

# final report

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## State Government energy and greenhouse programs NSW – Energy savings actions plans (ESAP) VIC – Environment and resource efficiency plans program (EREP)

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## **Executive Summary**

The Victorian **Environment and Resource Efficiency Plans** (EREP) program was introduced in 2008 and applies to businesses using more than 100 TJ of energy and/or 120 ML of water per annum. Data was obtained from 11 of the 13 sites that were involved in the program. In NSW, water and energy savings initiatives were introduced in May 2005 and required nominated business businesses using more than 10 gigawatt-hours per year of **electricity** at a site to prepare **Energy Savings Action Plans** during 2006. Data was obtained from 6 of the 7 sites that were involved in the program.

Projects that reoccur with a payback of less than 1 year include:

- Flow restrictors in hot and warm water lines
- Compressed air leak program
- Insulating un-insulated refrigerant pipe
- Boiler tuning

Projects that reoccur with a payback of between 1 and 2 years include:

- Replacing steriliser nozzles (water flow control)
- Improved condensate recovery
- Insulate knife sterilisers
- Flash steam recovery
- Variable Speed Drives on hot water pumps, cold water pumps, blast freezer fans, boilers ID fans, boiler FD fans and boiler feed water pumps

Projects which provided the best greenhouse saving per dollar invested include:

- Checking for compressed air leaks
- Reducing electricity use in refrigeration through use of door strips, improved chiller utilisation and door control
- Insulating steam and refrigerant pipe
- Program to turn lights off, energy awareness training
- Variable Speed Drives on hot and cold water pumps

Projects that provided the best energy saving per dollar invested related to:

- Refrigeration control (door strips, door control)
- Delaying non-essential equipment startup
- Insulating steam and refrigerant pipe
- · Economisers on boilers, boiler tuning, flash steam recovery
- Compressed air leak program
- Improved heat recovery from rendering

Comparisons between the two state programs provide the following information

- NSW program identified fewer opportunities, but was principally centred on electricity, not on energy, water and waste as the Victorian program was
- The Victorian program identified more projects with smaller capital requirements and shorter payback periods
- On average, the Victorian projects saved more energy and more greenhouse emissions per dollar invested, by factors of 7 and 5 respectively. This tends to indicate that smaller capital projects may provide better energy and greenhouse savings, so that small incremental improvements in energy efficiency can be a better investment than larger scale step-change projects

## 1. Overview of State Government Energy and Greenhouse Programs

#### 1.1 Victorian Regulatory Overview

The **Environment and Resource Efficiency Plans** (EREP) program was introduced in 2008 and applies to businesses using more than 100 TJ of energy and/or 120 ML of water per annum. Businesses must assess their operations to identify energy, water and waste savings, which are then priorities into an action plan. Any opportunity with a payback period within three years must be implemented. The sites involved from the meat industry are listed in the following table and there are 13 in total.

Company name	Location	Exceeded energy threshold	Exceeded water use threshold
Ashton	Swan Hill	No	Yes
Castricum Brothers	Dandenong	Yes	Yes
CRF (Colac Otway)	Colac	No	Yes
G & K O'Connor	Pakenham	Yes	Yes
George Weston Foods	Castlemaine	Yes	Yes
H W Greenham & Sons	Tongala	No	Yes
M C Herd	Corio	No	Yes
Peerless Holdings	Braybrook	Yes	Yes
Rivalea <sup>1</sup>	Huntly	No	Yes
Swift Australia Southern	Brooklyn	Yes	Yes
Swift Australia Southern	Cobram	Yes	Yes
Warrnambool Stockfeeds	Warrnambool	Yes	Yes
Wodonga Rendering	Wodonga	Yes	Yes

Prior to the EREP program, there had been an **Industrial Greenhouse Program**, which required **EPA Licence holders** that were medium or large energy users to undertake a similar process but only covering energy (not water and waste). This program commenced in 2002. A detailed Energy and Greenhouse Management Toolkit was developed to assist sites with compliance.

#### 1.2 NSW Regulatory Overview

The NSW Government introduced the NSW water and energy savings initiatives in May 2005. They included a requirement for nominated business businesses using more than 10 gigawatt-hours per year of **electricity** at a site to prepare **Energy Savings Action Plans**, submit them to the Department of Environment, Climate Change and Water, provide annual updates on progress and review the Plans every 4 years.

Savings Action Plans had to be prepared in accordance with Guidelines provided by the Government and were to be a comprehensive technical document. The included such details as a description of the business, history of energy savings, at least one years' worth of monthly baseline data, management review and a detailed technical review of opportunities identified. Companies were required to submit then plan by the date specified by the Government, as listed in the following table and there are 7 in total.

Company	Location	Plan to be submitted by
P & M Quality Smallgoods	Primo Abattoirs, Sydney Street,	30 June 2006
Pty Ltd	Scone	

<sup>1</sup> Formerly QAF Meat Industries

Company	Location	Plan to be submitted by
Cargill Australia Limited	Cargill, Phoenix Street,	30 September 2006
_	Tamworth	
Cargill Australia Limited	Cargill Mill, Dampier Street,	30 September 2006
	Bomen, Wagga Wagga	
Fletcher International Exports	Fletcher International Exports,	30 September 2006
Pty Ltd	11 Yarrandale Road, Dubbo	
Northern Co-operative Meat	Casino Abattoir, 10615	30 September 2006
Company Limited	Summerland Way, Casino	
Yolarno Pty Ltd	Bindaree Beef Company,	30 September 2006
	Warialda Road, Inverell	
Rockdale Beef Pty Limited	Rockdale Beef, Regulator	31 December 2006
	Road, Yanco	

The Government provided a Template Tool and generally the level of investigation was equivalent at a Level 3 Energy Audit under Australian Standard AS3598:2000. Level 3 is the most detailed audit level under the AS and this means that the costs and benefits have an accuracy of +/- 10% and so can generally be used to justify investments. Reported results had to include the summer<sup>2</sup> and winter peak<sup>3</sup> electricity demand saving as kVA or kW.

At the same time, the NSW Government established the Energy Saving Fund, which allocated \$25.6 million to 44 projects, saving more than 170,000 megawatt hours of electricity and more than 180,000 tonnes of greenhouse gas emission. They included projects covering energy efficiency, alternative energy generation, energy education and power factor correction. The meat and food processing companies who were allocated funding as part of the Energy Saving Fund are outlined in the following table. Not all the companies who were allocated funding ended up taking up the grant, such as the Rockdale Beef biodigester.

 $<sup>^2</sup>$  Summer Peak Demand means the maximum electrical demand (in kVA or kW) of the site on a hot summer's afternoon – generally between 12pm and 5pm on a weekday.

<sup>&</sup>lt;sup>3</sup> Winter Peak Demand means the maximum electrical demand (in kVA or kW) of the site on a cold winter's evening – generally between 5pm and 10pm on a weekday.

Company	Funding	Project	Details
P & M Quality Smallgoods Pty Ltd	Energy Management System	\$299K	The Primo smallgoods site at Chullora has upgraded their refrigeration, compressor and defrost systems to an Energy Management System to lower maintenance and operating costs. The project is saving 1,671 MWh of electricity and 2,112 tonnes of greenhouse gas emissions a year.
Burrangong Meat Processors Pty Ltd	Gas recovery from effluent ponds to generate electricity	\$700K	Burrangong Meat Processors in Young will harness methane gas from animal effluent to generate 65% of its energy needs. The project involves installing ultrasound equipment in the effluent pond to maximise methane production and capture the gas. It will then be sent via a pipeline to a gas engine to generate electricity to power the plant. The project will save 3,600 MWh of electricity each year and 3,852 tonnes of greenhouse gases a year.
Fletcher International Exports Pty Limited	Reducing peak demand through power factor correction	\$19.6K	Fletcher International Exports Pty Limited proposes to install power factor correction equipment at its Dubbo Abattoir site to improve the efficiency of power use in their operations. By increasing the power factor, Fletcher International Exports will reduce the demand on the electrical infrastructure for this site, providing spare capacity on the network.
Rockdale Beef Pty Limited	Bio Gas Generation from Waste Water and Manure Digester	\$2.1M	Manure from cattle at Rockdale Beef's feedlot and abattoir at Yanco will be harnessed to generate enough energy to run the facility. Excess electricity generated from the new biogas plant will be fed back into the grid and the upgrades to equipment and existing wastewater treatment plant will save both water and money by avoiding manure disposal costs. The project will utilise 120,000 tonnes of manure produced each year and save 15,500 megawatt-hours of electricity each year.
Baiada Poultry Pty Ltd	New chiller, heat recovery and optimising controls	\$140K	New chiller equipment at the Baiada poultry processing plant at Pendle Hill will save both energy and water by combining improved efficiency, heat recovery and reduced evaporation The new equipment will replace the existing ice machines, currently used to chill the chickens. It will save energy during peak periods and enable heat from refrigeration compressors to be recovered to heat water for cleaning. The project builds on Baiada's work with Sydney Water under the Every Drop Counts program and will save more than 71 megalitres of water over the next 10 years as well as 6,700 megawatt-hours of energy.
Simplot Australia Pty Limited	Water and energy savings from process and utility improvements	\$200K	Simplot plan to improve energy efficiency at their food processing plant in Bathurst by installing new technology, using heat recovery and modifying existing pipeworks and controls. Heat recovery and/or evaporative cooling is proposed for the canning systems and for the pre-cooling of the product prior to freezing. Variable speed drives and automatic controls will also be added to the fans of the freezing tunnel and the evaporative condenser to improve efficiency and optimise performance.
George Weston Foods Limited	Energy Savings with variable speed drives (VSDs) and	\$40K	The baguettes, pastries, and pizza bases baked at George Weston's Speedibake plant at Ermington will be made more energy efficiently in the future with the installation of variable speed drives in the refrigeration room. The new equipment will be installed on the drive motors of five screw

Company	Funding	Project	Details
	advanced control		compressors, saving 5% of the power on each. The project is expected to save 317 MWh a year and
	logic		313 tonnes of greenhouse gases, the equivalent of taking 69 cars off the road.
Toohey's Pty Limited	Power factor correction and refrigeration improvements	\$150K	This project will see Toohey's Brewery at Lidcombe save more than 337 tonnes of greenhouse gases a year. Power factor correction equipment will be installed on 12 switchboards around the site to maximise efficiency and reduce peak demand. Improvements to the refrigeration systems, including controls, fans and speed drives, will save energy and costs and pave the way for future savings as equipment is upgraded.

In July 2007 the Energy Savings Fund was incorporated into the NSW Government's \$700 million Climate Change Fund, which includes a \$150 million program under the Energy Efficiency Strategy. This includes the Energy Saver Program for medium to large organisations, which provides funding for subsidised energy audits and facilitation to help NSW businesses identify and implement energy savings. This can be done in conjunction with the voluntary Sustainability Advantage program.

## 2. Data for this report

#### 2.1Victorian sites

To obtain data on Victorian sites involved in the EREP program, the EPA was contacted directly and assisted with obtaining approval from sites to release the information in a way that did not identify an individual site. Of the 13 sites on the program, 11 agreed for their information to be released through the Victorian EPA, so it is not known which 2 sites declined to be involved.

#### 2.2 NSW sites

To obtain data on NSW sites involved in the ESAP program, the EPA was contacted directly through a Freedom of Information request to obtain permission from sites to release the required information. However, the FOI request was withdrawn after concern from sites and the sites were then contacted individually by the report author. Northern Co-operative Meats declined the request for information, one company provided information which included only as indicative payback period (2-4 years, not capital costs, cost savings, energy savings or greenhouse savings. All these projects are listed as having a payback period of 3 years. One company provided capital cost and greenhouse savings but not estimate savings or payback period.

#### 2.3 Differences in data obtained

The Victorian data for each action included:

- Project Cost (\$)
- Energy Cost Savings (\$)
- Water Cost Savings (\$)
- Waste Cost Savings (\$)
- Other Cost Savings (\$)
- Total Cost Savings (\$)

The NSW data for each action included:

- Cost to Implement (\$)
- Energy savings (GJ pa)
- Energy cost savings (\$ pa)
- Payback period

- Payback period (years)
- Energy Savings (GJ)
- Greenhouse Gas Reductions (tCO<sub>2-e</sub>)
- Watersavings(kL)
- Solid Waste Savings (t)
- Liquid Waste Savings (kL)
- Greenhouse Gas Reductions (tCO<sub>2-e</sub>)
- Winter peak demand reduction (kVA)
- Summer peak demand reduction (kVA)
- Maintenance/ other cost savings (\$ pa)

The above data was analysed to provide details on

- kg CO<sub>2-e</sub> per \$ invested
- MJ saved per \$ invested

Together with the projects ranked by payback period, this provides an indication of which projects are the most economic, which save the most greenhouse emissions per dollar invested and which save the most energy per dollar invested. No attempts have been made to confirm the accuracy of the data provided or to correct any apparent mistakes. Appendix 1 contains the full tables.

## 3. Opportunities identified

#### 3.1 Ranked by payback period

Details are provided in Table 1 of opportunities ranked by payback period, from the quickest to the longest.

Projects that reoccur with a payback of less than 1 year include:

- Flow restrictors in hot and warm water lines
- Compressed air leak program
- Insulating un-insulated refrigerant pipe
- Boiler tuning

Projects that reoccur with a payback of between 1 and 2 years include:

- Replacing steriliser nozzles (water flow control)
- Improved condensate recovery
- Insulate knife sterilisers
- Flash steam recovery
- Variable Speed Drives on hot water pumps, cold water pumps, blast freezer fans, boilers ID fans, boiler FD fans and boiler feed water pumps

#### Table 1: Ranked by payback period

Projects	Payback period (vears)
Replace Shower heads	0.1
Regularly check air compressors for leaks in processing areas	0.1
Fit evisceration table with reduced flow nozzles (estimate 50% reduction)	0.1
Steriliser Flow Restriction	0.1
Hand Wash Flow Restriction	0.1
Compost Waste Skins along with Wastewater Solids for beneficial reuse	0.1
Education Program, Turn Lights Off	0.2
Reposition aerator for more even DO concentration in aerobic lagoon	0.2
Fit slaughter floor final wash with reduced flow nozzles (estimate 41% reduction)	0.2
Compost Cardboard along with Wastewater Solids for beneficial reuse	0.2
Implement a compressed air leak reduction program and compressor control	0.29
Fit slaughter floor Y-cut water faucet with flow reduction nozzles	0.3
Fit slaughter floor at Evisceration pluck with foot operated valve	0.3
Replacement of X-Ray Machine with Metal Detector	0.3
Refrigeration System B Towers 1&2, repair tower basin, reduce splash out on	0.4
Cooling towers	0.4
water savings as per water Plan	0.4
Insulate un-insulated reingerant pipe	0.47
operations	0.5
Replace heat exchanger to reduce hot water waste	0.5
Update and review data at site	0.6
Replace two gear sterilisers with one steam heated, insulated steriliser.	0.6
Skins Area Lighting	0.7
Insulate un-insulated steam pipe, scalding water tanks, boiler feed water tanks	0.75
Reposition alum dosing point in aerobic lagoon	0.8
Recover clean wastewater from abattoir reuse at Rendering Plant	0.8
Connect water flow meters to CITECT: establish monitoring systems and alarm	0.0
feedback to operators.	0.9
Replace hot water pipes to reduce hot water waste	0.9
Improving cardboard packaging machine	1.0
Boiler Feed Water recovery from condensate water return from abattoir	1.1

Replace steriliser nozzles in processing area     (Years)       Reduce size, insulate & control flow of slaughter flor knife sterilisers     1.1       Revised Use of Cogeneration Plant     1.15       Condenser towers BAC1 & Muller: Install pulse output water meters in make-up line     1.2       New Air Compressor at Rendering Plant     1.2       Installed VSD on 2 hot water pumps to match flow to demand on all processing floors. Now monitoring.     1.3       Montor and replace worn out hand held hoses in processing area     1.3       Convert to bould rinkers for 1400 sows     1.4       Reclaimed Water Project - reuse class B water     1.6       Maintenance Area Liphting Controls     1.6       New duit 6.4 Flash Site on track flow to demand on all processing     1.9       Foregr Audit 6.3 VSD in Blast Freezer fans     1.9       Install or VSD on 2 cold water pumps to match flow to demand on all processing     1.9       Reduce size, insulate & control flow in boning room kit sterilisers     2.0       WaterBese Urinals     2.2       Install water Brogen drives on bollers ID fans. FD fans and boiler feed water     1.93       Reduce size, insulate & control flow in boning room kit sterilisers     2.0       WaterBesuing Room Lighting     2.7	Projects	Payback period
Replace steriliser nozzles in processing area     1.1       Reduce size, insultate & control flow of slughter floor knife sterilisers     1.1       Revised Use of Cogeneration Plant     1.15       Condenser towers BAC1 & Muller. Install pulse output water meters in make-up line     1.2       Installed VSD on 2 hot water pumps to match flow to demand on all processing floors. Now monitoring.     1.3       Monitor and replace worn out hand held hoses in processing area     1.3       Compressed air system review     1.4       Compressed air system review     1.4       Convert to bowl drinkers for 1400 sows     1.4       Reclaimed Water Project - reuse class B water     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Install variable speed drives on boliers ID fans, FD fans and bolier feed water     1.9       Install variable speed drives on boliers ID fans, FD fans and bolier feed water     1.93       Reduce size, insulate & control flow in boning room kit sterilisers     2.0       Waterless Urbands     2.2       Install VSD on tripe washer to reduce wear on mechanical parts.     2.76       Chiler Utgitting     2.6       Chiler Utgitting		(years)
Reduce size , insulate a control tide of slaughter hoor knine sterinisers     1.1       Revised Use of Cogeneration Plant     1.15       Condenser towers BAC1 & Muller. Install pulse output water meters in make-up line     1.2       New Air Compressor at Rendering Plant     1.2       Installed VSD on 2 hot water pumps to match flow to demand on all processing floors. Now monitoring.     1.3       Monitor and replace worn out hand held hoses in processing area     1.3       Convert to bowl drinkers for 1400 sows     1.4       Convert to bowl drinkers for 1400 sows     1.4       Reclamed Water Project - reuse class B water     1.5       Maintenance Area Liphting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Installed VSD on 2 cold water pumps to match flow to demand on all processing floors. Now monitoring     1.9       Energy Audit G.3. VSD in Blast Freezer fans     1.9       Install variable speed drives on boliers ID fans, FD fans and bolier feed water     1.9       Install variable speed drives on boliers ID fans, FD fans and bolier feed water     2.2       Chiler Lighting     2.7     2.72       Carcase wash to Rendering     2.72       Carcase wash to Rendering     2.79 <td>Replace steriliser nozzles in processing area</td> <td>1.1</td>	Replace steriliser nozzles in processing area	1.1
Install of the output water meters in make-up line     1.1       New Air Compressor at Rendering Plant     1.2       Installed VSD on 2 hot water pumps to match flow to demand on all processing floors. Now monitoring.     1.3       Monitor and replace worn out hand held hoses in processing area     1.3       Conversition of the AF lash Steam recovery in Rendering Plant     1.3       Compressed air system review     1.4       Convert to bow drinkers for 1400 sows     1.4       Reclaimed Water Project - reuse class B water     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.93       Reduce size , insulate & control flow in boning room kit sterilisers     2.0       Waterless Urinals     2.2       Chiller Lighting     2.6       Further Processing Room Lighting     2.6       Chiller Lighting     2.7       Carcase wash to Rendering     2.73       Target 1% reduction of plant telect cost in refrigeration system through use of :     2.9	Reduce size, insulate & control now of slaughter noor knile sterilisers	1.1
1.2     New Air Compressor at Rendering Plant     1.2       Installed VSD on 2 hot water pumps to match flow to demand on all processing floors. Now monitoring.     1.3       Monitor and replace worn out hand held hoses in processing area     1.3       Compressed at system revew     1.4       Commersed at system revew     1.4       Comvert to bowd drinkers for 1400 sows     1.4       Reclaimed Water Project - reuse class B water     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water pumps to match flow to demand on all processing floors. Now monitoring     1.9       Energy Audit 6.3 VSD in Blast Freezer fans     1.9       Install vSD on 2 cold water pumps to match flow to demand on all processing floors. Now monitoring     2.0       Waterless Urinals     2.2       Install variable speed drives on boilers ID fans, FD fans and boiler feed water pumps     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water pumps for the washer to reduce wear on mechanical parts.     2.5       Chiller Lighting     2.7     2.7       Caccase wash to Rendering     2.77     2.72       Revice evaporation water from stick water process     2.78     7       Replacement storg	Condenser towers BAC1 & Muller: Install pulse output water meters in make-up	1.10
New Air Compressor at Rendering Plant     1.2       Installed VSD on 2 hot water pumps to match flow to demand on all processing     1.3       Monitor and replace worn out hand held hoses in processing area     1.3       Compressor air system review     1.4       Convert to bowd drinkers for 1400 sows     1.4       Reclaimed Water Project - reuse class B water     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Installed VSD on 2 cold water pumps to match flow to demand on all processing     1.9       floors. Now monitoring     1.9       Energy Audit 6.3.3 VSD in Blast Freezer fans     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.93       Reduce size, insulate & control flow in boning room kit sterilisers     2.0       Waterless Urnals     2.2       Install VSD on tripe washer to reduce waro n mechanical parts.     2.5       Fuller Processing Room Lighting     2.7       Carcase wash to Rendering     2.79       Target 1% reduction of plant leet cost in refrigeration system through use of :     2.9       High Pressure Hoses     2.9       Review	line	1.2
Installed VSD on 2 hot water pumps to match flow to demand on all processing     1.3       Monitor and replace worn out hand held hoses in processing area     1.3       Energy Audit 6.4 Flash Steam recovery in Rendering Plant     1.3       Compressed air system review     1.4       Convert to bowl drinkers for 1400 sows     1.4       Reclaimed Water Project - reuse class B water     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Installed VSD on 2 cold water pumps to match flow to demand on all processing     1.9       Energy Audit 6.3 VSD in Blast Freezer fans     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.93       Reduce size, insulate & control flow in boning room kit sterilisers     2.0       Waterless Urinals     2.5       Chiller Ughting     2.6       Further Processing Room Lighting     2.7       Carcase wash to Rendering     2.72       Carcase wash to Rendering     2.78       Replacement spray sterilisers     2.79       Target 1% reduction of plant elect cost in refrigeration system through use of :     0.0       door strips fitted	New Air Compressor at Rendering Plant	1.2
floors. Now monitoring.     1.3       Energy Audit 6.4 Flash Steam recovery in Rendering Plant     1.3       Compressed air system review     1.4       Convert to bar dystem review     1.4       Convert to bar dystem review     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.9       Install variable speed drives on boilers ID fans, FD fans and boiler feed water     2.0       Waterless Urinals     2.0     Waterless     2.0	Installed VSD on 2 hot water pumps to match flow to demand on all processing	13
Monitor and replace worn out hand held hoses in processing area     1.3       Energy Audi 6.4 Flash Steam recovery in Rendering Plant     1.4       Convert to boul drinkers for 1400 sows     1.4       Reclaimed Water Project - reuse class B water     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Installed VSD on 2 cold water pumps to match flow to demand on all processing     1.9       Energy Audi 6.3.3 VSD in Blast Freezer fans     1.9       Install variable speed drives on boliers ID fans, FD fans and boiler feed water     1.93       Reduce size , insulate & control flow in boning room kit sterilisers     2.0       Waterless Urinals     2.2       Install VSD on tripe washer to reduce wear on mechanical parts.     2.5       Chiller Lighting     2.7       Cacrase wash to Rendering     2.77       Recycle evaporation water from stick water process     2.78       Replacement spray sterilisers     3.00       Target 1% reduction of plant elect cost in refrigeration system through use of : 2.9     2.9       High Pressure Hoses     3.00       Install Water meters     3.00       Install Water meter	floors. Now monitoring.	1.5
Energy Audit 6.4 Flash Steam recovery in Rendering Plant   1.3     Compressed air system review   1.4     Convert to bowl drinkers for 1400 sows   1.4     Reclaimed Water Project - reuse class B water   1.5     Maintenance Area Lighting Controls   1.6     new chute to eliminate water use in slaughter floor wax eye chute spray   1.7     Installed VDD On 2 cold water pumps to match flow to demand on all processing floors. Now monitoring   1.9     Energy Audit 6.3.3 VSD in Blast Freezer fans   1.9     Install variable speed drives on boilers ID fans, FD fans and boiler feed water pumps   2.0     Waterless Urinals   2.2     Install variable speed drives on boilers ID fans, FD fans and boiler feed water flow match flow in boning room kit sterilisers   2.0     Waterless Urinals   2.2     Install variable speed drives on breed water no mechanical parts.   2.5     Chiller Lighting   2.6     Further Processing Room Lighting   2.72     Repacement spray sterilisers   2.78     Replacement spray sterilisers   2.9     door strips fitted & improved chiler utilisation, door control   2.9     High Pressure Hoses   3.00     Install water meters   3.00 <td< td=""><td>Monitor and replace worn out hand held hoses in processing area</td><td>1.3</td></td<>	Monitor and replace worn out hand held hoses in processing area	1.3
Lompressed air system review   1.4     Convert to bowd drinkers for 1400 sows   1.4     Reclaimed Water Project - reuse class B water   1.5     Maintenance Area Lighting Controls   1.6     new chute to eliminate water use in slaughter floor wax eye chute spray   1.7     Installed VSD on 2 cold water pumps to match flow to demand on all processing floors. Now monitoring   1.9     Energy Audit 6.3.3 VSD in Blast Freezer fans   1.9     Install variable speed drives on boliers ID fans, FD fans and boiler feed water pumps   1.93     Reduce size , insulate & control flow in boning room kit sterilisers   2.0     Waterless Urinals   2.5     Chiller Lighting   2.6     Further Processing Room Lighting   2.7     Carcase wash to Rendering   2.79     Replacement spray sterilisers   2.9     door strigs fitted & improved chiller utilisation, door control   2.9     High Pressure Hoses   3.00     Install WSD or in Chillers   3.00     Power Factor Correction   3.00     Review air requirements for product lines in rendering plant   3.00     Install Smart Energy Meters   3.00     Install Smart Energy Meters   3.00	Energy Audit 6.4 Flash Steam recovery in Rendering Plant	1.3
Convent to Down Initials in Table Solvis     1.4       Maintenance Area Lighting Controls     1.5       Maintenance Area Lighting Controls     1.6       new chute to eliminate water use in slaughter floor wax eye chute spray     1.7       Installed VSD on 2 cold water pumps to match flow to demand on all processing floors. Now monitoring     1.9       Energy Audit 6.3.3 VSD in Blast Freezer fans     1.9       Install Variable speed drives on boilers ID fans, FD fans and boiler feed water pumps     2.0       Matteress Urinals     2.2       Install VSD on tripe washer to reduce wear on mechanical parts.     2.5       Chiller Lighting     2.6       Further Processing Room Lighting     2.7       Replacement spray sterilisers     2.79       Target 1% reduction of plant elect cost in refrigeration system through use of : door strips fitted & improved chiller utilisation, door control     2.9       High Pressure Hoses     3.00       Install Smart Energy Meters     3.00       Power Factor Correction     3.00	Compressed air system review	1.4
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International Light may be a subject of the state of the sta	Maintenance Area Lighting Controls	1.5
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Energy Audit 6.3.3 VSD in Blast Freezer fans   1.9     Install variable speed drives on boilers ID fans, FD fans and boiler feed water   1.93     Reduce size , insulate & control flow in boning room kit sterilisers   2.0     Waterless Urinals   2.2     Install VSD on tripe washer to reduce wear on mechanical parts.   2.5     Chiller Lighting   2.6     Further Processing Room Lighting   2.7     Carcase wash to Rendering   2.72     Repcice evaporation water from stick water process   2.78     Replacement spray sterilisers   2.9     Target 1% reduction of plant elect cost in refrigeration system through use of :   2.9     door strips fitted & improved chiller utilisation, door control   2.9     High Pressure Hoses   3.00     Install Narat Energy Meters   3.00     Install Internal Doors in Chillers   3.00     Power Factor Correction   3.00     Boiler Tuning   3.00     Flash steam recovery - to pre-heat water used as warm water in plant   3.00     Reduce air conditioning hours in cold beef passage, frozen load out and frozen annex during nights and on weekends   3.00     Review air requirements for produce plassage, frozen load out and frozen annex during nights and on weekends	floors. Now monitoring	1.9
Install variable speed drives on boilers ID fans, FD fans and boiler feed water     1.93       Reduce size , insulate & control flow in boning room kit sterilisers     2.0       Waterless Urinals     2.2       Install VSD on tripe washer to reduce wear on mechanical parts.     2.5       Chiller Lighting     2.6       Further Processing Room Lighting     2.7       Carcase wash to Rendering     2.72       Recycle evaporation water from stick water process     2.78       Replacement spray sterilisers     2.79       Target 1% reduction of plant elect cost in refrigeration system through use of :     2.9       Not or strips fitted & improved chiller utilisation, door control     2.9       Install water meters     3.0       Install smart Energy Meters     3.00       Install Thermal Doors in Chillers     3.00       Power Factor Correction     3.00       Reduce air conditioning hours in cold beef passage, frozen load out and frozen annex during nights and on weekends     3.00       Install during nights and on weekends     3.00       NVSD on motors - 55KW toffilter, 55KW Tallow Polisher, 2x75KW Saveall Pumps     3.00       Ammonia - increase high stage suction return line from the fab     3.00	Energy Audit 6.3.3 VSD in Blast Freezer fans	1.9
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Replacement spray steriliser3.67Belt Wash System3.8Trial Citect System for real time reporting of all inputs3.90Change to variable flow4.0Remove electric heating from cryovac shrink tunnels, replace with steam4.3Economisers installed on two new boilers4.4Cold store Lighting4.7Power Factor Upgrade5.06Tree planting around site boundary5.7Additional variable speed drives will be installed on pumps5.9Install economisers for boilers to preheat the boiler feed water temperature6.75New boilers commissioned in January 201011.0	Heat Recovery Unit on 2nd Boiler	3.2
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New boilers commissioned in January 2010 11.0	Install economisers for boilers to preheat the boiler feed water temperature	6.75
	New boilers commissioned in January 2010	11.0

Projects	Payback period (years)
Installed 45000 litre rain water tank on new 800 sq meter new carton store to recover rain water	12.0
Implementation of Distech Vacuum Distillation technology for the treatment wastewater	13.4
Biomass Plant	17.86
Convert to more efficient heater	77.9
Energy Efficient Lighting	92.59

#### 3.2 Ranked by greenhouse saving per dollar invested

Details are provided in Table 2 of opportunities ranked by greenhouse savings per dollar invested, from the largest to the smallest.

Projects which provided the best greenhouse saving per dollar invested include:

- Checking for compressed air leaks
- Reducing electricity use in refrigeration through use of door strips, improved chiller utilisation and door control
- Insulating steam and refrigerant pipe
- Program to turn lights off, energy awareness training
- Variable Speed Drives on hot and cold water pumps

#### Table 2: Ranked by greenhouse saving per dollar invested

Project	kgCO2-e saving
Regularly check air compressors for leaks in processing areas	281.3
Target 1% reduction of plant elect cost in refrigeration system through use of : door strips fitted & improved chiller utilisation, door control	59.4
Implement a compressed air leak reduction program and compressor control	49.40
Insulate un-insulated steam pipe, scalding water tanks, boiler feed water tanks and tallow tank	36.84
Education Program, Turn Lights Off	33.3
Energy awareness and management program	28.5
Heat Recovery Unit on 2nd Boiler	27.2
Review boiler operations retune the 5000KW boiler for more efficient low fire operations	26.6
Insulate un-insulated refrigerant pipe	26.32
Skins Area Lighting	19.2
Recycle evaporation water from stick water process	16.55
Steam and water pipe insulation	14.1
Roof space lighting	12.4
New Air Compressor at Rendering Plant	12.3
Installed VSD on 2 hot water pumps to match flow to demand on all processing floors. Now monitoring.	12.0
Install Internal Doors in Chillers	8.82
Installed VSD on 2 cold water pumps to match flow to demand on all processing floors. Now monitoring	8.1
Maintenance Area Lighting Controls	7.7
Replace hot water pipes to reduce hot water waste	7.2
Energy Audit 6.3.3 VSD in Blast Freezer fans	7.1
Energy Audit 6.4 Flash Steam recovery in Rendering Plant	6.8
Carcase wash to Rendering	6.34
Install economisers for boilers to preheat the boiler feed water temperature	5.74
Install variable speed drives on boilers ID fans, FD fans and boiler feed water pumps	5.27
Replace steriliser nozzles in processing area	5.1
Condenser replacement	5.1
Chiller Lighting	5.0
Energy management control system	5.0
Review air requirements for product lines in rendering plant	4.85
Further Processing Room Lighting	4.7

Project	kgCO2-e saving
Reclaimed Water Project - reuse class B water	4.6
Replacement spray sterilisers	4.30
Trial Citect System for real time reporting of all inputs	3.96
Heat recovery from hot gas	3.5
Replacement spray steriliser	3.32
Replace two gear sterilisers with one steam heated, insulated steriliser.	3.0
Remove electric heating from cryovac shrink tunnels, replace with steam.	2.9
Cold store Lighting	2.9
Change to variable flow	2.8
Fit evisceration table with reduced flow nozzles (estimate 50% reduction)	2.6
Boiler economiser	2.5
Boiler Feed Water recovery from condensate water return from abattoir	2.5
Power Factor Upgrade	2.44
Cogeneration	2.40
Reduce size , insulate & control flow in boning room kit sterilisers	2.3
Reduce size , insulate & control flow of slaughter floor knife sterilisers	1.7
Heat exchanger condensate recovery	1.6
Boiler precision combustion control	1.5
Energy Efficient Lighting	0.95
Compressed air system review	0.9
Biomass Plant	0.61
Connect water flow meters to CITECT; establish monitoring systems and alarm	0.3
feedback to operators.	0.0
Economisers installed on two new bollers	0.2
High procesure bet water ring main	0.2
Convert to more efficient bester	0.2
Convent to more enicient neater	0.16
New poliers commissioned in January 2010	0.1
Ensure all waste heat from rendering is converted to plant not water	no capital
Delay non-essential equipment until required	no capital
Reduce solid general waste collection by 1/3 - approx. 25t to recycling	no capital
Freezer door management	no capital
Shut down at the end of the cleaning shift	no capital
Convert cars to diesel	no capital
Conversion of heat lamps	no capital
Implement Geothermal water supply as substitute to existing potable supply	no capital
Implement 1.5MW Cogeneration Plant.	no capital

#### 3.3 Ranked by energy saving per dollar invested

Details are provided in Table 3 of opportunities ranked by energy savings per dollar invested, from the largest to the smallest.

Projects that provided the best energy saving per dollar invested related to:

- Refrigeration control (door strips, door control)
- Delaying non-essential equipment startup
- Insulating steam and refrigerant pipe
- Economisers on boilers, boiler tuning, flash steam recovery
- Compressed air leak program
- Improved heat recovery from rendering

#### Table 3: Ranked by energy saving per dollar invested

Project	MJ saving
Target 1% reduction of plant elect cost in refrigeration system through use of : door	507.2
Strips litted & improved chiller utilisation, door control	507.0
Insulate up insulated steam pine, scalding water tanks, boiler feed water tanks and	507.0
tallow tank	375.7
Ensure all waste heat from rendering is converted to plant hot water	309.6
Insulate un-insulated refrigerant pipe	254.4
Heat Recovery Unit on 2nd Boiler	253.2
Economisers installed on two new boilers	245.5
New boilers commissioned in January 2010	244.0
Recycle evaporation water from stick water process	228.1
Review boiler operations retune the 5000KW boiler for more efficient low fire operations	219.3
Implement a compressed air leak reduction program and compressor control	180.7
Replace heat exchanger to reduce hot water waste	178.6
Energy Audit 6.4 Flash Steam recovery in Rendering Plant	173.9
Reclaimed Water Project - reuse class B water	137.7
Replace hot water pipes to reduce hot water waste	132.2
Replace steriliser nozzles in processing area	114.7
Monitor and replace worn out hand held hoses in processing area	92.7
Carcase wash to Rendering	87.4
Conversion of heat lamps	78.4
Replacement spray sterilisers	65.1
Install economisers for boilers to preheat the boiler feed water temperature	58.5
Freezer door management	56.5
Shut down at the end of the cleaning shift	56.5
Regularly check air compressors for leaks in processing areas	56.5
Replacement spray steriliser	50.2
Boiler Feed Water recovery from condensate water return from abattoir	49.1
New Air Compressor at Rendering Plant	44.7
Installed VSD on 2 not water pumps to match flow to demand on all processing floors. Now monitoring.	41.9
Compressed air system review	41.9
Installed VSD on 2 cold water pumps to match flow to demand on all processing floors. Now monitoring	41.9
Energy Audit 6.3.3 VSD in Blast Freezer fans	40.4
Chiller Lighting	38.0
Skins Area Lighting	37.8
Maintenance Area Lighting Controls	37.6
Cold store Lighting	37.3
Further Processing Room Lighting	37.3
Trial Citect System for real time reporting of all inputs	37.2
Remove electric heating from cryovac shrink tunnels, replace with steam.	37.0
Reduce size , insulate & control flow of slaughter floor knife sterilisers	36.2
Reduce size , insulate & control flow in boning room kit sterilisers	34.4
Convert to more efficient heater	32.7

Project	MJ saving
Install Internal Doors in Chillers	30.0
Replace two gear sterilisers with one steam heated, insulated steriliser.	24.7
Education Program, Turn Lights Off	21.6
Change to variable flow	18.9
Install variable speed drives on boilers ID fans, FD fans and boiler feed water pumps	17.8
Review air requirements for product lines in rendering plant	17.7
Biomass Plant	9.0
Power Factor Upgrade	8.9
Fit evisceration table with reduced flow nozzles (estimate 50% reduction)	6.7
Energy Efficient Lighting	3.2

## 4. Summary of opportunities by site and state

For the NSW ESAP Program, the summary details were as follows:

- 6 of the 7 participants submitted information, with only Northern Co-operative Meats declining to be involved
- Of the 6 who submitted information, one company submitted only project information and an indicative payback period, which meant that the data could not be analysed in as much detail. One company provided capital cost and greenhouse saving but not financial savings, so this data could not be analysed in as much detail either.
- Average of 7 projects identified per site, with a minimum of 2 and a maximum of 15, total of 41 projects identified
- Average payback period for all opportunities was 15 years, skewed largely by the 18 year payback biomass plant, 93 year payback energy efficient lighting project and cogeneration project. Without these 3 projects, the average payback period is 2.57 years
- Project financial details included:
  - Total project costs of \$30,464K (or \$30.5M)
  - Total energy savings of \$1,732K (85% of total savings)
  - Total peak demand savings of \$162K (8% of total savings)
  - Total maintenance or other cost savings of \$148K (7% of total savings)
  - Project environmental annual savings included:
    - o 273,736 GJ energy
    - 40,665 tCO<sub>2-e</sub> greenhouse
    - $\circ \quad \ \ 4,687 \ kVA \ winter \ peak \ demand \ reduction$
    - 4,499 kVA summer peak demand reduction
  - Average performance indicator savings per dollar invested included:
    - o 9.0 MJ of energy
    - 1.33 kg CO2-e greenhouse
- Of the 41 total projects, full data was provided for 21. 2 projects required no capital expenditure, average capital cost for all projects was \$743K (including those that had no capital expenditure), 1 project cost under \$1K and had average paybacks of 0.5 years, there were 3 projects between \$1K and \$10K, 17 projects cost between \$10K and \$100K and had average paybacks of 5 years (which included the lighting project with a 92.6 year payback), there were 9 projects over \$100K with an average payback of 19 years.
- Project with the single largest greenhouse saving was the cogeneration plant (19,233 tCO<sub>2-e</sub> per annum), next closest was 12,240 tCO<sub>2-e</sub> per annum for the biomass plant

#### For the Victorian EREP program, summary details were as follows:

- Average of 9 opportunities identified per site, with a minimum of 1 and maximum of 17, with a total of 103 projects at the 11 sites
- Average payback period for all opportunities was 1.5 years
- Project financial details included:
  - Total project costs of \$2,930K
  - Total energy savings of \$568K per year (29% of total savings)
  - Total water savings of \$458K per year (23% of total savings)
  - Total waste savings of \$599K per year (30% of total savings)
- Total "other" cost savings of \$349K per year (18% of total savings)
  - Project environmental annual savings included:
    - o 121,455 GJ energy
    - 17,822 tCO<sub>2-e</sub> greenhouse
    - o 457.5ML water
    - 724 t solid waste
    - o 272 ML of liquid waste
- Average performance indicator savings per dollar invested included:

- o 61.5 MJ of energy
- 6.1 kg CO2-e greenhouse
- $\circ$  0.2 kL of water
- 23 projects required no capital expenditure, average capital cost for all projects was \$36.6K (excluding those that had no capital expenditure), 11 projects cost under \$1K and had average paybacks of 0.6 years, 32 projects has capital costs of between \$1-5K and payback of 0.8 years, 9 projects cost between \$5-10K and had paybacks of 2.5 years, 23 projects cost between \$10-100K and had average paybacks of 5.3 years (2 years when 1 project was removed), 5 projects cost more than \$100K and had average paybacks of 5.3 years
- Project with the single largest greenhouse saving was 1.5MW cogeneration plant (9,870 tCO<sub>2-e</sub> per annum), next closest was 1,322 tCO<sub>2-e</sub> per annum for a heat recovery unit on a boiler

Comparisons between the two state programs provide the following information

- NSW program identified fewer opportunities, but was principally centred on electricity, not on energy, water and waste as the Victorian program was
- The Victorian program identified more projects with smaller capital requirements and shorter payback periods
- On average, the Victorian projects saved more energy and more greenhouse emissions per dollar invested, by factors of 7 and 5 respectively. This tends to indicate that smaller capital projects may provide better energy and greenhouse savings, so that small incremental improvements in energy efficiency can be a better investment than larger scale step-change projects

### 5. References

Meat and Livestock Australia, "Eco-Efficiency Manual for Meat Processing", 2002.

Meat and Livestock Australia, "Red Meat Processing Industry Energy Efficiency Manual", 2009.

## Appendix 1. List of all projects by capital cost

Measure Description	Capital Cost \$	Energy cost savings \$ p.a.	Other cost savings \$ p.a.	Total cost savings	Payback period years	Energy savings GJ p.a.	Greenhouse gas reduction tCO2 p.a.	kg CO2-e per \$ invested	MJ per \$ invested
Paper Recycling	50		18,382	18,382					
Plastic & Other Recycling	50		5,448	5,448					
Insulate un-insulated refrigerant pipe	114	210	35	245	0.47	29			254.4
Education Program, Turn Lights Off	150	1,000		1,000	0.2	22	5	33.3	21.6
Skins Area Lighting	600	900		900	0.7	34	12	19.2	37.8
Replace Shower heads	700	25	7,971	7,996	0.1				
Cold store Lighting	700	150		150	4.7	6	2	2.9	37.3
Reposition aerator for more even DO concentration in aerobic lagoon	1,000		5,000	5,000	0.2				
Review boiler operations retune the 5000KW boiler for more efficient low fire operations	1,000	2,120		2,120	0.5	465	27	26.6	219.3
Procedure: identify resource efficiency outcomes of projects approved on other grounds	1,000								
Establish KPI for cleaning water consumption. Set target for reduction, e.g. 10%.	1,000								
Trial recovery and reuse of steriliser water in stockyards	1,000		91,259	91,259					
Maintenance Area Lighting Controls	1,100	670		670	1.6	25	9	7.7	37.6

Measure Description	Capital Cost \$	Energy cost savings \$ p.a.	Other cost savings \$ p.a.	Total cost savings	Payback period years	Energy savings GJ p.a.	Greenhouse gas reduction tCO2 p.a.	kg CO2-e per \$ invested	MJ per \$ invested
Conversion of electric water heaters to solar (provided that a rebate still exists)	1,200			-					
Fit slaughter floor Y-cut water faucet with flow reduction nozzles	1,500		5,255	5,255	0.3				
Install water meters	1,500		500	500	3.0				
Target 1% reduction of plant elect cost in refrigeration system through use of : door strips fitted & improved chiller utilisation, door control	1,840	636		636	2.9	322.6	109.3	59.4	507.2
Energy meter installation	2,000								
Hot water meter installation	2,000								
Improving cardboard packaging machine	2,000		2,000	2,000	1.0				
Regularly check air compressors for leaks in processing areas	2,200	30,090		30,090	0.1	1,700	619	281.3	56.5
Refrigeration System A Tower 4, repair leaks on cooling towers	2,500		102,724	102,724					
Refrigeration System A Tower 5, repair / replace make up valve and ball float on cooling towers	2,500		102,724	102,724					
Refrigeration System B Towers 1&2, repair tower basin, reduce splash out on cooling towers	2,500		5,602	5,602	0.4				
Update and review data at site	3,000	5,000		5,000	0.6				

Measure Description	Capital Cost \$	Energy cost savings \$ p.a.	Other cost savings \$ p.a.	Total cost savings	Payback period years	Energy savings GJ p.a.	Greenhouse gas reduction tCO2 p.a.	kg CO2-e per \$ invested	MJ per \$ invested
Fit slaughter floor final wash with reduced flow nozzles (estimate 41% reduction)	3,080		16,194	16,194	0.2				
Fit evisceration table with reduced flow nozzles (estimate 50% reduction)	3,520	564	25,302	25,866	0.1	174.5	9.2	2.6	6.7
Fit slaughter floor at Evisceration pluck with foot operated valve	3,600		11,211	11,211	0.3				
Reposition alum dosing point in aerobic lagoon	4,000		5,000	5,000	0.8				
Tree planting around site boundary	4,000		703	703	5.7				
Rendering System C Tower, increase sump capacity, repair make up valve, control overflow on cooling towers	4,000		143,085	143,085					
Condenser towers BAC1 & Muller: Install pulse output water meters in make-up line	4,000		3,460	3,460	1.2				
Roof space lighting	4,500						56	12.4	0.0
Steriliser Flow Restriction	4,700	25	59,181	59,206	0.1				
Hand Wash Flow Restriction	5,000	25	79,259	79,284	0.1				
Water treatment review	5,000								
Collate data from each electricity meter. Identify in general what each meter services & monitor.	5,000								

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Add environmental actions to maintenance job monitoring software when implemented	5,000								
Develop resource flow diagrams for energy, water and waste to upload with 2010 EREP.	5,000								
Educate staff re waste segregation, increase signage, initiate inspections and reporting	5,000								
Compost Waste Skins along with Wastewater Solids for beneficial reuse	5,000		75,000	75,000	0.1				
Compost Cardboard along with Wastewater Solids for beneficial reuse	5,000		30,000	30,000	0.2				
Replace two gear sterilisers with one steam heated, insulated steriliser.	5,000	2,000	6,084	8,084	0.6	200	15	3.0	24.7
Install VSD on tripe washer to reduce wear on mechanical parts.	5,000		2,011	2,011	2.5				
Remove electric heating from cryovac shrink tunnels, replace with steam.	5,000	1,166		1,166	4.3	43.2	14.6	2.9	37.0
new chute to eliminate water use in slaughter floor wax eye chute spray	5,200		3,005	3,005	1.7				
Compressed air system review	5,200	3,636		3,636	1.4	152	5	0.9	41.9

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Installed VSD on 2 hot water pumps to match flow to demand on all processing floors. Now monitoring.	7,000	5,537		5,537	1.3	232	84	12.0	41.9
Convert to bowl drinkers for 1400 sows	7,000		5,000	5,000	1.4				
Water savings as per WaterPlan	8,000		21,000	21,000	0.4				
Heat exchanger condensate recovery	8,500						14	1.6	
Steam and water pipe insulation	8,560						121	14.1	
Further Processing Room Lighting	9,500	3,485		3,485	2.7	130	45	4.7	37.3
Implement a compressed air leak reduction program and compressor control	10,000	35,000		35,000	0.29	1,807	494	49.40	180.7
Monitor and replace worn out hand held hoses in processing area	10,000	4,620	2,930	7,550	1.3	700			92.7
Installed 45000 litre rain water tank on new 800 sq meter new carton store to recover rain water	10,000		836	836	12.0				
Establish regular water leak inspection and repair procedure across site	10,000								
WaterLess Urinals	10,800		4,946	4,946	2.2				
Installed VSD on 2 cold water pumps to match flow to demand on all processing floors. Now monitoring	11,000	5,854		5,854	1.9	245	89	8.1	41.9

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Chiller Lighting	11,100	4,347		4,347	2.6	165	56	5.0	38.0
Reduce size , insulate & control flow in boning room kit sterilisers	11,868	657	5,255	5,912	2.0	203.4	27.6	2.3	34.4
Boiler Feed Water recovery from condensate water return from abattoir	12,000	3,044	7,702	10,746	1.1	528	30	2.5	49.1
Adopt and implement EMS	15,000								
New Air Compressor at Rendering Plant	16,225	11,036	2,040	13,076	1.2	584	200	12.3	44.7
Replace steriliser nozzles in processing area	18,000	11,880	3,809	15,689	1.1	1,800	92	5.1	114.7
Install VSD's into hot and cold water pumps	20,000								
Review air requirements for product lines in rendering plant	20,000	6,860		6,860	2.92	353	97	4.85	17.7
Install variable speed drives on boilers ID fans, FD fans and boiler feed water pumps	22,000	10,464	925	11,389	1.93	392			17.8
Energy awareness and management program	22,000						627	28.5	
Convert to more efficient heater	25,000	321		321	77.9	11	4	0.16	32.7
Insulate un-insulated steam pipe, scalding water tanks, boiler feed water tanks and tallow tank	25,838	34,575		34,575	0.75	9,708			375.7
Replacement of X-Ray Machine with Metal Detector	32,000		96,250	96,250	0.3				

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High Pressure Hoses	32,000		11,000	11,000	2.9				
Install Smart Energy Meters	35,000				3.0				
Carcase wash to Rendering	35,000	12,854		12,854	2.72	3,060	222	6.34	87.4
Connect water flow meters to CITECT; establish monitoring systems and alarm feedback to operators.	40,000		45,536	45,536	0.9		12	0.3	
Replace heat exchanger to reduce hot water waste	40,000	75,000	8,978	83,978	0.5	15,000	10	0.2	178.6
Install Internal Doors in Chillers	45,000	15,000		15,000	3.0	1,350	397	8.82	30.0
Power factor correction	45,040								
Economisers installed on two new boilers	48,000	11,000		11,000	4.4	2,700	12	0.2	245.5
Reduce size , insulate & control flow of slaughter floor knife sterilisers	48,375	5,128	38,682	43,810	1.1	1,587.60	81.5	1.7	36.2
Heat Recovery Unit on 2nd Boiler	48,600	15,404		15,404	3.2	3,900	1,322	27.2	253.2
Replace hot water pipes to reduce hot water waste	53,000	37,500	19,238	56,738	0.9	7,500	384	7.2	132.2
Condenser replacement	59,960						305	5.1	
Recycle evaporation water from stick water process	60,000	21,600		21,600	2.78	13,686	993	16.55	228.1
Boiler economiser	62,200						159	2.5	
Energy Audit 6.3.3 VSD in Blast Freezer fans	65,000	33,375		33,375	1.9	1,350	460	7.1	40.4
Boiler precision combustion control	65,720						100	1.5	
Change to variable flow	70,000	17,538		17,538	4.0	332	194	2.8	18.9

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Install sub-metering of water, investigate efficiency opportunities.	75,000								
Belt Wash System	80,000		21,230	21,230	3.8				
Heat recovery from hot gas	86,000						299	3.5	
Replacement spray sterilisers	90,392	32,451		32,451	2.79	5,887	389	4.30	65.1
Energy Efficient Lighting	100,000	1,080		1,080	92.59	324	95	0.95	3.2
Additional variable speed drives will be installed on pumps	100,000		17,000	17,000	5.9				
Energy Audit 6.4 Flash Steam recovery in Rendering Plant	100,000	76,004		76,004	1.3	13,218	680	6.8	173.9
Replacement spray steriliser	110,000	30,000		30,000	3.67	5,520	365	3.32	50.2
Develop long-term secure outlet for stock manure, paunch and DAF float from stockyards area	110,000								
Install economisers for boilers to preheat the boiler feed water temperature	120,000	17,766		17,766	6.75	7,020			58.5
Power Factor Upgrade	120,890	23,868		23,868	5.06	1,080	295	2.44	8.9
Recover clean wastewater from abattoir, reuse at Rendering Plant	145,000		175,800	175,800	0.8				
Reclaimed Water Project - reuse class B water	221,020	89,008	54,662	143,670	1.5	19,779	1,010	4.6	137.7
Energy management control system	285,700						1,417	5.0	

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Revised Use of Cogeneration Plant	300,000	71,500	189,280	260,780	1.15	- 13,000	- 3,817	- 12.72	-43.3
High pressure hot water ring main	311,209						55	0.2	
Trial Citect System for real time reporting of all inputs	390,000	100,000		100,000	3.90	14,520	1,545	3.96	37.2
new boilers commissioned in January 2010	550,000	50,000		50,000	11.0	12,200	54	0.1	244.0
Implementation of Distech Vacuum Distillation technology for the treatment wastewater	750,000		56,000	56,000	13.4				
Cogeneration	8,000,000						19,233	2.40	
Biomass Plant	20,000,000	1,000,000	120,000	1,120,000	17.86	180,000	12,240	0.61	9.0
Carcase Wash		319,000		319,000		42,000	2,776		
Ensure all waste heat from rendering is converted to plant hot water		6,057		6,057		1,875.30	96.2		309.6
Delay non-essential equipment until required		426		426		216	73.2		507.0
Reduce solid general waste collection by 1/3 - approx. 25t to recycling			1,555	1,555			55		
Freezer door management		7,080		7,080		400	146		56.5
Shut down at the end of the cleaning shift		7,080		7,080		400	146		56.5
Maintain monthly records on water use per head killed									

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Water conservation to be made an agenda at monthly management meeting									
Water awareness program. Reset targets for water reductions through increased operator awareness									
Convert cars to diesel		7,466		7,466			2		
Conversion of heat lamps		31,321		31,321		2,455	862		78.4
Implement Geothermal water supply as substitute to existing potable supply.						20,800	900		
Implement 1.5MW Cogeneration Plant.						10,000	9,870		
Incorporate resource efficiency into induction procedure. Strong management input.									
Adapt and implement EMS									
Procedure: identify resource efficiency outcomes of projects approved on other grounds									
Develop resource flow diagrams for energy, water and waste to upload with 2010 EREP.									
Establish training program re waste segregation, increase signage, initiate inspections, reporting									

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Investigate and trial high pressure, low volume cleaning system.									
Investigate recommendations from Macutex energy audit - enter in register.									
Collate data from hot and warm water meters. Analyse regularly to drive improvements									
Install further sub-metering of water, investigate efficiency opportunities.									
Install sub-meter to hot water and warm water to kill & boning floors. (Initial installation failed)									
Develop strategic plan for low water use: goals, objectives, timelines, reviews - strong Management input.									
Power Factor Correction					3.00				
Boiler Tuning					3.00				
Flash steam recovery - to pre-heat water used as warm water in plant					3.00				
Reducing hot water temperature - water for cleaning from 5pm to 5am adjusted to 68 degrees C					3.00				
Power Metering					3.00				

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Reduce air conditioning hours in cold beef passage, frozen load out and frozen annex during nights and on weekends					3.00				
Installation of gas and electricity sub- metering					3.00				
Ammonia - increase high stage suction return line from the fab					3.00				
VSD on motors - 55kW biofilter, 55kW Tallow Polisher, 2x75kW Saveall Pumps					3.00				
Motor system efficiency program							430		