <li>• Systematic, regular monitoring of energy use against appropriate KPIs</li> <li>• Project tracking systems</li> </ul>	All sectors	Enables improved mapping of energy use, production rates and material flows. Provides useful data for quality and productivity improvement. Also provides the data required for reporting purposes and helps to estimate the costs and benefits from opportunities more accurately.
Enhanced resources for energy assessment and management	<ul style="list-style-type: none"> <li>• Appointment of energy efficiency engineers or energy managers</li> <li>• Acquisition of specific external expertise</li> <li>• Use of global company expertise</li> </ul>	All sectors, mostly in manufacturing, mining and transport (the more energy intensive sectors)	Appointment of specific personnel helps to identify a great number and depth of opportunities, provides accountability and promotes a culture of energy efficiency and continuous improvement. While external energy experts can identify and help to implement specific opportunities, involvement of internal staff can improve ongoing energy management and promote project implementation.

## Appendix 2. Examples from meat processing companies

### Cargill – second report

#### Opportunity 1 - Flash Steam Recovery System Project at Wagga Wagga facility

Steam produced by a natural gas boiler is used for various heating process across the plant. The utilization of steam to cook the product in the rendering plant generates excess energy in the form of flash steam which was wasted into the atmosphere. This energy is a potential source that can be utilized further for heating process in the plant.

This opportunity was identified during the assessment.

The project kicked off in September 2008 and was completed in May 2009. The installed flash steam recovery system consists of a flash tank, a heat exchanger and pumps to capture the wasted flash steam. The flash tank is used to separate the vapour from condensed liquid; the heat of the vapour is used for heating water in the heat exchanger. The pumps are used to transfer the recovered condensed liquid from the flash tank and the heat exchanger into the boiler feed water tank for further reuse.

The installed system was able to recover most of the wasted flash steam, and increased the efficiency of the water heating process in the plant. This results in reduction of natural gas usage in the boiler which equates to a saving of over 13,500 GJ per year, equivalent to \$94k per year.

#### Opportunity 2 - Biogas recovery and Electricity Co-Generation at Wagga facility

As part of the wastewater treatment plant the anaerobic process at Wagga facility generates biogas consisting of methane gas which is commonly used as fuel. The methane gas generated from this process has the potential to be used further for alternative energy source if captured.

A feasibility study about the potential of this opportunity to increase the energy efficiency of the plant was carried out during 2003 to 2008. It resulted in a potential saving of 46,000 GJ of Gas and Electricity that can be recovered by implementing this opportunity.

This project since then has been split into 2 stages: - the Effluent System Upgrade and the Cogeneration Project. Implementation of the first stage is underway involving construction of a covered anaerobic lagoon which will enable the capture of methane generated from the anaerobic process. The methane will initially be flared off using an enclosed burner.

In the second stage of the project the methane gas will be scrubbed to remove any Hydrogen Sulphide gas and then sent to an electric genset to produce electricity.

The renewable gas collected can potentially be converted into 1 MW of electricity generated which is 1/5th the electricity usage on site at the Wagga facility.

The exhaust gas from the genset will be then used either in a boiler or heat exchanger to compensate for a part of the natural gas usage on site. The exhaust heat from the genset (a potential source) of energy will also be utilized either to produce hot water or steam.

### **Opportunity 3 - Increase Power Factor Correction to .98**

Ever since this opportunity was identified after the assessment, it has been implemented as ongoing maintenance to achieve a correction factor as high as possible.

Several Power Factor Correction units have been replaced in 2008 - 2009 during and after the assessment period that increased the correction factor from an average of 0.85 to an average of 0.93.

## **Nippon Meat Packers Australia Pty Ltd (Thomas Borthwick & Sons Pty Ltd) – first report**

### **Opportunity 1 – install an economiser (water pre-heater) and blow down heat recovery system to the steam boiler**

In a boiler such as that operated by Borthwicks, some 25% of the energy released from the fuel is lost to the stack without being recovered. Preheating inlet air and/or water by heat exchange with flue gas can yield a 10% increase in boiler efficiency. This means less coal is needed for the same steam output.

- Estimates \$250,000 project capital
- 10% improvement in efficiency
- Annual CO2 emissions reduced by 930 tonnes
- Estimated 4 year payback

### **Opportunity 2 – Lagging Refrigerant Pipes**

There is an extensive chilling and cold storage requirement on site. The refrigeration equipment consumes the majority of the electricity used by the site. Several of the pipes carrying refrigerant at sub zero temperatures are uninsulated and are being heated by the sun and surrounding area. Hence the coolant plants have to work harder to maintain the required coolant temperatures.

- Estimates \$50,000 project capital
- 10% reduction in electricity consumption
- Annual CO2 emissions reduced by 263 tonnes
- Estimated 1.5 year payback

### **Opportunity 3 – Reducing knife sterilisation temperature**

One of the largest steam consumers on site is the heater to raise 70°C water to 82 °C water for knife sterilisation. Research in Australia and Overseas has shown that satisfactory knife sterilisation can be achieved at 70°C.

Government lobbying is in progress to change codes and export contracts accordingly.

- Estimates \$5,000 project capital
- 10% reduction in coal consumption
- Annual CO2 emissions reduced by 1,318 tonnes
- Estimated 1 month payback

## **Nippon Meat Packers Australia Pty Ltd (Thomas Borthwick & Sons Pty Ltd) – second report**

### **Opportunity 1 – Modify boiler operating program**

It was identified that under our present production schedules we were able to reduce the boiler operating time by 1.5 hours per day. This equated to an energy saving of 7,741 GJ/year

### **Opportunity 2 – Reduce Plant Hot Water Usage**

Through a plant water audit it was identified that 82 °C steriliser water was distributed to the process area 1 hour before production commences. With improved management of each process station it was identified this was not required till process start. This equated to an energy saving of 972 GJ/year.

### **Opportunity 3 – Condensate Return Pipe Lagging**

An energy audit in our Rendering department identified an opportunity to increase condensate return temperature by insulating the return line to the boiler feed water tank. This equated to an energy saving of 729 GJ/year.

## **Nippon Meat Packers Australia Pty Ltd (Wingham Beef Exports Pty Ltd) – first report**

### **Opportunity 1 – Conversion of lighting in Boning Room to fluorescent**

New fluorescent bulbs to replace 400 watt metal halide units in areas that do not require 600 lux (80 watts compared to 400). Not only are the units energy efficient but they also do not contribute to the heat load of the room.

Current lighting costs \$1,533 / month. Modified lighting equates to \$593/ month.

Refrigeration saving \$40/ month

Total saving of \$900/ month

Cost of upgrade \$6,710, equates to payback of 5.5 months

### Opportunity 2 – Hot Water Delivery Pumps

Fitment of a variable speed control to the hot water pump system capable of sensing the requirements of the plant and delivering same.  
Electrical energy savings equates to \$69/month. Outlay of \$1,900 for VSD equates to a payback of 2.3 years

### Opportunity 3 – Replacement of Butane fired boiler with a bio-mass unit

By sizing & building a boiler to suit the load of the plant, fuel efficiency is assured. After assessment it was found that a 4 meg unit was required instead of the 6 meg unit in place. A decision on bio-mass fuel was taken due to the dramatic increases in the prices of fossil fuels & the availability of economical local sawdust.

Cost of new Bio-mass boiler \$1.5 million.

Payback in comparison to butane usage \$1,412,913.90 for butane pa,

Sawdust \$173,915.70 pa.

Potential saving of \$1,238,998.20 pa

Payback <2 years

## Nippon Meat Packers Australia Pty Ltd (Wingham Beef Exports Pty Ltd) – second report

### Opportunity 1 – Wirimbi Blast Freezer Floor Heating System

**Identification** – currently there are two air heaters and a blower which heated and passes through vents on the W&S and No 37 Blast Freezers, there is also a heater in the W&S control room. By redesigning the current pipe work arrangement one of these heaters can be removed as well as redirecting air to the control room and the heater can be turned off and only used during periods of high humidity.

**Investigation** – the above process can be achieved. The cost saving is \$6,700.51 per annum.

### Opportunity 2 – Wirimbi Cold Store Refrigeration

**Identification** – Intermittent fault in the Howden Compressor resulting in refrigeration problems. It has been noted that the current motor is a pre-MEPS motor and very inefficient. It has been found to be the cause of the fault with the compressor. It should be replaced with a high efficiency motor.

**Investigation** – The current motor is drawing a total of 175 amps, the new high efficiency motor with the same horse power has a maximum load of 150 amps, therefore a reduction of 14.3%. This equates to a saving in electrical use of 25 amps per phase which is the equivalent of 15kW. Cost saving is \$12,300 per annum

### Opportunity 3 – Replacement of Butane fired boiler with a bio-mass unit



**Identification** – No 1 & 2 Save-all pumps currently pump at 60 litres per second at 85psi with a total head of 37 meters through the current 225mm effluent line – Effluent line can handle a greater flow and pressure.

**Investigation** – Replace one of the current pumps that is at the end of its serviceable life with a new Grundfos pump with greater flow rate. Power saving is 155,68kW per annual and annual cost saving of \$11,912.46 per year.

### **Nippon Meat Packers Australia Pty Ltd (Oakey Abattoir Pty Ltd) – first report**

#### **Opportunity 1 – Modify standard operating procedures for beef chillers**

Modify standard operating procedures for the beef chiller operators to ensure all chiller lighting is turned off on completion of loading the chillers and the chillers doors are locked. This has two benefits firstly to reduce the heat load on the refrigeration and also reduce the electrical demand. Currently the chillers have 76 x 400 watt globes, \$17,484/ year saved on electricity.

#### **Opportunity 2 – Insulate hot water tanks**

Insulation of hot water tanks to reduce the load on the boilers and reduce energy costs.

Cost of insulation \$32,500

Savings of \$21,542/year in lost energy and reheating -7 1.5 yr payback

#### **Opportunity 3 – Recover condensate from boning room**

Recover condensate water from boning room heat shrink tunnels and steriliser water heat exchanger to return to boiler feed tank. This will save on chemical treatment and water costs, returned condensate will be approx 95 degree thus further reducing energy costs and demand on the boilers.

Installation costs \$25,000

Savings equal \$16,092/year -7 1.6 yr payback

### **Nippon Meat Packers Australia Pty Ltd (Oakey Abattoir Pty Ltd) – second report**

#### **Opportunity 1 – Procedure for lights off at end of cleaning**

Oakey Abattoir have added a procedure that has some one in charge of making sure lights are turned off at the end of our cleaning shift. Having saved energy between the cleaning shift and the start of production.

Savings an estimated total of 471,168 kW and \$37,000 a year

**Opportunity 2 – Lighting controls in cattle yards**

Oakey Abattoir has fitted motion & timing sensor in the cattle yards/ loading area to turn off lights when area is not being used.  
Saving an estimated total of 6,864kW and \$550 a year.

**Opportunity 3 – Steam audit**

Oakey Abattoir has undertaken a complete steam usage audit of the plant to help identify & evaluate future steam/ energy saving opportunities.

## Swift Australia Pty Ltd – first report

### Opportunity 1 – Biogas capture and use

This opportunity identified the possibility of capture and use of biogas either within the gas fired boiler on site or the blood ring drier. This project was assessed to save an estimated \$140,000 per annum in gas charges, plus additional carbon credits based on \$30/t. An approximate greenhouse saving of 7,700 tonnes per annum could be achieved. This opportunity has a payback greater than 4 years.

### Opportunity 2 – Biogas capture and recovery from anaerobic pond - cogeneration

This opportunity identified the possibility of capture and recovery of biogas and to install a gas fired generator on site to utilise the available gas to generate electricity. This project was assessed to have an installed cost of approximately \$1.2m with a greater than 4 year payback.

### Opportunity 3 – Improved waste heat recovery – rendering facility

This opportunity identified the possibility of improving the cooker's vapour recovery through technologies such as multiple effect evaporators. It estimated by installing such equipment, and assuming a 50% recovery rate, 50TJ of energy could be saved. The payback on this project is not quantified.

## Swift Australia Pty Ltd – second report

### Opportunity 1 – Dryer Waste Heat Recovery - Brooklyn

Most of the latent heat of evaporation is reclaimed when hot vapours are condenser. That heat however is rejected to the atmosphere mostly through a cooling tower despite existing heat exchangers aimed to transfer that heat to pre heat water. The remaining heat in the hot condensate along with the condensate itself is also dumped into the sewer. The relatively low temperature of the cooling water at approx. 55 °C can be further boosted to close to 82 °C by capturing the heat of hot vapours up steam of the vapour condensers. The supplier Flo-Dry gives an estimate of \$130,000 to \$170,000 cost for such installation on one Dryer. A review of optimum loading and part load efficiency of dryers through accurate measurement of throughput, its water content and gas usage is therefore recommended in order to establish Dryers efficiencies and optimise their energy performance.

### Opportunity 2 – Rendering Vessel's Condensate Recovery - Brooklyn

Despite the existing infrastructure to capture the condensate from rendering vessel, it is believed that no amount of condensate is returned from the

rendering Plant. The energy required to heat that amount of feed water from 15 °ambient to 100 ° at 80% boiler efficiency would be 3.213 GJ per year or approximately \$13,000 pa. There will also be flash steam losses of close to 14.4% or 173 kg/hr when condensate pressure is reduced from 900 kPa to atmospheric pressure. Capturing that flash steam will be equivalent to a further energy savings of 2,900 GJ per year or a further \$12,000 pa.

If the perceived risk of boiler feed water contamination is indeed that great, then a heat exchange and flash steam recovery vessel would still be able to capture much of the energy content of the condensate if not the condensate itself.

### **Opportunity 3 – Boiler Economiser - Brooklyn**

Rationalising boilers to only one duty boiler after replacing much of hot water heating load from Dryer heat recovery, would enable a further efficiency gains in stalling an economiser on the main boiler stack. An economiser installed on the exhaust gas stack of a steam boiler should be able to increase the feed water temperature by about 25 °C. An increase of 6°C in boiler feed water temperature increases the boiler efficiency by about 1%. Assuming boiler use is rationalised to only one duty boiler (eg the 8MW boiler at 80% capacity 24 hours/day), 4% savings would be equivalent to 5,530 GJ/yr or close to \$22,000 per year. Assuming \$100,000 cost of economiser the pay back period would be 4 to 4.5 years.

## **Teys Bros (Holdings) Pty Ltd – second report**

### **Opportunity 1 – Biogas capture**

Biogas capture from anaerobic pond and use in onsite boiler operation. It currently under investigation as payback period is well in excess of 4 years

### **Opportunity 2 – Solar heating of boiler feed water**

Solar heating of boiler feed water – project not to be implemented due to payback period well in excess of 4 years.

### **Opportunity 3 – Chiller lights**

Turn off lights in carcass chillers using a change to standard operating procedure. Electricity savings and also saving on load to refrigeration system due to heat loss from lighting.

## **A J Bush & Sons Pty Ltd – second report**

### **Opportunity 1 – Biogas capture - Beaudesert**

Cover anaerobic dam at Beaudesert plant (complete) and use biogas to generate electricity (gen-sets in place and being commissioned)

**Opportunity 2 – Biogas capture - Riverstone**

Cover anaerobic dam at Riverstone plant and use biogas to fire boilers in substitution for natural gas (final engineering details completed)

**Opportunity 3 – Flash steam recovery**

Flash steam recovery at Beaudesert Plant to heat process pre-heater in substitution for using live steam. Engineering proposal complete and awaiting approval.

**Opportunity 4 – Boiler economiser - Riverstone**

Economiser installed on Danks boiler at Riverstone Plant to increase boiler efficiency. Operating

## Appendix 3. Examples from other industries

### Shell Australia Ltd

Shell is a major global energy organisation. Its business in Australia is broadly divided into “upstream” and “downstream”. The upstream business finds, develops and supplies liquefied natural gas (LNG), condensates and liquefied petroleum gas (LPG) to overseas markets and natural gas to domestic customers in WA. The downstream business manufactures petroleum products.

#### **Re-instate turbo-alternator at Geelong Refinery**

##### **Status: To be implemented**

The refinery will re-instate a turbo-alternator that will let down high-pressure steam to the medium-pressure steam header. The turbo-alternator will generate electricity that will be used by the refinery. By generating electricity the refinery will be able to reduce the amount of electricity imported to the plant, reducing indirect carbon emissions.

Source: Shell EEO Public Report p.5

**Applicability to red meat industry: generate steam at higher pressure than process requirement, use turbo-alternator or steam engine to generate electricity (this is already done at Big River Timbers at Grafton and could be done in future at Wingham Beef Exports)**

### Australian Char Pty Ltd

Australian Char Pty Ltd manufactures premium quality carbonised brown coal to be used by industrial electric furnace processes for carbon control in the steel and iron industries. It is used by consumers as barbecue heat beads.

#### **Variable speed drive installation**

##### **Status: Under investigation**

The installation of a Variable Speed Drive (VSD) to a 150hp motor that drives a Fuel Gas Fan. The estimated energy savings from the audit were  $(150\text{hp} \times 0.746\text{W}/\text{hp}) \times 0.9 \times 8000\text{hrs}/\text{yr} \times 0.2 = 161,136\text{kWh}$ . Estimated savings at  $\$0.125/\text{kWh} = \$20,142$ .

Source: Australian Char Pty Ltd EEO Public Report, p.4

**Applicability to red meat industry: Variable speed drives on fans in refrigeration and boiler system**

### BlueScope Steel Limited – Cokemaking at Port Kembla steelworks

BlueScope produces a range of flat steel products; including slab, hot rolled coil, cold rolled coil, plate and value-added metallic coated and painted steel solutions used to build houses, structures and cars.

#### **Electrical Improvements**

##### **Status: Under investigation**

Facilities for personnel based on site at the Coke Ovens were identified as an area where improvements could be made in energy efficiency. Current areas being investigated include smart sensors on lights, turning off machines when not required and education programs to ensure office and amenity energy use is minimised wherever possible.

Estimated capital cost: \$315,000, Potential energy savings per annum: 15,873 GJ

**Applicability to red meat industry: Control equipment to turn off machines when not required and smart sensors on lights (for cold stores and freezers)**

**Wesfarmers Ltd (Chemicals and Fertilisers Division)**

Wesfarmers Ltd is a diverse business with operations including supermarkets, hardware retailing, coal mining as well as chemical and fertiliser manufacturing.

**Insulation of steam lines from header to steam traps**

**Status: To be implemented**

It was identified that steam lines from the header to steam traps around the new CSBP WA Nitric Acid/Ammonium Nitrate plant were uninsulated. Approximately 720m of steam line was determined to require insulation. Energy savings per year are estimated to be 7,920 GJ, while the cost of installation of additional lagging is estimated at \$129,600. This project will be implemented with completion expected in 2009-10.

Source: Wesfarmers Ltd EEO Public Report

**Applicability to red meat industry: insulation of steam and hot water lines from point of generation to point of use**

**Ford Motor Company of Australia Ltd – Ford Broadmeadows Paint Shop**

**Status: Implementation commenced/to be implemented**

**Energy Saving Mode**

Energy Saving Mode (ESM) is a new mode of operation for the paint shop air supply system. When ESM is activated, during non-production periods, the air supply system will work at 20% of normal rated capacity. This project is expected to save 80,450 GJ of energy per year.

**Applicability to red meat industry: similar system could be installed on compressed air system**

**Mars Australia Pty Ltd**

Mars Australia Pty Ltd manufactures quality food, pet care, and snack food products. Mars Australia has assessed its four main manufacturing facilities, Bathurst and Wyong in NSW and Wodonga and Ballarat in VIC. Together these four sites account for around 92 percent of total energy use for the group.

**Heat recovery**

**Status: To be implemented**

As part of an assessment of primary natural gas usage in two boilers used to generate steam for a major process on one site, a heat recovery opportunity was identified and investigated. The opportunity considered the use of hot post-process water to pre-heat boiler feed water. This water would pass through a heat exchanger, discharging heat to the incoming cold boiler feed water stream. By using water with higher temperatures, the potential for savings in natural gas within the boilers was assessed. Natural gas savings per annum are calculated at approximately 21,000 GJ or 1,077 tonnes of scope 1 CO<sub>2</sub>-e emissions annually. The project is planned for implementation in the very near future and further assessments will also be undertaken on aspects of end-use of the heat.

Source: Mars Australia Pty Ltd EEO Public Report p.5

**Applicability to red meat industry: Heat water heat recovery, but AQIS contamination issues and smaller volumes may make difficult to use for boiler feed water, may be used for other users**

**Lion Nathan Ltd**

Lion Nathan manufactures alcoholic beverages in Australian and New Zealand. The company uses approximately 1.1 PJ of energy in Australia. Two large breweries account for about 70 percent of its energy use.

**Refrigeration upgrade**

**Status: To be implemented**

Upgrade to the -2 degree Celsius refrigeration plant included installation of new condensers (large surface area and relatively small fans), automatic controls for minimising total compressor and condenser energy use; overhaul of screw compressors and variable speed drive fans and pumps. The annual energy savings are expected to be 1,422 MWh of electricity or 5,120 GJ. Greenhouse gas savings are estimated to be 1,522 tonnes CO<sub>2</sub>-e/year.

**Upgrade of boiler plant**

**Status: Implemented**

Replacement of approximately 25 year old steam boilers with state of the art new ones, providing operational, maintenance and energy savings. The new system includes: energy efficient boilers with oxy trim burner control, variable speed burner fans, efficient de-aerated water system and a waste heat recovery boiler economiser). The boilers are installed and have just been commissioned. The expected annual energy savings are 250,000 kWh of electricity or 900 GJ of energy per year from the improved boiler fans and 23,550 GJ of gas savings from improved thermal efficiency. Greenhouse gas savings are estimated to be 1,810 tonnes CO<sub>2</sub>-e/year.

Source: Lion Nathan Ltd EEO Public Report p.5

**Applicability to red meat industry: refrigeration and boiler systems are often old and less efficient**

<b>National Foods Ltd</b>
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National Foods Ltd is one of Australia's largest food and beverage groups with core activities in milk, dairy foods, juice, soy beverages and specialty cheese.

**Compressed air use reduction**

**Status: Implemented**

The Smithfield operation located in Sydney, New South Wales, which operates 24/5 identified an opportunity during an energy audit to develop a compressed air leak program for the site. The program has been implemented along with improved compressed air demand control, lowering of the compressor set-point, and isolation of non-essential services. Also, the process has identified other opportunities to remove many of the compressed air bottle drying blowers from production lines. The total savings identified through the reduction in compressed air use is in the order of 5000 GJ of energy and \$115,000 per annum for a cost of \$63,000. Aspects of these opportunities are now being assessed for roll out across all NFL sites.

Source: National Foods Ltd EEO Public Report p.4

**Applicability to red meat industry: compressed air audit and control**



#### **Honan Holdings Pty Ltd (the Manildra Group)**

Honan Holdings (the Manildra Group) controls seven active companies involved in various wheat and grain processing activities at many sites throughout Australia. Manildra Group's total energy consumption is about 3.72 PJs. Of this, 3.41 PJs is consumed at their Bolong Rd site at Bomaderry in NSW which produces starch products, glucose products, ethanol and stillage (used to make high-protein cattle feed).

#### **Status: Implemented**

##### **Combustion control**

Boiler 4 combustion control was by manual operator adjustment only. Flue gas analysis showed that the flue oxygen levels in Boiler 4 were consistently around 4 percent higher than Boiler 6 (on automatic control). This translated to energy wastage of up to 24,800 GJ per annum for Boiler 4. An oxygen analyser was fitted to Boiler 4's flue, linked to the SCADA system for automatic control. The capital cost was \$70,000 and the value of the energy saved indicated a payback period of 12 months.

##### **Boiler Feedwater Preheat**

The boiler feedwater to Boilers 5 & 6 was preheated from 16 degrees Celcius to 60 degrees Celcius using recovered waste heat from the condensate from the stillage evaporators. The estimated steam saving is 3.5 tonnes per hour, equivalent to some 66,300 GJ per annum. At a capital cost of \$207,700, the payback period was 0.8 years.

##### **Flash Steam Opportunities**

Flash steam recovery has been installed on Gluten Dryer No.5. The additional cost of installing a flash steam recovery system and heating coil was \$33,000 for a saving of 29,600 GJ, yielding a payback of only 0.4 years. The project has been so successful that any future dryers will have a flash steam recovery system fitted during manufacture. Flash steam recovery from the Dried Distiller Grain (DDG) dryers has commenced and further investigation and analysis of other opportunities is being undertaken with an indicated further saving of \$204,000 per annum in steam production.

Source: Honan Holdings Pty Ltd EEO Public Report p.3

**Applicability to red meat industry: boiler control, boiler feedwater preheating and flash steam recovery are all relevant to meat processing plants**

#### **QLD Coal Mine Management**

##### **Truck tyre pressure management**

##### **Status: Implemented**

Jellinbah mine has fleets of large trucks for hauling coal and overburden. The running efficiency of these trucks greatly impacts on their fuel / energy consumption. It has been assessed that maintaining optimal tyre pressures on these trucks is one method for improving their running efficiency. Jellinbah has implemented a tyre pressure management system, which is estimated to produce a 5 percent saving in fuel consumption, and which in 2007–08 equated to a saving of 370,000 litres of fuel or 14,282 GJ of energy.

Source: QLD Coal Mine Management Pty Ltd EEO Public Report p.3

**Applicability to red meat industry: some companies have their own transport fleet**

**Linfox**

Linfox operates trucks and warehouses to offer a complete supply chain logistics service.

**Eco Driving program**

**Status: To be implemented**

Eco Driving refers to a system of driving where maximum fuel economy is achieved by the vehicle operator. This achievement is attained by observing a range of behaviours in driving that have been codified by Linfox and translated into a curriculum document suitable for instructional purposes. Over the next 24 months it is planned to train all Linfox Vehicle Operators in Eco Driving. The reduction in energy use from this activity is estimated to be 4.8 percent. In addition to the above programme we have partnered with a firm of Environmental Specialists, Andromeda Pty Ltd to produce the Eco Drive programme in an online version for use by Linfox staff and external users. The curriculum has been made available to this company, Andromeda, at no cost in order that they can commercialise the product and make it widely available to small and medium sized enterprises who may not, if reliant on their own resources, secure access to this training. In the absence of significant technological advances Eco Driving represents the single largest opportunity for improvement in energy use in the road transport sector. The biggest barrier to adoption of the principles of Eco Driving is acceptance by vehicle operators of changed driving habits. To overcome this barrier within Linfox a variety of strategies and materials have been developed to improve acceptance. These include delivery modes, learning materials, coaching, monitoring and recognition programmes.

Source: Linfox Energy Efficiency Opportunities Act Public Report 2008

**Applicability to red meat industry: some companies have their own transport fleet**

**Woolworths Limited**

**Distribution centres**

**Status: Implemented**

Supermarkets logistics have implemented a range of energy efficiency measures across eight major distribution centres, including:

- Upgrade of building management systems to integrate high bay lighting control,
- energy efficiency lighting fixture upgrade and installation of smart lighting controls, and
- optimisation of HVAC operating hours.

This project roll out cost is approximately \$520,000 and estimated savings are approximately \$440,000. The total energy savings are estimated at 19,000 GJ abating the emission of 6,100 tonnes CO<sub>2</sub>-e.

Source: Woolworths Limited EEO Public Report p.6

**Applicability to red meat industry: lighting system controls are relevant to all plants**

**Westfield Holdings Limited – Chatswood shopping centre, NSW**

Energy Management and Controls System (EMCS) Optimisation

Status: Under investigation

The energy saving opportunity would involve the upgrade of the existing building management and control systems (BMCS). The EMCS component of the BMCS provides for monitoring, control and optimization of a number of key components of the heating, ventilation and air conditioning (HVAC) system. The upgrade would provide the following functionalities:

1. Chiller optimal control to include:
  - a. Chilled water temperature reset
  - b. Condenser temperature optimal control
  - c. Optimal chiller selection and loading
2. Pumps variable speed drives (VSDs)
3. Air handling unit fan VSDs
4. Enthalpy based economizer cycle
5. Demand management

The total HVAC energy usage is currently 58%. If the opportunity was implemented, it has been estimated that the potential annual energy saving would be 2,832,621 kWh or 10,197 GJ. In addition, a potential benefit of 20.94% reduction in annual energy usage and resulting reduction of 2,918 tCO<sub>2</sub>-e GHG emissions has been estimated. The estimated cost of upgrading the BMCS is \$944,845; this upgrade could be implemented over a 2 year period. Source: Westfield Holdings Limited EEO Public Report p.11

**Applicability to red meat industry: control of refrigeration relevant to all plants**