AM10-5029

Prime Minister's Task Group On Energy Efficiency

Red Meat Background Report

April 2010

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Purpose

The Federal Government has established a Task Group on Energy Efficiency, which is to report to the Prime Minister by mid-2010 on options to deliver a step change improvement in Australia's energy efficiency by 2020. The Task Group has released an Issues Paper to catalyse discussion and submissions have been called for. The closing date for submissions is 3 May 2010. This process is intended to assist with formulating Federal Government policy on energy efficiency and greenhouse emissions and as such, it is timely and pertinent for the red meat industry to ensure that the issues, future needs and options of its members are investigated and can be used to inform it's stakeholders in any consultation process going forward.

This Report will provide information that can be used to build on future investigations and options relating to energy use and efficiencies within the red meat processing sector. **Given the likely deferral of the CPRS until 2013, this provides a unique opportunity to reduce the emissions intensity of the industry prior to fiscal intervention via the CPRS.**

Executive Summary

The key issues identified for the red meat industry to assist with improving energy efficiency are:

- Recognition that energy efficiency and greenhouse emissions are linked, but in the case of renewable energy, energy efficiency may decrease even though greenhouse emissions reduce substantially
- **CPRS/NGER treatment of Scope 1 emissions** from cogeneration/ trigeneration – grid electricity emissions are scope 2 so not included in CPRS, larger plants may trigger CPRS threshold if cogen/trigen implemented
- **Subsidised energy audits**, to assist with identifying opportunities, which allow local utility costs and supply issues to be considered in detail, including renewable energy supply options → feed into online national database organised by industry sector code (US ITP model)
- **Immediate deductions for feasibility studies** for large capital projects
- **Accelerated depreciation and/or standing offer grants** for smaller items (pumps, motors, boiler efficiency), to assist with replacing prior to end of life
- **Grants or subsidies for large capital projects** and accelerated depreciation for the residual
- **Feed-in tariffs** for any excess electricity generated at plants that can be exported to the grid

- **Guaranteed network access** and transparent process for approvals – for embedded generation projects, particularly those which have the potential to export
- **Support to develop training packages and resources** - for economic decision makers (plant management), operations and maintenance personnel etc (US ITP model) as per skills gaps identified for cogen/trigen/ renewables
- **Support to develop integrated local energy supply solutions, particularly for renewable energy supply** – assist red meat industry to engage with its own supply chain and other local agribusiness supply chains, to optimise use of local renewable resources
- Support to produce **blueprints** for step change projects which feed into **roadmap** for red meat industry – to link all the knowledge into a cohesive plan

Australia is widely regarded as an example of a country where a failure to put the right regulatory framework in place has hindered the development of the biofuel sector. At present, about 70% of Australia's tallow production is exported but with the right regulatory framework, this could be delivering efficiency and greenhouse savings to the Australian economy.

Specific issues relating to **biodiesel** are:

- excise and potential significant negative impact on industry in absence of any other government support
- lack of a mandatory % of biodiesel in petroleum diesel
- government use of biodiesel in its own transport fleet at Federal, State and local level eg public transport, rail
- government support for building plant capacity and associated infrastructure, such as transport

The potential energy and greenhouse savings are summarised as follows:

Technology	Efficiency saving	Greenhouse savings for whole industry (tCO_{2-e})	Cars off the road annual equivalent
Cogeneration	10-20%	467,008	111,192
Bioenergy	varies	597,451	142,250
Tallow Biodiesel – stationery energy	varies	1,434,175	341,470
Tallow Biodiesel – transport energy	varies	1,384,180	329,567

1. Industry energy intensity and benchmarks

Red meat processing plants use electricity purchased from the electricity supply network and fuel for boilers to generate steam and hot water. This document will refer to a typical meat processing plant which includes rendering.

The boiler fuel varies depending on what fuels are available at the plant location – generally plants that have access to natural gas use it for boiler fuel, sites that don't use a variety of non-renewable fuels such as coal, fuel oil etc. There are a handful of plants that have biomass fired boilers (Northern Cooperative Meats, Wingham Beef Exports, Ramsey) and these are located near forestry industries. Steam is principally used in rendering (81%), with 13% used for hot water production and about 5% system losses[1]. A relatively high degree of heat integration exists at most plants as heat is recovered from rendering to produce hot water, which reduces the amount of steam required to top up the hot water temperature to 82°C supply temperature.

Plant obtain all their electricity from the electricity network, there are not currently any known plants with backup power generation onsite. There are two plants with a cogeneration plant supplying some of their electricity – Rockdale Beef and Midfield Meats. Electricity is used principally in the refrigeration system (about 54%), with about 37% used for motors (fans, pumps etc), 7% for air compressors and 2% for lighting. Peak electricity demand tends to occur on hot summer afternoons, due to the refrigeration load which coincides with the peak demand in the electricity supply network.

There have been a number of industry benchmarking studies completed, the most recent completed in 2003 and published in 2005.

Table 1: Key Performance Indicators (KPI) from MLA Industry environmental performance review, 2005

KPI	Lowest	Highest	Average	Unit
Greenhouse gas	1,722	6,178	525	$kgCO_{2-e}$/tHSCW
	92	979	76	$kgCO_{2-e}$/head
Energy Usage	238	891	3,389	MJ/tHSCW
	8.9	154	463	MJ/head

[1] figures are sourced from the Eco-Efficiency Manual for Meat Processing, MLA, 2002 unless otherwise stated

A study was completed in 2009 which looked at Energy Efficiency in plants, which included more detailed energy benchmarking information.

Table 2: Key Performance Indicators (KPI) from Red Meat Processing Industry Energy Efficiency Manual, 2010

KPI	Lowest	Highest	Average	Unit
Greenhouse gas	124	862	410	$kgCO_{2-e}$/tHSCW
Energy Usage	832	8,159	3,368	MJ/tHSCW
Electricity usage	79	623	271	kWh/tHSCW
Boiler fuel usage	549	5,917	2,391	MJ/tHSCW

The range in values in the above tables can be attributed to factors such as:

- Whether or not plants have onsite rendering, and whether rendering processes only material produced onsite or material from offsite
- Degree of further processing and value adding at plant, such skins treating/ fellmongering, pet food, wool scour, bone chip/gel plants, retail ready portions – production measure only looks at hot standard carcase weight off kill floor, not final products
- Type of processing equipment used onsite eg low vs high temperature rendering, blast vs plate freezers
- Boiler fuel available, solid fuel boilers are inherently less efficient than gas fired boilers
- Drought impact on stock weights, meaning less weight her head
- Small plants tend to be less mechanised, more tasks are completed manually
- Efficiency of generation, distribution and end use of heat and electricity

Further analysis of the data from Table 2 is provided below.

Table 3: Analysis of Key Performance Indicators (KPI) from Red Meat Processing Industry Energy Efficiency Manual, 2010

KPI	Lowest	Highest	Average	% of total	Unit
Greenhouse gas	124	862	410	-	$kgCO_{2-e}$/tHSCW
Energy Usage	832	8,159	3,368	-	MJ/tHSCW
Electricity usage	79	623	271		kWh/tHSCW
	284	2,243	976	29	MJ/tHSCW
	79	623	271	66	$kgCO_{2-e}$/tHSCW*
Boiler fuel usage	549	5,917	2,391	71	MJ/tHSCW

* based on assumption of 1kgCO2-e per kWh

Boiler fuel use accounts for about 70% of total energy use onsite, but generally only 35% of the greenhouse emissions. **Electricity use accounts for about 30% of the energy used onsite and about 65-70% of the greenhouse emissions for the site. Reducing the emissions intensity**

of electricity supply could therefore be key to reducing industry emissions.

Factors which are likely to **increase** the above KPI's in the absence of any policy measures include:

- Electricity
  - Refrigeration load increase due to climate change (higher temperatures and humidity)
  - Power quality and reliability likely to be worse due to climate change impacts such as storms/ extreme weather events → more start ups, shut downs, brownouts affecting sensitive equipment
  - Level of automation in plant, in part due to labour costs
  - More value adding onsite, such as retail ready portions
  - Drought meaning less stock available and plants running under capacity, so fixed portion of consumption becomes more significant
  - More stock being sources from feedlots, so increased refrigeration requirements due to higher fat content
- Boiler fuel
  - Food safety and quality requirements increasing need for cleaning and limited reuse and recycling options
  - More stock being sources from feedlots, increasing cleaning requirement

Economic factors which are likely to act to **decrease** the above KPI's in the absence of any policy measures include:

- Electricity
  - Peak electricity demand charges, such as critical peak pricing, as plant consumption often coincides with system peaks
  - Increasing electricity price due to expanded Mandatory Renewable Energy Target
- Boiler fuel
  - Competition for coal leading to increase in boiler fuel supply costs

The most significant current policy factors likely to act to **decrease** the above KPI's is the Carbon Pollution Reduction Scheme or an equivalent scheme which effectively levies a tax on carbon dioxide emissions. The Queensland Gas Policy resulted in a cogeneration plant being built at a pig processing facility but not at any red meat plants, despite the fact that Queensland has the large red meat processing plants in the country and 2 of the largest are located in grid constrained areas (JB Swift Dinmore and Teys Bros Beenleigh, in SE Qld).

If the current policy changes were designed to both optimise energy efficiency and reduce greenhouse emissions, then the red meat industry would look significantly different and would include:

- Cogeneration/trigeneration at sites, with excess power being exported to the local electricity network
- Biogas capture from anaerobic ponds or biodigesters, which process wastewater, manure and paunch generated onsite
- Wherever possible, cogeneration/trigeneration plant and boilers fuelled by locally sources, renewable biofuels, such as forestry wastes, municipal green waste, agricultural byproducts or residues. This may included dedicated energy crops, such as short rotation coppicing using treated effluent from plants
- Geothermal bores used for boiler feedwater preheating where available
- Biofuels from tallow used either as boiler fuel or as transport fuel
- Accelerated depreciation for energy efficient products would mean that equipment is replaced prior to end of life with more efficient options

2. The technical and economic potential of and barriers to efficiency

2.1 COGENERATION and TRIGENERATION

2.1.1 Cogeneration/Trigeneration Potential

Currently, almost all meat processing plants purchase electricity from the electricity supply network and generate their own steam and hot water onsite. Waste heat is recovered from rendering, but no waste heat is recovered from the refrigeration system and most sites do not have any heat pumps.

Cogeneration is well established and has been in existence since the 1800's and a cogeneration plant can be designed to fit almost any plant which uses heat and electricity at the same time. There are 3 main types for prime movers for producing the electricity:

- Gas turbines for sites with over 3MW electrical demand
- Reciprocating engines for sites with less than 3MW electrical demand
- Steam turbines or engines, ideal for solid fuels such as waste products

The waste heat can be recovered from the prime mover exhaust gases, jacket and lube oil cooling systems, and can be used to produce steam and hot water.

Using average values based on a coal fired boiler, this gives an overall efficiency of site energy use as follows:

Table 4: Average site energy efficiency – coal boiler + grid electricity

Electrical efficiency+	% of site energy use	Thermal efficiency	% of site energy use	Overall end use efficiency
28%	30%	60%	70%	50%

+ as received at plant, after transmission and distribution losses

Table 5: Average site energy efficiency – natural gas boiler + grid electricity

Electrical efficiency+	% of site energy use	Thermal efficiency	% of site energy use	Overall end use efficiency
28%	30%	80%	70%	64%

+ as received at plant, after transmission and distribution losses

By comparison, cogeneration can produce electrical and thermal energy with an overall efficiency up to 85%, depending on the plant configuration. In addition, many meat processing plants have a high heat to power ratio, so if the cogeneration plant was sized to provide all the plants heat needs, there would be excess power available to export to the local electricity network. **This equates to a potential 20% energy efficiency gain.**

The KR Castlemaine Food plant at Toowoomba, a pig processing plant, achieved an overall thermal efficiency of 75%, producing 4.5MW of electricity, of which 2.6MW was the peak site load and 7MW of steam and 3MW of hot water. If we assume the onsite boiler efficiency was 80% (natural gas), this provides a rough estimate of the overall site efficiency as 65%. **This represents a clear 10% increase in overall site energy efficiency.**

The improvements in terms of greenhouse savings are far more significant. The KR Castlemaine Food plant at Toowoomba, which was fuelled by natural gas, saved 12,000 $tCO_{2\text{-}e}$ per year.

The overall emissions intensity of cogeneration depends on the system configuration, but in using published data a comparison of power from a cogeneration plant with electricity purchased from the grid can be made. Depending on which state the plant is located in, cogeneration power onsite using natural gas can achieve greenhouse savings of 0.55 – 0.96 $kgCO_{2\text{-}e}$ per kWh produced and has **one third to one quarter the emissions intensity of electricity purchased from the grid.**

Table 6: Greenhouse emissions savings from cogeneration

Generation type	$kgCO_{2\text{-}e}$ /kWh	Greenhouse saving $kgCO_{2\text{-}e}$/kWh Vs 72% cogen	Vs 77% cogen
Gas cogeneration, 72% efficiency+	0.29	-	-
Gas cogeneration, 77% efficiency+	0.26	-	-
Grid electricity, NSW and ACT x	0.89	0.6	0.63
Grid electricity, Victoria x	1.22	0.93	0.96
Grid electricity, Queensland x	0.89	0.6	0.63
Grid electricity, South Australia x	0.77	0.48	0.51
Grid electricity, Western Australia x	0.84	0.55	0.58
Grid electricity, Tasmania x	0.23	-0.06	-0.03

+ from "Profiting from Cogeneration", DPIE, 1997
X all grid electricity figures from National Greenhouse Accounts (NGA) Factors, Jun09

To obtain a sense of the magnitude of greenhouse savings that could be obtained if the entire industry changed to natural gas cogeneration, if it was assumed that all electricity came from 77% natural gas fired cogeneration, the annual greenhouse saving would be 467,008 $tCO_{2\text{-}e}$ per year or the equivalent of taking 111,192 cars off the road[2] (note - this is not practical as not all sites have access to

[2] Taken from ABS Survey of Motor Vehicle Use (12 months ending October 2007) and June 2009 National Greenhouse Accounts Factors

natural gas but it does illustrate the potential magnitude of greenhouse savings which this industry could contribute).

Table 7: Best case scenario – greenhouse savings from red meat industry natural gas fired cogeneration

2007 production data	2,872,127 t HSCW/ year
77% cogeneration efficiency vs grid electricity from Qld	0.6 $kgCO_{2-e}$/kWh saving
Average electricity use	271 kWh/tHSCW
Total potential greenhouse saving from red meat cogeneration	467,008 tCO_{2-e}/year

Note that as this uses the electricity figure for Queensland, Victorian savings will be higher due to higher electricity greenhouse emissions in that state.

Trigeneration is similar to cogeneration, in that it produces heating and electricity from the one fuel source, but it also uses waste heat to provide cooling in an absorption refrigeration system. Absorption refrigeration systems are more expensive than the ammonia vapour compression systems normally used in the red meat industry, so the capital cost has to be offset by electricity savings.

A 1998[3] study in New Zealand found that, even when the cost of an absorption refrigeration system was discounted by the cost of a vapour compression system, it still had a pay back period of more than 4 years. The system studied used heat recovered from rendering to provide cooling for chilling, boning room air conditioning and precooling of refrigerant exiting the condensers, the temperature of the rendering waste heat was not suitable to provide freezing. The small scale of the system was another problem.

A project is currently underway with MLA to determine the exact extent of the energy and greenhouse savings from absorption refrigeration, looking at using the waste heat from a biogas cogeneration plant as the heat source.

2.1.2 Existing cogeneration plants in the red meat industry

Current examples in the red meat industry include reciprocating engine plants at Midfield Meat (1.5MW unit producing electricity and hot water) and Rockdale Beef (0.92 MW unit producing electricity and hot water). Wingham Beef has a high pressure biomass fired boiler installed, so at some future stage may install a steam engine to produce power onsite. Despite being a good technical fit, the absence of any significant presence of cogeneration or trigeneration is an indication that the right economic signals do no currently exist in this industry.

[3] "Energy Saving Opportunities Using Absorption Refrigeration - A Cost Benefit Study", S White and M Harris, MRDC Project 97PE/MU125, October 1998

The Burrangong Meat Plant biogas cogeneration project is the most recent and graphic example of why cogeneration and trigeneration projects need support if they are to be successfully implemented in this industry. Amongst other issues that crippled the project, and ultimately led to the company going into receivership, where:

- Difficulty in negotiating access to local electricity network for sale of excess power generated (plant was to be a peaking plant, so could have assisted with ameliorating network peak demand) – monopoly power of local network company meant company basically had no negotiating power at all
- Lack of transparent information about electricity network connection issues
- Additional cost required for interconnection with local network due to local fault levels
- Difficulty integrating heat recovery with plant heat needs
- Suitability of engines for biogas application
- Biogas generation rates higher than expected, meaning that downstream equipment (scrubber, flare etc) was undersized

Wingham Beef Exports (WBE) have installed a high pressure biomass fired boiler, which at some stage in the future could be integrated with a steam engine or turbine and used to generate electricity as well as steam for onsite use (ie cogeneration). Depending on how the prime mover is sized, there may even be excess electricity for export to the local grid. A similar system exists at Big River Timbers at Grafton, but it was only economic because it received a grant from the NSW State Government. At the present point in time, it is not economic for WBE to install the steam engine/turbine system.

2.1.3 Existing trigeneration plants in the red meat industry

There are not currently any trigeneration plants in the Australian red meat industry, but trigeneration is used in other industry, particularly for space heating and cooling of buildings. Examples include the Crown Casino in Melbourne which has to have backup electricity supply onsite to cover gaming machines.

2.1.4 Barriers to Cogeneration in the red meat industry

There have been a number of reports[4] about the barriers to distributed generation (DG) (including cogeneration) for the energy industry in general and the barriers identified include:

- **CPRS/ NGER treatment of Scope 1 emissions – electricity is scope 2 and not included in CPRS, sites implementing cogeneration/ trigeneration may end up triggering the 25,000 tCO2-e direct (Scope 1) emissions**
- Market distortions created by anti-competitive regulation
- Lack of transparent access to information about network issues
- Lack of incentives for distribution network service providers to support DG ie split incentives between key players in this market sector
- Need for streamlining of approvals, particularly to do with connection approvals
- No way to capture the network security benefits of DG
- No reward for DG environmental benefits
- Lack of consistent, cost-reflective electricity buyback prices for DG
- Apathy of current stakeholders – non-core business
- Lack of information about risk – financial, safety, project management[5]
- Lack of standard proforma contract
- Lack of information on operations eg troubleshooting guide
- Upfront cost of feasibility study to investigate best option for site
- Lack of assistance to companies wanting to investigate cogeneration, including lack of capital funding for projects where marginal
- Lack of accredited training relating to operation of cogeneration plant

There are additional issues which relate specifically to the red meat industry and there are:

- Economic
    - o Global financial crisis, ongoing drought, labour shortage due to mining boom and high Australian dollar → poor returns in the industry → interest constricted to core projects such as quality, safety, product development, lack of capital for major new projects ie projects must have < 2 year paybacks
    - o Not currently economic due to the difference between electricity and alternative fuel prices

[4] CSIRO Investigation Report ET/IR745R – "Solution to Distributed Generation barriers in the Australian Electricity Industry", S Miller and S White, February 2005
[5] SEDA Cogeneration Development Program Review, March 2003

- Due to the size of the cogeneration/trigeneration plant (ie small <10MW), too much risk for too little financial return
- Regional location, so often local networks have higher fault levels, meaning more costly safety protections required to connect to grid
- Not much has to gone wrong for a project to go from being marginally economic, to significantly uneconomic (as was the case with Burrangong Meats)

- Technical Risk
  - High degree of technical risk and innovation for this industry, due to lack of plants in industry → lack of industry knowledge
  - Lack of detailed information about projects such as cost, integration into existing plant, operating and maintenance issues
  - Non core nature of project
  - Not an established practice to use Build Own Operate or Build Own Operate Transfer project models in this industry, historical preference for Design and Construct
  - No history of Energy Performance Contracting in this industry
  - Lack of successful projects to date, existing projects have had significant technical issues (exception being Midfield Meats)
  - Lack of accredited training and trained personnel capable of operating and maintaining plant

2.1.5 Barriers to trigeneration in the red meat industry

Similar barriers exist to cogeneration, with some additional issues such as:

- Lack of information about greenhouse and energy savings
- Lack of information about technical "fit" to red meat industry
- No existing plants in red meat industry, so no industry knowledge, operating experience etc

2.2 BIOENERGY

2.2.1 Bioenergy Potential

Red meat processing plants have consistently been identified as possessing bioenergy feedstocks and the potential for onsite use of those feedstocks, creating a simple model for renewable energy supply.

Bioenergy feedstocks in the industry include:

- Biogas capture from anaerobic wastewater treatment
- Wet wastes (manure, paunch)
- Agricultural and forestry residues, from nearby agribusiness
- Energy crops, such as short rotation coppicing using treated wastewater
- Commercial or industrial waste, such as packaging, from own site and adjacent industries (especially in regional areas)
- Municipal solid waste from nearby town
- Byproducts, such as tallow

Feedstocks can be used directly or converted into other fuels using techniques such as:

- Anaerobic digestion, in wastewater treatment ponds or digesters
- Gasification or pyrolysis
- Fermentation or chemical processing

Feedstocks can be use in combustion or engine systems to produce electricity, heating, cooling, and used as transport fuels.

Some of the advantages for bioenergy include[6]:

- Reducing greenhouse emissions and air pollution by displacing fossil fuels
- Reduced reliance on oil imports
- Provide opportunities for regional and rural Australia
- Increase the reliability and diversity of electricity supplies
- Reduce the load on the electricity network through distributed generation
- Ability to utilise thermal energy, leading to higher overall energy efficiency
- Minimal infrastructure costs, as generators embedded within existing networks
- Supports existing enterprises

[6] From NSW Bioenergy Handbook, 2004 and Clean Energy Council "Australian BioEnergy Roadmap", 2008

- Help tackle salinity problems and improve biodiversity in some cases

As most of the red meat plants are located in rural and regional areas, there are additional benefits which would accrue to the local communities, such as:

- Permanent local jobs associated with growing, harvesting, processing and transporting feedstock materials
- Temporary jobs created during construction
- Agricultural diversification, creating another income stream for local business
- Environmental benefits, such as shelter belts for stock, assisting with tackling salinity
- Security of electricity supply improved
- Local energy supply, meaning less reliance on fuels and electricity from distant sites

In addition, a number of the potential feedstocks at a red meat plant can have their energy or carbon content reclaimed and the nutrient content can still be recycled back to agriculture. This could mean a reducing reliance on petro-based fertilisers, and an integrated industrial ecology approach to recycling nutrients within the catchment area. For example, manure and paunch are currently often recycled as soil conditioners, sometimes with composting prior to land application. By using these waste products for energy capture, they are being used for a higher value purpose and the nutrients can still be recycled.

NSW is the state that has done the most work on bioenergy potential and in the 2004 NSW Bioenergy Handbook identified that there is significant bioenergy resources which are currently available but not being utilised for electricity production, as outlined in

Table 8. **These resources could be used by red meat plants if they are located in the same physical location for thermal or electrical energy supply.** They represent low or carbon neutral alternatives to fossil fuels and could help with reducing the emissions intensity of thermal and electrical power use at a red meat plant. It could promote the local integration of agribusinesses at a given location, strengthening the local economy and profitability of the businesses within the regional area.

Table 8: Potential electricity generation capacity for NSW bioenergy from currently available resources

Feedstock	Current (MW)	Potential (MW)
Agricultural residues	17.5	740
Energy crops	None	550
Plantation residues	4	105
Sawmill wastes	16	42
Wet wastes	23	40
Municipal, industrial and commercial wastes	29	100
Total	89.5	1,577

The Australian Bioenergy Roadmap's (ABR) main focus is on the contribution renewable bioenergy can make to **electricity** supply in Australia. There is currently a target for 20% of Australia's electricity to come from renewable source by 2020, which equates to 60,000 GWh. The ABR estimated that 18% of this could come from bioenergy, as indicated in Table 9.

Table 9: Bioenergy target for electricity generation by 2020

Feedstock	2020 target GWh	%
Sugar cane	3,165	30
Wood-related wastes	2,948	28
Landfill gas	1,880	18
Sewage gas	901	8
Agricultural-related wastes	791	7
Urban biomass	721	7
Energy crops	218	2
Total	10,624	

The longer term potential for electricity generated from bioenergy shows a significantly different picture in terms of which feedstock will contribute most significantly. In particular, agricultural-related wastes will be the most significant contributor.

The longer term potential is about 7 times the 2020 target, and indicates the relative sizes of the underlying bioenergy resources. While this report was focussed on electricity generation, the issue for the red meat industry is that there are **significant bioenergy resources** in Australia and it would be advantageous to investigate how these can best be used by the industry. For example, if plants could use these renewable resources for **thermal or electrical energy production**, such as in a cogeneration plant.

Table 10: Bioenergy target for electricity generation by 2020

Feedstock	Long term potential GWh	%
Agricultural-related wastes	50,566	70
Sugar cane	7,800	11
Wood-related wastes	5,060	7
Urban biomass	4,320	6
Landfill gas	3,420	5
Sewage gas	929	1
Energy crops	534	1
Total	72,629	

Both the preceding documents focused on the potential of bioenergy to contribute to electrical energy supply because the data currently available on biomass for thermal energy in the stationery energy sector is not reliable. This lack of data has been identified as "a fundamental impediment to the future development of the (renewable) thermal energy sector" (ABR). **The greatest potential for renewable energy in the red meat sector lies in using it as a cogeneration fuel, where it would provide both thermal and electrical needs for a site. Ideally, if the cogeneration plant were sized to maximise energy efficiency, in many instances it would have excess electricity available for export into the local electricity network.**

The sector-specific objectives relating to agricultural-related wastes where developed as part of the Australia Bioenergy Roadmap were:

1. Ensure that agricultural sector has access to feed-in tariffs for bioenergy applications
2. Create an integrated supply chain for waste generated by the agricultural industry in order to ease feedstock logistics for bioenergy generation
3. Ensure that bioenergy take-up is encouraged with proven practices within the agricultural sector

2.2.2 Bioenergy greenhouse and energy savings

Greenhouse savings achievable from switching from fossil to renewable fuels are significant. However, sometimes the energy efficiency will decrease, for example if a plant switches from a gaseous or liquid fuel to a solid renewable fuel, such as wood waste. As such, it is important that **greenhouse savings are given priority over energy efficiency, as the ultimate aim should be to produce products with a lower carbon footprint.**

Using figures published by the Federal Government, we can compare the greenhouse saving between fuel types as outlined in Table 11. For example, every GJ of black coal that is replaced by wood saves about 87 $kgCO_{2-e}$.

Table 11: Greenhouse emissions savings from bioenergy for stationery energy

Fuel type	$kgCO_{2-e}$ /GJ	Greenhouse saving $kgCO_{2-e}$/GJ Vs wood	Vs biomass
Wood	**1.28**	-	**0.52**
Solid biomass	**1.8**	**-0.52**	-
Black coal	88.43	87.15	86.63
Biogas	**4.83**	**3.55**	**3.03**
Natural gas	51.33	50.05	49.53
LPG	59.9	58.62	58.1
Biodiesel	**0.26**	**-1.02**	**-1.54**
Heating oil	69.02	67.74	67.22
Fuel oil	73.13	71.85	71.33

all figures from National Greenhouse Accounts (NGA) Factors, Nov08

If a worst case scenario is assumed, that all the thermal energy currently used in the red meat industry was from coal and that this was all replaced by biomass, then the greenhouse saving is calculated to be **597,451 tCO_{2-e} per year or the equivalent of taking 142,250 cars off the road.**

Table 12: Greenhouse savings from red meat industry switching from coal to wood or biomass

2007 production data	2,872,127 t HSCW/ year
Greenhouse saving by replacing black coal with biomass	87 $kgCO_{2-e}$/GJ saving
Average thermal energy use	2,391 MJ/tHSCW or 2.391 GJ/tHSCW
Total potential greenhouse saving from red meat renewable thermal energy	597,451 tCO_{2-e}/year

If it was assumed that all the thermal energy currently used in the red meat industry was from natural gas and that this was all replaced by biogas, then the greenhouse saving is calculated to be 343,363 tCO_{2-e} per year. This is not technically feasible as few plants produce enough biogas to replace all their thermal fuel use, but it does illustrate the potential magnitude of greenhouse savings which this industry could contribute.

Table 13: Greenhouse savings from red meat industry switching from natural gas to biogas

2007 production data	2,872,127 t HSCW/ year
Greenhouse saving by replacing natural gas with biogas	50 $kgCO_{2-e}$/GJ saving
Average thermal energy use	2,391 MJ/tHSCW or 2.391 GJ/tHSCW
Total potential greenhouse saving from red meat renewable thermal energy	343,363 tCO_{2-e}/year

2.2.3 Barriers to bioenergy

Despite the significant potential contribution that bioenergy can make to Australia's energy future, a lack of supportive government policy has meant that the potential is largely unrealised. The focus to date has been on renewable **electricity**, with almost no focus at all on renewable **thermal** power production or cogeneration. As many meat processing companies also own farms and feedlots, there is good potential in this industry for improving the integration between stages in the supply chain. In particular, a plant could utilise its own treated wastewater to grow short rotation coppice energy crops on its own land, and then harvest and use this renewable fuel for energy supply at the plant, providing the plant with a higher level of energy security.

The barriers identified as relevant to the red meat sector are summarised here and are taken principally from the Australian Bioenergy Roadmap:

- Economic
    - Lack of consistent feed-in tariffs for small-scale bioenergy facilities
    - Lack of support for new technologies (urban biomass, thermal energy)
    - Lack of incentive programs for adoption and adaption of new technologies (wood wastes)
    - Ensure biosequestration is given same emphasis as other carbon sequestration technologies
    - Lack of support for renewable thermal energy supply
- Technical/Risk
    - Lack of information about and focus on thermal energy supply, with primary focus being on renewable electricity supply – R&D required to evaluate potential
    - Lack on integration between agricultural supply chains ie red meat and other agricultural business
    - Lack of information on proven practices
    - Energy costs – lack of information on economic harvesting techniques
    - Focus on energy crops to date has not been integrated within one industry, but has focused on replacing coal supply to existing coal fired generators, rather than on thermal/cogeneration energy potential in industries such as red meat processing
    - Federal and State regulatory regimes encourage sustainable use of wood waste for bioenergy

In a similar fashion to cogeneration and trigeneration, there are also significant barriers relating to the skills and knowledge of the current workforce and a lack of existing accredited training covering this area.

2.3 Access to capital funds, deployment and socialising outcomes

The industry has, for some time, been considering undertaking a number of pilot projects at different plant types, to develop an industry body of knowledge about renewable and sustainable projects such as cogeneration, trigeneration and bioenergy. The idea would be to trial different projects to cover the variety of meat processing plants that currently exist in Australia, develop project blueprints which cover the variations between plant configurations and then link the project blueprints in a sustainable energy roadmap for the industry.

The variables which would need to be covered in the pilot projects include:

- Fuel type available and cost eg coal, natural gas, site and regional biomass/bioenergy resources, network vs usage charges for utilities
- Process operations at plant eg kill floor, boning room, rendering (high vs low temperature), pet foods, skins treating, fellmongering, wool scour, value adding (eg retail ready), specialised products (eg gall, foetal blood, pituitary, ovaries/testes), offal, runners/casings, bone chip, bone gel
- Process operations within plant areas eg rendering – variations such as high vs low temperature, wet vs dry, batch vs continuous, dryer (direct, indirect), tallow processing, blood processing, heat recovery, waste product transfer to rendering (screw conveyors vs blow tanks)
- Degree of onsite refrigeration vs freezing
- Location issues relating to electricity supply eg transmission and distribution losses, local electricity system fault level, degree of local electricity network grid constraint, existence of other large users adjacent to site (independent export potential)
- Locational issues relating to plant site eg noise, traffic, nearest residences or sensitive locations (schools, hospital)
- How the plant is operated eg shifts in different process areas, operating hours

To date, the larger companies in the red meat industry, such as those participating in the Energy Efficiency Opportunities Program, have not been able to access capital funding from Federal Government programs such as Climate Ready or Retooling for Climate Change due to the financial requirements of those programs. The program requirements focus on turnover, rather than profit.

These larger companies are the ones which have the best economic and technical potential to implement successful projects, with the results being shared with the rest of the industry. Burrangong Meat

Processors is an unfortunate example of what can happen to a smaller meat processor who tried to implement a high risk renewable project – the plant closure was attributed by the General Manager to be largely due to the "budget black hole" created by the unsuccessful biogas capture cogeneration project.

The red meat industry generally manages R&D through Meat and Livestock Australia and the Meat Industry Training Council (MINTRAC) is in a perfect positive to convert the "learnings" from R&D projects into training products for the industry. This process ensures that information obtained through projects is shared by the industry as is the technical and economic risk of implementing innovative projects.

2.4 Barriers to deployment of energy efficiency improvements

The largest barrier to deployment of energy efficiency improvements is lack of capital funding, lack of suitable economic returns (payback period 2 years or less) and pressure for existing funding to be used for other objectives such as food safety, occupational health and safety and new product development.

The industry as a whole has been going through difficult times, as evidenced by the number of plants that have closed or been bought out. Projects must have at most a 2 year payback and due to the high Australian dollar, most export plants would need a payback of less than 1 year to consider implementing a project.

Given the sensitivity to payback periods, taxation incentives, such as accelerated depreciation or capital offsets, could provide a significant incentive to implement these projects.

2.5 Workforce skills and gaps created

At the present point in time, there is virtually no widely known industry experience with distributed generation (such as cogeneration and trigeneration) or bioenergy. If these technologies are to be implemented, then possible gaps in skills and knowledge will include:

- Project risk issues
    - Issues on integration with existing plant operations into design of new plant eg shutdown, maintenance, redundancy/ backup
    - Information on project management issues such as timelines, permitting requirements, design and construction issues, commissioning issues

  - Connection agreements for electricity network, time required to negotiate and potential impact on project budget
- Financial risk issues
  - Details of costs, benefits, sensitivity to changes in electricity and fuel prices, impact of carbon credit costs, availability of external financial support eg government grants/ loans
  - Fuel supply reliability, potential impact on project economics
  - Tariff for sale of excess power to local grid, impact on project economics
- Technical risk issues
  - Operating and Maintaining new plant → operating procedures and work instructions, training requirements for staff, certification or accreditation required to operate equipment
  - Troubleshooting guide to plant, covering problems that are most likely to arise and how to fix them

3. Review of models of regulatory intervention vs facilitation and taxation legislation

State and Federal Governments have tended to opt for regulatory requirements, rather than voluntary assistance programs.

When the Greenhouse Challenge Program was operational, the red meat industry had 26 members nationally participating, which at one stage accounted for nearly 25% of the manufacturing participants in the program.

Despite this fact, when the Energy Efficiency Opportunities (EEO) Act was implemented, no recognition was given for early actions, despite the fact that the Federal Government had always said that those who acted early would not be disadvantaged. The EEO program is highly prescriptive and basically requires a company to adopt a management system approach to managing energy, but it does not consider greenhouse emissions. **Some of the greatest opportunities for the red meat industry to contribute to a lower carbon economy lie in their bioenergy potential, which in many instances will reduce their energy efficiency, not improve it**. This lack of a comprehensive approach to sustainable energy supply through the EEO program and the duplication in Federal and State programs has led to a significant waste in resources in red meat processors, and no doubt other companies as well. In particular, the duplication between the Federal schemes (EEO, NPI, and NGER) and State schemes (EREP in Victoria, ESAP in NSW, SESP in Qld) should be removed – companies should only have to report energy use and greenhouse emissions once to government, not multiple times as current is the case. Company time spent on generating multiple reports for government would better be spent on managing energy use and efficiency.

It is interesting to compare the regulatory approach of Australia to the policy approach of the USA. The US Department of Energy (DOE) has operated an Industrial Technologies Program (ITP), which aims to have U.S. industry lead the world in energy efficiency and productivity. The ITP provides free energy audits for companies through a network of Assessment Centers that are linked to universities. The audits are followed up to check what has been implemented and the results are available through an online database, where audit results are grouped by industry code. This provides a fantastic resource as to what energy efficiency options are available within an industry.

The US DOE Industrial Technologies Program also provides

- Co-ordinated deployment of information through the BestPractices program
- free software tools for plant wide energy profiling, motors, compressed air, fans, pumps, chilled water, steam, combined heat and power (cogeneration/trigeneration), process heating,
- comprehensive technical publications resource that includes
  - market assessments,
  - handbooks and
  - technical fact sheets.
- Training packages and free webcast and free 1 – 3.5 day training programs covering all areas of energy efficiency
- benchmarking for a range of industry sectors (16 in total)
- sector assessments guides identifying energy-saving technologies and measures for a range of industries
- comprehensive information on emerging technologies and their applicability to industry
- comprehensive information on industry system optimisation for compressed air systems, fan systems, process heating, pump systems and steam systems
- databases of information such as BEST: Benchmarking and Energy Saving Tool, California Energy Balances, Enterprise Energy Management, Global Energy Demand Collaborative, Industrial Life Cycle Optimization, International Motor Software, MBase Cement
- database of accredited specialists, who are trained in using the software packages

The US Environmental Protection Agency runs an Energy Star program, which is similar to the Energy Smart Business Program that used to be run by the Sustainable Energy Development Authority in NSW (which is now incorporated into the Sustainability Advantage program).

The EU has numerous energy efficiency programs, such as the massive energy audit program called Save II (Audit I from 1998-200 and Audit II from 2001-2003). The Intelligent Energy Europe program (2004 onwards) covers more than 400 projects throughout the EU, such as energy efficiency, renewables, distributed generation and more.

In comparison, Australia's Energy Efficiency Best Practice Program has produced information for only 2 industries (aluminium and wineries) and has an online motors resource centre. Instead, Australia has tended to adopt mandatory requirements, rather than working co-operatively with business.

Some industries, like the red meat industry, have developed their own Environmental key performance indicators, Environmental Best Practice Guidelines and Energy Efficiency Manuals.

There is significant potential for both Federal and State government to adopt a stronger policy on supporting business to make the change to the new, lower carbon economy, through the sorts of ideas that are used in the US DOE Industrial Technologies Program, rather than more mandatory regulatory intervention.

3.1 Tax and Fiscal Policies for promotion of energy efficiency

There is not a **tax or fee on greenhouse emissions or energy use**, although the proposed Carbon Pollution Reduction Scheme is an emissions trading scheme which will provide a carbon signal in the economy. **Given the likely deferral of the CPRS until 2013, this provides a unique opportunity to reduce the emissions intensity of the industry prior to fiscal intervention via the CPRS.**

Fiscal policies relating to improved energy efficiency can include **grants or subsidies, subsidised audits, loans or tax relief.**

Most of the **grants** or **subsidies** have been rounds of rounding, rather than standing offers for agreed energy efficiency improvements or greenhouse reductions. There have been Federal Schemes, such as Climate Ready and Retooling for Climate Change and the earlier Greenhouse Gas Abatement Program, but because of the design of these programs, red meat plants have not benefited. Both the Climate Ready and Retooling for Climate Change programs were aimed at small and medium sized businesses, with annual turnover of less than $100 million. **This meant that the larger companies, who are more capable of managing complex projects, were not eligible.** The Greenhouse Gas Abatement Program required such a large amount of reduction within a project (>250,000 $tCO_{2\text{-}e}$ per year) that there would not have been any eligible projects, even at the largest plants. The AJ Bush Beaudesert biogas capture project obtained $715K funding from the Federal Food Innovation Grant (FIG) program (2007-2011) as part of the National Food Industry Strategy at Department of Agriculture, Fisheries and Forestry.

There have been State based **grant** schemes which meat processors have benefits from, such as

- NSW
    - Energy Savings Fund – money to Fletchers for power factor correction, $700K to Burrangong Meat Processors for biogas capture cogeneration project, $2.1M for Rockdale Beef biodigester project, $299K to Primo for Energy Management System (smallgoods manufacturer)
- Victoria

  - o Regional Infrastructure Development Funds (RIDF) - $3M to George Weston Castlemaine plant redevelopment
  - o Sustainability Victoria, Sustainable Manufacturing Program – CRF Colac carbon dioxide refrigerant and boiler heat recovery condensing unit, Midfield Meat cogeneration and geothermal bore project, now ResourceSmart Business program
- Queensland
  - o AJBush Beaudesert - $100K for biogas capture

These programs tend to be run as funding rounds, but some of the most successful energy efficiency programs are **standing offer programs**, such as those offered by New York State Energy Research and Development Authority (NYSERDA). NYSERDA has an existing facilities program, which offers incentives ($/unit) for pre-qualified energy-efficiency and conservation measures up to $30,000. For larger-scale projects, **performance-based incentives** are typically higher than pre-qualified incentives but are based on an engineering analysis and are potentially subject to measurement and verification (M&V) requirements. Both these programs run continuously, so applications can be made in line with the company requirements, rather than the company altering its normal processes to apply for a round of funding and then having to wait to hear if their project was successful.

Subsidised energy audits are offered from small and medium businesses as part of the NSW Sustainability Advantage program, and they used to be offered as part of the Enterprise Energy Audit Program (ceased operation in 1998) and Greenhouse Challenge Plus Program (ceased operation in 2009, free audits ceased prior to that date). Many countries have some sort of audit program, and most of these are subsidised, with subsidies varying from 40 to 100% of the cost of the audit[7]. The benefit of subsidised energy audits is that the information obtained can be used to inform industry and government on options available for improving efficiency. The LBNL report listed 23 OECD and 17 non-OECD countries that provide subsidised audits, including major competitors to the Australian red meat industry such as Brazil, Canada, Japan, UK and USA.

Public loans, at low or zero interest rates, are less popular than subsidies or grants.

Innovation funds, where banks and private capital are involved in energy efficiency, do not seem to exist on any appreciable scale in Australia. There is limited evidence that energy service companies (ESCO's) are providing **equity participation** through either energy

[7] "Tax and Fiscal Policies for Promotion of Industrial Energy Efficiency: A Survey of International Experience", L Price, C Galitsky, J Sinton, E Worrell, W Graus, LBNL-58128, September 2005

performance contracting (EPC)/ shared savings or guaranteed savings project models. One example would be Ergon Energy's involvement in the KR Castlemaine Cogeneration Power plant at Toowoomba in 2006, which has subsequently been decommissioned due to the plant closure. This is largely due to the Queensland Gas Scheme, which requires Queensland electricity retailers and other liable parties to source 13% of their electricity from gas-fired generation. EPC's are common in other industry sectors, particularly the commercial building sector.

Mandatory targets such as the Federal Government Mandatory Renewable Energy Target for electricity generation or set tariffs, such as a **mandated feed-in tariff** for small scale renewables (such as the Australian Federal solar PV tariff) are another means of promoting energy efficiency or renewable energy.

At present, there are no specific **tax relief incentives** to encourage companies to invest in energy efficiency or greenhouse friendly technology through accelerated depreciation, tax reductions and tax exemptions.

Accelerated depreciation allows accelerated write-off for specified energy efficiency or renewable energy equipment. Schemes exist in Canada, Japan, the Netherlands, Singapore and the UK, as detailed in Table 14.

Tax reductions, such as rebates or deductions, allow companies to deduct all or part of the cost of energy-efficiency equipment from annual profits. Generally, the equipment must be either pre-approved or be selected for an agreed list of technologies. Schemes currently exist in Japan, Korea, The Netherlands, UK and US. **Tax credits** can be used to provide incentives for clean energy, such as a per kilowatt hour credit for electricity generated by qualified energy resources, such as the US Renewable Energy Production Tax Credit.

Table 14: Financial Incentives in other countries

Country	Incentives
UK	• Enhanced Capital Allowance (ECA) - 100% of an investment in designated energy-saving plant and machinery written off against the taxable profits of the period in which the investment is made, must be on the on the Energy Technology Product List (ETPL), cover heat recovery, boiler systems, combined heat and power (cogeneration), compressed air, heat pumps, HVAC, lighting, motors, insulation, refrigeration, solar, UPS etc • SME Energy-Efficiency Loans – 0% loan for

Country	Incentives
	purchasing energy-efficient equipment £3,000 to £100,000 • Carbon Trust – free carbon surveys, online training, emerging technology grants and directory
Canada	• Canadian Renewable and Conservation Expenses (CRCE) is a category of fully deductible expenditures associated with the start-up of renewable energy and energy conservation projects, eligible expenditures involves certain intangible costs, such as feasibility and resource assessment studies, are 100 percent deductible in the year they are incurred or can be carried forward indefinitely for deduction in later years. This includes cogeneration and specified-waste fuelled electrical generation systems (municipal waste, wood waste, landfill gas or digester gas), heat recovery systems • Accelerated depreciation - Class 43.1 allows taxpayers to deduct the cost of eligible equipment at up to 30 percent per year, on a declining balance basis. This includes machinery and equipment, related soft costs for design, engineering and commissioning, other services required to make the system operational
Japan	Financial assistance program with special low interest rate for projects such as • Cogeneration over 50kW with primary energy efficiency over 60% • Project to reduce energy use by 10% if it will reduce oil use by 100kL/year • Electric power load levelling projects
Netherlands	• MIA Program - Up to 40 percent of the annual investment costs (purchase costs and production costs) are deductible from the fiscal profit over the calendar year in which the equipment was procured. • Vamil – accelerated depreciation of equipment costs

Country	Incentives
Singapore	• the capital expenditure on the qualifying energy efficient or energy-saving equipment can be written off in 1 year instead of three, replacement equipment must fall under the List of Approved Replacement Machines and Equipment, includes solar heating or cooling system, solar energy collection system, heat recovery, power factor controller, high efficiency electric motor, variable speed drive motor control, high frequency lighting, computerised energy management system • also Energy Efficiency Improvement Assistance Scheme (EASe) (provide up to 50% of the qualifying cost of engaging an expert consultant to conduct investment grade energy appraisals and recommend specific measures that can be implemented to improve energy efficiency)

Some countries have **integrated policies**, where a carbon tax or levy is linked to voluntary agreements, whereby companies which make a voluntary agreement with government are given a discount on the tax or levy.

Denmark introduced a carbon tax in 1992, and companies are given about a 20-25% saving on the carbon tax if they have an agreement with the government.

The UK introduced a Climate Change Levy in 2000, which is a tax on energy use. All energy used and electricity produced through combined heat and power (cogeneration) or with renewable fuels is not taxed. The levy was returned through a reduction in another government tax, and the funds raised were used in programs that provide financial incentives for adopting energy efficiency and renewable energy, such as the Enhanced Capital Allowance Scheme. If companies negotiate a Climate Change Agreement (CCA) and then achieve the specified energy efficiency improvements, they can be given up to an 80% discount on the Climate Change Levy. The goal of the CCAs was to achieve carbon dioxide emission reduced by 2.5 MtC by 2010, but a review of the first target period (2001-2002) indicated that 4.3 MtC had been achieved.

Some examples of projects indentified in the Red Meat Processing Industry Energy Efficiency Manual which could benefit from accelerated depreciation include:

	% of sites		% of sites
Thermal Energy Savings		**Electrical Energy Savings**	
Boiler burner tuning	100	Sub metering	100
Flash steam recovery	75	Reducing refrigeration lift	100
Boiler drum TDS level	67	Review boning rm fresh air	100
Blowdown heat recovery	42	Use plate freezers	33
Boiler economiser	92	Use dehumidifiers in freezer	83
Cooker waste heat recovery	58	Automate refrigeration system control	100
Increased condensate recovery	75	Floating heat condenser control	92
Steriliser waste heat recovery	75	Evaporative/ chilled water spray pre-cooling	100
Improved boiler part load performance	100	VSD on trim screw compressor	83
Reduction in hot water use	100	VSDs on evaporator fans	75
Electrical Energy Savings		Eliminate compressed air leaks	100
Optimise sequencing of air compressors	92	VSD on screw air compressors	92
Demand side management	83	Power factor correction	50
Purchase energy efficient motors	100	Improve lighting controls	100
Biogas capture and use	75	Cogeneration	100

The Clean Energy Council (CEC) report "Accelerating cleantech – future tax measure to accelerate the delivery of clean technologies in Australia", October 2009 identified a number of categories of cleantech initiatives which are relevant to the red meat industry, such as:

Consumer side	Supply side
• Energy efficiency	• Bioenergy
• Grid demand response	• Geothermal
• Power and efficiency management systems	• Water reuse and recycling technologies
• Lighting	• Waste water treatment
• Solar hot water	• Biochar production
• Water conservation and monitoring systems	• Recycled materials and products
• Waste reuse and recycling programs	• Energy recovery and use
• Refrigeration and HVAC systems	• Trigeneration plants for local power, heating and cooling
• Heat pumps	• biofuels

Some advantages of providing concessions through the tax system were identified in the CEC Cleantech report as:

- tend to be more equitable than grants as they are accessible to everyone
- more market based and provide greater accountability and transparency than grants which can be perceive as "picking winners"
- reducing the political risk of grants being perceived to be awarded inappropriately
- greater flexibility and allow business and investors to react quickly to new development and changing circumstances
- can be tightly regulated but with simpler administration than grants and subsidies, which required labour intensive application processes, administrative processes and political intervention to deal with applications and approvals

Options identified for accelerated depreciation include:

- increasing the 200% loading under the diminishing balance method
- introducing a loading on existing depreciating rates eg 18 or 20% on top of standard rate
- reduce write off period for capital allowance eg 5 years for an asset with a 10 year expected life

As part of the response to the Global Financial crisis, the Federal Government implemented a "Small Business and General Business Tax Break" investment allowance, which was effectively a bonus tax deduction at 50% for businesses with turnover of less than $2 million and 30% for other businesses, if the expenditure happened with a given time frame. A similar scheme could be developed for energy efficient technology that meets a certain minimum standard.

In terms of **what would best support the red meat industry to achieve innovation**, it would probably be a combination of:

- **Subsidised energy audits**, to assist with identifying opportunities, which allow local utility costs and supply issues to be considered in detail, including renewable energy supply options → feed into online national database organised by industry sector code (US ITP model)
- **Immediate deductions** for feasibility studies for large capital projects
- **Accelerated depreciation and/or standing offer grants for smaller items** (pumps, motors, boiler efficiency), to assist with replacing prior to end of life
- **CPRS/NGER treatment of Scope 1 emissions from cogeneration/ trigeneration** – grid electricity emissions are scope 2 so not

included in CPRS, larger plants may trigger CPRS threshold if cogen/trigen implemented
- **Grants or subsidies for large capital projects and accelerated depreciation for the residual**
- **Feed-in tariffs** for any excess electricity generated at plants that can be exported to the grid
- **Guaranteed network access and transparent process** – for embedded generation projects, particularly those which have the potential to export
- **Support to develop training packages and resources** - for economic decision makers (plant management), operations and maintenance personnel (US ITP model) as per skills gaps identified previously for cogen/trigen, renewables etc
- **Support to develop integrated local energy supply solutions, particularly for renewable energy supply** – assist red meat industry to engage with its own supply chain and other local agribusiness supply chains, to optimise use of local renewable resources
- **Support to produce blueprints for step change projects which feed into roadmap for red meat industry** – to link all the knowledge into a cohesive plan

3.2 Supporting energy efficiency through R&D

Some of the activities of red meat companies may meet the definition of **research and development (R&D)**, and be eligible for incentives through the **R&D tax concession**. In the 2007-2008 there were 7,754 companies registered for the tax concession.

The current **R&D tax concession** is comprised of:
- Tax deduction of up to 125% for R&D expenditure
- A 175% premium tax deduction for increase in R&D expenditure above a rolling three year average
- Must involve **innovation** (involving an appreciable level of novelty) OR involve **high level of technical risk** (applying the scientific method to close a knowledge gap), the purpose must be to create new knowledge or develop a new or improved product, process, material, device or service ie create new intellectual property

A consultation paper was issued at the end of 2009, covering proposed modifications to the research and development tax incentive, and then the first exposure draft of the legislation for the new scheme was released in December 2009. The second exposure draft legislation was released on 31Mar2010, with submissions taken up until 19Apr2010. The

Government still expects the new **R&D tax incentive** to start from 1 July 2010 and it is intended to offset tax payable.

The **new definition of core R&D** is that they are experimental activities:

- whose outcome cannot be known or determined in advance on the basis of current knowledge, information or experience, but can only be determined by applying a systematic progression of work that:
  - is based on principles of established science; and
  - proceeds from hypothesis to experiment, observation and evaluation, and leads to logical conclusions; and
- that are conducted for the purpose of acquiring new knowledge (including knowledge or information concerning the creation of new or improved materials, products, devices, processes or services).

This new definition more fairly reflects the sort of R&D which will occur at red meat plants, particularly relating to more complex projects such as cogeneration, trigeneration and bioenergy projects. **The amount of variation in key parameters between sites (as covered in 2.3) unfortunately means that a study conducted at one red meat plant will not necessarily be applicable at other sites, unless everything at the site is exactly the same and this is highly unlikely.**

The new R&D tax incentive provides for:

- tax offset for expenditure on eligible R&D activities and for the decline in value of depreciating assets used for eligible R&D activities. Neither tax offset is subject to an expenditure cap
- A 45 per cent refundable tax offset is available to R&D entities with an aggregated turnover of less than $20 million
- A 40 per cent non-refundable tax offset is available for all other R&D entities ie aggregated turnover more than $20 million, the potential benefit of this tax deduction will only be enjoyed when the company has sufficient profits to start paying income tax.

As a general rule, companies will receive a higher tax offset under the new scheme at 40 or 45% (depending on company turnover) than they could have under the existing scheme (125% tax deduction x 30% company tax rate = 37.5% effective tax credit) if they were not increasing their amount of R&D expenditure based on the previous 3 year average. If they had been increasing R&D levels, the effective tax credit could be more or less than under the previous scheme, depending on the incremental R&D expenditure above the 3 year average (ie 175% tax deduction x 30% company tax rate = 52.5% effective tax credit). This will vary between companies and little is known about R&D expenditure in red meat companies as they are mostly privately owned.

Regardless of whether the effective tax credit is more or less under the new scheme, companies with over $20 million turnover will only receive a benefit when they have sufficient profits to require payment of income tax. Given the current state of the industry, it would be anticipated that many companies were in a loss situation and would not have profits, but they can carry the tax credit forward.

3.3 Biofuels and Biodiesel

Australia is widely regarded as an example of a country where a failure to put the right regulatory framework in place has hindered the development of the biofuel sector[8].

Biodiesel is currently produced from feedstocks including tallow, used cooking oil, vegetable oil, poppy seed oil and soya at 10 plants located around Australia.

At present, about 70% of Australia's tallow production is exported. If we assume that all the Australian tallow production is used for biodiesel production, the greenhouse savings would be 1,434,174.83 $tCO_{2\text{-}e}$/year fro stationery energy and 1,384,180.20 $tCO_{2\text{-}e}$/year for transport fuels.

Table 15: Greenhouse savings from tallow biodiesel for stationery energy

Average annual tallow production		560,000 tonnes
Biodiesel yield from tallow		894 L/t
Greenhouse emissions	Petrodiesel Biodiesel	2.6827 $tCO_{2\text{-}e}$/kL 0.008996 $tCO_{2\text{-}e}$/kL
Total potential greenhouse saving from red meat renewable thermal energy		1,434,174.83 $tCO_{2\text{-}e}$/year 341,479 cars off road

Table 16: Greenhouse savings from tallow biodiesel for transport fuel

Average annual tallow production		560,000 tonnes
Biodiesel yield from tallow		894 L/t
Greenhouse emissions	Petrodiesel Biodiesel	2.69814 $tCO_{2\text{-}e}$/kL 0.11764 $tCO_{2\text{-}e}$/kL
Total potential greenhouse saving from red meat renewable thermal energy		1,384,180.20 $tCO_{2\text{-}e}$/year 329,567 cars off road

Please note that this may be an overestimate, as biodiesel can have 88-99% of the energy content of petrodiesel, depending on the feedstock and process.

At the present point in time, an excise of 38.143 cents per litre currently applies to petrol, ultra low sulphur diesel and biofuels. However, the effective excise rate for domestically produced ethanol and imported

[8] Render Magazine, April 2010, p57

and domestically produced biodiesel is effectively zero until 1 July 2011 due to the Energy Grants Cleaner Fuels Scheme (EGCFS) for biodiesel and the Ethanol Production Grant for ethanol.

From 1 July 2011 onwards, a 50 per cent discount on energy content fuel tax rates will apply to the excise rate of biofuels (and other alternative fuels). The EGCFS will start phasing down by 20 per cent per year from July 2011. The effective rates of excise will increase annually until final rates of 12.5 cents a litre for ethanol and 19.1 cents a litre for biodiesel are reached on 1 July 2015. In energy content terms, these final rates of excise represent a 50 per cent discount on the rates levied on petrol and diesel.

To date, there has not been a great deal of government support for biodiesel in terms of mandated percentages of diesel. Support has mainly been through the Biofuels Capital Grants Program and the EGCFS.

Existing schemes include:

- Federal - target of achieving 350 ML of biofuels production by 2010 as part of Biofuels Action Plan
- NSW – 2% biodiesel from 1st January 2010, RTA trials of B20 and B100 in Council trucks[9]
- Victoria – 5% biofuels target by 2010, expected that the target will be met easily, largely by biodiesel
- SA - the entire diesel metro rail and bus fleet have operated on B5 since March 2005, proportion to be increased progressively to B20
- WA – loans/grants for capital works,
- Biodiesel trials in NT, Qld, NSW, SA, WA

Given the lack of either Government mandatory biodiesel levels in normal diesel or widespread Government use of biodiesel in transport fleets, the demand has largely been left to consumer demand. There have not been any consumer education campaigns about biodiesel or bioethanol; in fact there was significant negative press about potential engine damage from using biofuels. Basically, the biodiesel

[9] The RTA assisted trials of biodiesel by Camden and Newcastle Councils. Camden used 100 per cent biodiesel (B100) in one of its waste trucks, while Newcastle City Council used a blend of 20 per cent biodiesel and 80 per cent diesel (B20) in 12 of its test vehicles. The RTA tested the emissions of the vehicles to quantify environmental benefits. It was found that there was a significant reduction in particulate and smoke emissions, no significant increase in nitrous oxide emissions and no significant reduction of engine power. These trials and test results help fleet owners make informed choices when considering using biodiesel. The RTA also undertook a vehicle testing program comparing exhaust emissions, fuel consumption and power tests on three light duty diesel engines vehicles using diesel and biodiesel fuels. Again the results of this testing program produced similar positive results to the above trials.

market has largely been left to consumer demand, but there has not been any information provided to consumers to educate them about the benefits of biodiesel, nor is it widely available.

As a consequence, one biodiesel plant has closed and there is currently low production of biodiesel, largely due to the rise in feedstock costs which accounts for 60-70% of biofuel production costs. The excise issue is creating economic uncertainty for the industry. For these reasons, the potential contribution of biodiesel to stationery generation in 2020 is limited according to the Australian Bioenergy Roadmap. In the March 2007 quarter Australian commodities outlook for biofuels in Australia, ABARE predicted that because production grants are paid in nominal terms on a per litre basis, the amount of support they deliver would effectively fall through time in real terms, even before the scheduled reduction in support from 1 July 2011. ABARE found that the three main factors influencing the rates of return obtainable by biofuels producers were:

» world oil prices
» costs of production, especially feedstock costs, and
» government support.

Looking at more mature markets where Government support for biodiesel is more structured, some interesting observations can be made:

- Total world production in 2009 was 14,305,920 metric tonnes, up 8% from 2008, global market expected to be worth $12.6 billion by 2014, Europe will account for 56% of revenue and Americas 29%
- EU – animal fats and greases account for 6% of biodiesel feedstock, world's largest biodiesel market due to government initiatives, worth $7 billion by 2014, net importer
- USA
  - US EPA has yearly volume requirements, 12.95 billion gallons in 2010 rising to 36 billion gallons in 2022 , excludes palm oil use
  - Funding support for building plant including loan guarantees as part of the American Recovery and Reinvestment Act
  - 2009 production was 1.6 million metric tonnes, down 29% on 2008 due to reduced exports to EU (due to duties)
  - rendered fats and greases accounted for 23% of biodiesel feedstocks, which was 10% of rendered fats and greases production,
  - Texas is largest producing state as uses existing infrastructure from oil industry for transport,
  - talk of extending 5 year production excise credit from 2011

  - some states have higher targets to support biodiesel industry eg Minnesota has 10% during summer in 2012 and 20% in 2015, with 5% for rest of year
  - Amtrak currently trialling biodiesel in trains
- Canada – animal fats and greases account for 77% of biodiesel feedstock, 2% biodiesel in all Canadian diesel fuel
- Brazil – animal fats and greases account for 15% of biodiesel feedstock, mandatory 3% of biodiesel in diesel
- Paraguay – animal fats and greases account for 83% of biodiesel feedstock

In many other countries, biodiesel raw material includes soy oil, palm oil, rapeseed oil and coconut oil. The USEPA has recently completed a life cycle analysis for biodiesel, and found that **biodiesel from soy oil reduced greenhouse emissions by 57%** compared to petroleum diesel, **compared to a 86% greenhouse reduction when using biodiesel from waste greases such as tallow**. In addition, biodiesel from animal fats do not have the same concerns about competing with human food and habitat destruction. Concerns over animal health issues from tallow which have been an issues in the American and European markets are not relevant to Australia, which is BSE free.

In considering all of the above, in terms of biodiesel the red meat industry should consider addressing the issues of

- excise and potential significant negative impact on industry in absence of any other government support
- lack of a mandatory % of biodiesel in petroleum diesel
- government use of biodiesel in its own transport fleet at Federal, State and local level eg public transport, rail
- government support for building plant capacity and associated infrastructure, such as transport

3.4 Streamlining government approvals for capital works

Ideally, in each state planning system there would be a policy which sets out that certain types of complying developments, such as cogeneration and trigeneration. This would enable pre-approval at a local government level, which there may not be the skills or experience to assess these types of development applications. It may be more efficient to consider State Government approval for cogen/ trigen/ renewable projects, rather than local Government approval.

4. Analysis of regional issues that have the potential to impede or support industry step changes to energy efficiency

Due to the regional location of many meat processing plants, there are significant issues which are not faced by industry that are located either in metropolitan areas or close to power generation facilities (such as the aluminium and metals refining industries). These issues include:

- lower electricity supply security, due to being further from generation assets and at the end of transmission and distribution systems, with flow on impact that peak electricity demand more expensive to supply especially if network augmentation required
- thermal fuel supply often similarly distant from production areas and main locations for usage
- peak electricity demand of plants often coincides with supply system peak demand due to summer air conditioning load

Additionally, it is expected that some of the impacts of climate change will exacerbate this issue, such as:

- higher temperatures more often and higher humidity leading to increase in refrigeration load
- more severe and more frequent storms and bushfires leading to adverse reliability impacts on electricity supply system and transport (for coal, LPG, fuel oil supply)

Due to these locational issues, meat plants which can installed embedded generation to reduce their site usage and ideally export excess electricity can make a significant contribution to strengthening regional electricity supply networks.

Regional economic multipliers can range from 1.5 to 3, depending on the industry and regional location. While most of the energy efficiency equipment is likely to come from outside of the regional areas, by ensuring that local employers such as meat plants are decreasing their costs of production means that they are more likely to stay in business. Often meat processing plants are the major employer in a local town, and a plant closure can have a significant adverse impact on the local economy, as was seen in Young when the Burrangong Meat plant closed.

By looking to regional bioenergy supply solutions for regional red meat processing plants, particularly those that draw on using byproducts from local agribusiness, this will help to further strengthen the local economy by supporting other local business.

The most significant regional issue likely to **impede** industry step changes are the availability of skilled personnel. This is partly due to the emergent nature of the cogen/trigen/ bioenergy market, meaning that there is not an established and well developed industry sector. It is also exacerbated by the competition from the mining sector for skilled labour.

Another regional issue likely to impede industry steps towards energy efficiency is that equipment suppliers are often located in major cities, so after sales support can be an issue in terms of the time delay in spare parts and service availability and additional costs.

Questions for consideration from Prime Minister's Task Group on Energy Efficiency Issues Paper

Question/ Issue	Red Meat Industry Response
Why is energy efficiency important - Page 3 What do you see as the key goal(s) of energy efficiency? What is the simplest way of measuring progress against these key goal(s)?	• Reducing greenhouse and energy intensity of industry • KPI such as kWh/ t product, MJ thermal energy/ t product, tCO2-e/t product , with consideration given to value adding • Refer to document section 1
How could these key goal(s) be better communicated to all sectors of Australian society?	No comment
Scope of the Task Group - Page 6 What do you consider a step change in energy efficiency to be?	Anything above 5% is statistically significant, Refer to document section 1
Where do you see the greatest potential for a step change improvement in energy efficiency in Australia over the next decade? What can be done to unlock this step change potential?	• Cogeneration/ trigeneration • Renewable fuels and local energy supply solutions • Accelerated replacement of equipment with newer, more efficient equipment • Refer to document section 2
What needs to be done to ensure step change keeps us at the forefront of OECD energy efficiency improvements?	• Participate in international research efforts eg IEA Industrial Energy-related Technologies and Systems (IETS) program
What non-greenhouse co-benefits could be delivered through a step change in energy efficiency in Australia?	Regional development, Refer to document section 2.2.1, 3.2, 4
Which existing measures could be part of delivering step change? What role would they play? Consider Commonwealth, State and Territory, and local measures. Please comment on the relative efficiency of implementation options where applicable.	NSW – Sustainability Advantage program, remove exclusive on energy audits for larger firms
Maximising the opportunities for energy efficiency improvement - page 9 What do you believe are the key barriers to uptake of energy efficiency improvements?	Economics – payback periods, particularly with current foreign exchange rate meaning export companies are adversely affected Refer to document section 2.1.4, 2.1.5, 2.2.3, 2.3, 2.4, 3, 3.1, 3.2, 3.4
What would be the most efficient and effective way(s) of overcoming these barriers?	• standing offer grants programs for small projects • accelerated depreciation • support for larger scale projects eg industry transformation programs • Refer to document section 3.1
What groups in society might find energy efficiency actions difficult to undertake or access? How can energy efficiency policies target these groups?	Industries under pressure, like red meat, from both supply side (due to drought) and demand side (due to high Australian dollar)

Question/ Issue	Red Meat Industry Response
How can energy efficiency measures be implemented in a way that takes into account the different energy needs of urban/regional and remote Australia?	Consider economic multiplier for regional areas investment, Refer to document section 4
How do time-of-day and time-of-year changes in demand influence energy efficiency in Australia?	Electricity – significantly for red meat plants, peak demand coincides with system peak
Energy Production Efficiency - page 10 What activities (Commonwealth and State) are currently working to improve energy production efficiency in Australia?	No comment
Is there any way to make these activities work better?	Feed in tariff for small scale renewables, Refer to document section 2.1.4, 2.2.1
What changes could be made within the R&D and energy production sectors to improve the development of new options?	Support R&D at industry and site level that looks at variation between sites due to locational issues Refer to document section 2.1.4, 2.2.1, 2.2.3, 2.3, 3.2
How could Government better engage on energy production efficiency?	Look at electricity and thermal energy – focus thus far has been on electrical energy supply, very little information on renewable thermal energy supply
Energy Efficiency in Energy Markets - page 11 What activities (Commonwealth and State) are currently working to encourage energy efficient energy markets (including electricity and gas) and subsequent efficient end-use of energy?	Minimum Energy Performance Standards (MEPS) – largely for residential thus far Lack of support for cogen/ trigen/ bioenergy
What practical and cost-effective things could make these activities work better?	Taxation measures, such as accelerated depreciation for approved equipment Standing offer programs as per NYSERDA Refer to document section 3, 3.1, 3.2
Noting current arrangements for energy market participants (generators, networks, retailers and consumers) what improvements could be made to support a step change in energy efficiency?	Feed in tariff for small scale cogen/trigen/ renewables
What improvements could be made to national electricity market operations and network incentives? – Are the current governance mechanisms adequate to allow for such a step change? – Are there any significant structural or other barriers to improved energy efficiency within Australian energy markets (including but not limited to current features of design, regulation or operation)? – Are there barriers to the deployment of distributed generation where it is cost effective, and would greater deployment of distributed generation improve energy efficiency outcomes?	Significant barriers to distributed generation, feed in tariff would assist in overcoming + transparent network access arrangements and approvals process – currently too much power with network owners.

Question/ Issue	Red Meat Industry Response
How could information access and flow within Australian energy markets be improved?	No comment
Energy Use Efficiency page 14 What energy use efficiency measures (Commonwealth, State and local) are currently working in your sector?	Not EEO
What practical changes could make these measures work better?	No comment
What further cost-effective measures could be used to deliver a step change improvement in energy efficiency in your sector?	Taxation relief Refer to document section 2 and 3
What metrics might usefully be applied in assessing measures for improving energy efficiency in your sector? How might competing proposals be assessed?	Combination of MJ/t product for thermal/ electrical and tCO2-e/t product for thermal, electrical and total energy supply, Refer to document section 1
Where do you see the greatest potential for a step change improvement in transport energy efficiency in Australia over the next decade and over the longer term?	Biodiesel, Refer to document section 3.3
Embedding Behavioural Change – p15 What can be done in Australia to develop a culture around energy efficiency improvement?	Ensure that government policy and programs provides an indication that the government is serious ie not just compliance programs Refer to document section 2.1.4, 2.1.5, 2.2.3, 2.5
What barriers exist to behaviour change at home, in transport, and at work? What could trigger or motivate change?	Cost, information/ knowledge/skills, Refer to document section 2.1.4, 2.1.5, 2.2.3, 2.5
What more can be done to make energy efficiency opportunities simple and accessible across all areas of people's lives?	Standing offer schemes, as per NYSERDA, which are well designed (not like home insulation scheme)
Is current information about improving energy efficiency relevant, personalised and available? How could this be improved?	No comment
Building Capacity p16-17 What workforce shortages and skills gaps (current and emerging) do you see in Australia in relation to energy efficiency?	Significant shortages, especially in regional areas, for people with skills in all areas relating to cogen/trigen/ bioenergy eg economics, operation, maintenance, Refer to document section 2.1.4, 2.1.5, 2.2.3, 2.5
What measures would most effectively address these shortages and gaps?	Government assist industry to develop resource and training materials, as per US DOE ITP, Refer to document section 2.1.4, 2.1.5, 2.2.3, 2.5
What do you see as the critical governance challenges and opportunities for improving energy efficiency in Australia?	Lack of feed-in tariffs and standard access agreements for small scale embedded generation exports to grid, lack of support through taxation system, refer to document section 2.1.4, 2.1.5, 2.2.3, 2.5

Question/ Issue	Red Meat Industry Response
Which institutions should play a role in governance arrangements for energy efficiency? Are there international examples of good institutional arrangements that Australia could adopt?	ATO (refer to UK and Singapore) UK Carbon Trust, US DOE Industrial Technologies Program
What information should be used to provide a stronger evidence base for future policy, monitoring and evaluation? What is the most effective way to collect and distribute this information?	Voluntary, co-operative programs where Government supports subsidised energy audits and in return, gets access to detailed information → online database
What are the cost-effective ways in which governments can facilitate new investment in energy efficiency?	Taxation system – accessible to everyone – accelerated depreciation Standing offer schemes – administratively easier for business
What can governments do to leverage greater understanding, viability and uptake of more innovative approaches to financing and implementing energy efficiency?	Ensure application of R&D tax incentive is applied in such a way that it reflects the real world difference between existing reports and actual site operations
What are some new or different business models that improve energy efficiency? How could governments foster these?	No comment

ENVIRONMENTAL BIOTECHNOLOGY CRC PTY LIMITED
A.B.N. 62 082 895 976

MEMORANDUM

Ref no: 0452M

To: All Board Members

From: David Garman

Date: 17th June 2010

Subject: **Update on Progress with Commonwealth Agreement (CA)**

We have been advised that the CA will be sent to us for signing this week and that the revised Participant's Agreement (PA) has been assented to by the Commonwealth legal advisor. There have been delays within the DIISR Secretariat which have meant that their proposed signing deadline will not now be met.

The CRC will have 3 months from the date of signing the CA to complete the signing up of all participants. No Commonwealth funding will be made available until the PA is fully signed.

There may be some difficulty with this as the changes to the PA impose greater accountability which could be unacceptable to some SMEs, international organisations particularly and even some larger corporations. We won't know until we ask them to sign. We are developing a contingency plan to cope with this and we are continuing discussions with the Secretariat about this aspect. DIISR has already acknowledged that the content in the PA required by their legal department will probably cause issues and are canvassing simplifications and improvements to apply to future funding rounds.

We will start to send out both Agreements in the coming week and propose to meet with participants to explain any issues and get their consent for involvement.

Board Meeting

There has been agreement that the most convenient date will be Friday 16th July for the next Board meeting in Sydney.

We propose to start at 11.00 am and finish by 2.30 pm to enable travel arrangements to be fitted in.

Premises

We are negotiating with a company that wishes to take over the existing premises and fit out. The date for moving is not fixed yet but is likely to be in the second half of July.

We have identified a smaller area (45% smaller) in the Innovation Building next to the Locomotive Workshop which will be taken on a monthly lease. We have received the draft contract and we are waiting for the concurrence of the CEO of the Innovation Centre to some minor changes to the draft. There are some other small advantages to the proposed premises which will be outlined to the Board at the next meeting.

Regards,

David Garman
Executive Director