AUSTRALIAN MEAT PROCESSOR CORPORATION

FINAL REPORT: Meat Processor Opportunities for Emissions Reduction Fund Participation

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Glossary

ACCUs	Australian Carbon Credit Units
ANREU	Australian National Registry of Emissions Units
CER	Clean Energy Regulator
DoE	Department of Environment
ERAC	Emissions Reduction Assurance Committee
ERF	Emissions Reduction Fund
MWe	megawatts of electrical energy
MWh	megawatt hours
MWt	megawatts of thermal energy
tCO_2-e	tonnes of carbon dioxide equivalent per annum
t HSCW	tonnes hot standard carcass weight

1.0 Executive Summary

The Emissions Reduction Fund (ERF) held its first auction in April 2015. A total of $660 million worth of contracts for carbon credit delivery were awarded to registered emissions reduction projects by the Clean Energy Regulator (approximately 26 per cent of the current ERF budget). Projects were registered under 'methodologies' which set out eligibility requirements and abatement calculations. Two recent methodologies have now created the opportunity for meat processors to participate in upcoming ERF auctions.

The two methodologies with application to Australian meat processors are:

- *Carbon Credits (Carbon Farming Initiative—Domestic, Commercial and Industrial Wastewater) Methodology Determination 2015*
- *Carbon Credits (Carbon Farming Initiative—Industrial Electricity and Fuel Efficiency) Methodology Determination 2015*.

The intent of the Wastewater Methodology is to recognize the reduction in emissions from wastewater treatment arising from the replacement of deep open anaerobic lagoons with new anaerobic digesters (note that an anaerobic digester can be a covered lagoon as well as an engineered biodigester).

The intent of the Industrial Efficiency Methodology is to account for real and additional to business-as-usual industrial emissions reductions arising from reduced energy consumption or increased energy efficiency. Included in the scope of activities is changing the energy sources or mix of energy sources used by existing energy-consuming equipment, such as using biogas to replace the use of natural gas or coal in a boiler.

A preliminary assessment of potential ERF projects for AMPC found the highest potential GHG abatement for meat processors would come from waste water treatment projects (involving methane capture and reuse/destruction), followed by fuel switching (particularly in the case of biogas for process heat or cogeneration), and energy efficiency (both heat and electricity). Australian meat processors now have the opportunity to register projects with the Clean Energy Regulator, and apply to participate in ERF Auctions to secure a contract to deliver Australian Carbon Credit Units (ACCUs) over up to seven years. This final project report provides an overview of the methodologies in addition to the next steps required for ERF participation. Key features of delivering Australian Carbon Credit Units (ACCUs) under a standard Carbon Abatement Contract are also provided.

The key project objectives were to determine the potential Red Meat Processing Industry abatement options under the ERF, engage with Department of Environment (DoE) and to Emissions Reduction Assurance Committee (ERAC), to prepare a fact sheet and present to industry on the ERF opportunities.

2.0 Introduction

The outcome of this project is the identification of ERF Methodologies suitable for abattoirs to use for the registration of abatement projects. The six key objectives to be delivered under this project include:

1. Review key ERF documents and potential Red Meat Processing Industry abatement options and prepare a briefing paper for the AMPC
2. Engage with AMPC to select the most promising abatement activity for ERF participation
3. Engage with Department of Environment (DoE) and ERAC to build a collaborative effort around methodology development
4. Prepare a method statement proposal for DoE and ERAC
5. Liaise with DoE and ERAC to deliver an approved methodology suitable for industry use
6. Prepare a fact sheet and conference presentation to advise Industry of the resulting ERF opportunity.

This final report summaries the works completed to achieve the above objectives.

The ERF intends to create incentives for eligible greenhouse gas (GHG) abatement projects. However, in order to monetise emissions reduction via the ERF, abatement projects need to complete a four stage process as follows:

- **STEP 1 MARKET ENTRY:** register project with the Clean Energy Regulator (CER) and open an account in the Australian National Registry of Emissions Units (ANREU).
- **STEP 2 CONTRACTS AND AUCTIONS:** commercial terms application received at least 20 business days before auction; delivery terms (abatement volume and delivery schedule) 5 business days before auction; financial terms delivered while auction is open - single-round, pay-as-bid, sealed-bid; contract automatically commences if no conditions precedent (CER discretion).
- **STEP 3 REPORT AND AUDIT:** offsets reports every 6 – 24 months; at least 3 audits with potential for unscheduled audits
- **STEP 4 DELIVERY AND PAYMENT:** delivery via ANREU; payment; shortfall management (if under delivery) and damages.

This process is discussed in greater depth in Section 6.0.

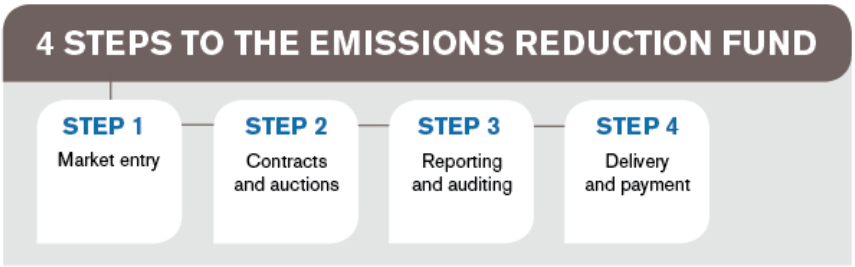

Figure 1: The four stages of the ERF[1].

[1] Clean Energy Regulator, http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund

3.0 Red Meat Processing Industry Abatement Options

The project considered a large number of abatement options for a 'typical' 625 head per day beef facility with a rendering plant, taking into account the methods that are available for use under the ERF. Figure 2 is a graphical presentation of the current sources of GHG emissions associated with a typical Australian beef facility. The main opportunities for the meat processing industry under the ERF being:

1. Conversion of deep (>2.0 m) open lagoons to an engineered digester with associated biogas combustion (refer section 4.0 for further information). Refer to Section 4.0 for more detailed information.
2. Reduced use of fossil fuels (e.g. bio-gas instead of natural gas or coal) or via fuel efficiency projects. Refer to Section 4.0 for more detailed information.
3. Reduction in the use of electricity. Refer to Section 4.0 for more detailed information.

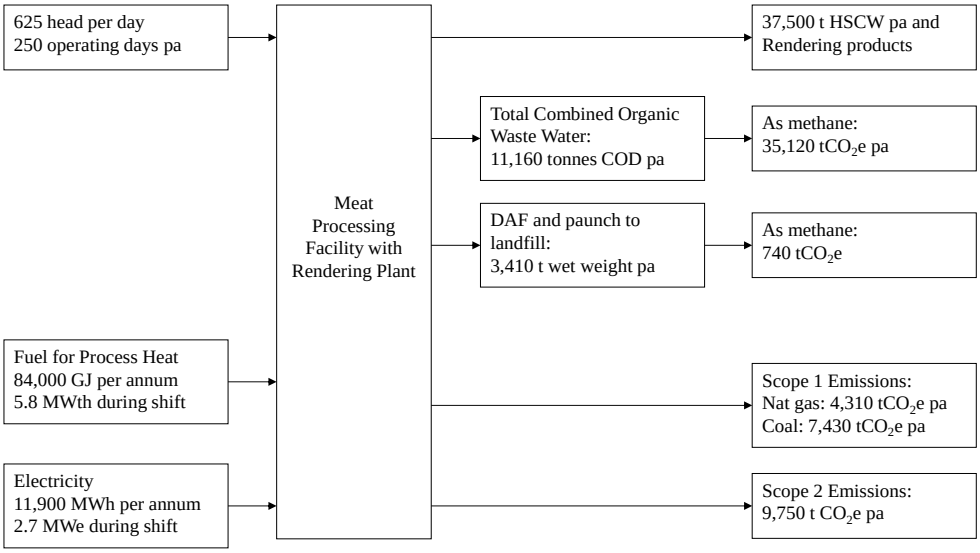

Figure 2: Graphical presentation of key sources of GHG emissions from 625 head per day beef processing facility with rendering. Units are in tonnes of carbon dioxide equivalent per annum (t CO_2-e pa).

4.0 Domestic, Commercial and Industrial Wastewater Methodology

The Federal Minister for the Environment made the methodology determination for domestic, commercial and industrial waste water treatment on 26 March 2015 (available at http://www.comlaw.gov.au/Details/F2015L00352).

The intent of the Methodology is to recognize the reduction in emissions from wastewater treatment arising from the replacement of deep open anaerobic lagoons with new anaerobic digesters (note that an anaerobic digester can be a covered lagoon as well as an engineered biodigester). An analysis of methodology shows that by converting from a deep lagoon to an in-vessel digestion system a 625 head per day beef facility could avoid emissions in the order of 24,000 – 25,000 t CO_2-e pa.

4.1 Waste Water Emissions

Biogas is generated when organic waste is treated in open anaerobic lagoons (in other words, operating without oxygen). This biogas contains approximately 50 - 70 per cent methane which has a global warming potential 25 times greater than carbon dioxide (CO_2).

Emissions from wastewater treatment can be minimised by replacing deep open anaerobic lagoons with anaerobic digesters and an associated combustion system. The anaerobic digester must include a closed digester unit, biogas collection system, and a combustion device (such as a flare, boiler or power generator). Examples of closed digesters include covered lagoons and in-vessel biodigesters.

Precedence exists under the Carbon Farming Initiative (CFI) for digesters (refer to methodologies for piggery and dairy waste water systems), however the Methodology under the ERF has a number of differences as outlined below.

4.2 Overview of Waste Water Methodology

The Methodology sets out how to reduce emissions by replacing a deep open anaerobic lagoon (greater than 2 metres in depth) with an anaerobic digester. The rules have been designed to reflect the requirements of the offsets integrity standards and to ensure that emissions reductions are real and additional to business as usual. In particular projects must meet:

- the newness requirement (must not be implemented before registration with the Regulator)
- the regulatory additionality requirement (must not be implemented to satisfy regulatory requirements
- the government program requirement (not likely to be carried out under another Commonwealth, state or territory government programme in the absence of the ERF).

The lagoon to be replaced must be a deep open anaerobic lagoon over 2 metres in depth that treats any combination of domestic, commercial or industrial wastewater. This methodology is not applicable to upgrading existing anaerobic digesters.

4.3 Key Definitions

Anaerobic digester: refers to a system used to promote anaerobic digestion of wastewater, collects the biogas that is produced and a combustion device.

Baseline Emissions: The carbon dioxide equivalent net abatement amount for the reporting period is worked out by calculating baseline emissions and then subtracting project emissions from that result. The Methodology estimates baseline emissions via one of two options:

1. Using sampling from the operation of a deep open anaerobic lagoon in the 12 month period or for 10 consecutive days before an application is made (this options is called "Subdivision B"), or

2. Using the amount of methane sent to a combustion device, that is, based on the amount of methane after the new system is installed (this options is called "Subdivision C").

Deep open anaerobic lagoon: refers to an existing wastewater treatment lagoon. Deep is defined as being of a depth greater than two metres. The NGER (Measurement) Determination states that anaerobic lagoons greater than two metres deep have the same methane generating output as anaerobic digesters. The methodology requires that the lagoon being replaced must be a deep open anaerobic lagoon. This ensures that no extra methane is generated simply as a result of replacing an open anaerobic lagoon with an anaerobic digester. This helps guarantee that any emissions abated by the project would have occurred in the baseline, and therefore the abatement is genuine.

Eligible wastewater: is any industrial, domestic or commercial wastewater which is from a source that is consistent with the historic source. The wastewater must be consistent with the historic source of wastewater to ensure that estimates of baseline emissions accurately reflect what would have occurred in the absence of the project.

Historic source: refers to the source(s) of wastewater treated at the wastewater facility in the 12 months or for 10 consecutive days before an application is made for the declaration of a project as an eligible offsets project. These sources need to be documented and must represent either industrial, domestic or commercial wastewater.

Monitoring requirements: the Methodology outlines the parameter monitoring requirements. Some parameters of note are:

- amount of biogas sent to the combustion device in cubic meters (m^3) is recommended to be measured continuously at the point of combustion at standard conditions in accordance with the NGER Determination Division 2.3.6, Section 2.31 (for example an appropriately calibrated orifice plate or turbine meter); further details are available in the NGER Determination

- wet weight of digestate to be measured 'in accordance with appropriate measuring requirements' (note that no additional or specific details are provided in the Methodology, but reference is made to the NGER Determination which calls upon measurements to be made in accordance with industry standard).

Net abatement: the baseline emissions minus the project emissions (see below).

Project emissions: the sum of emissions due to fossil fuel usage (for example diesel for excavators), electricity (for example pumps and fans), digester leakage or venting events, combustion of biogas (CH_4 and N_2O only), and end management (such as treatment, processing or disposal) of digestate (CH_4 and N_2O only). Refer to Figure 3 below for a graphical presentation of how 'project emissions' (E_P) are subtracted from the 'baseline emissions' (E_B).

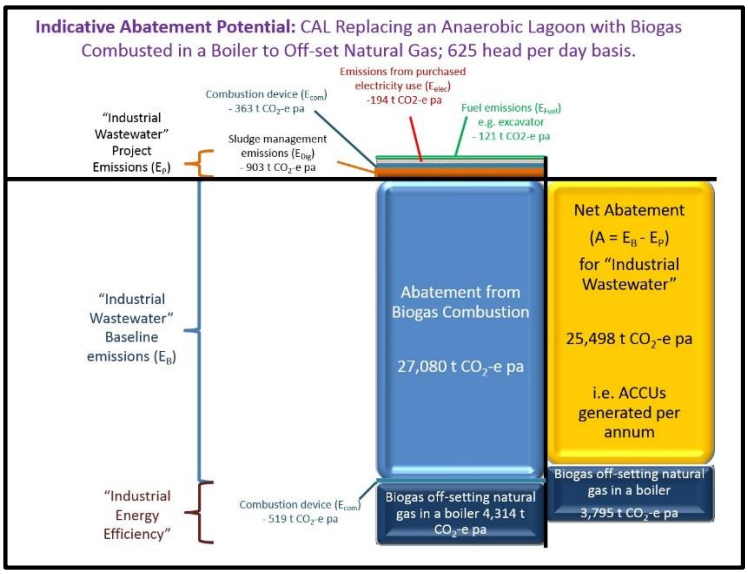

Figure 3: Indicative abatement potential for a 'typical' Australian beef processing facility showing how 'project emissions' (E_P) are subtracted from the "baseline emissions" (E_B) to determine the net abatement (A).

5.0 Industrial Electricity and Fuel Efficiency

The Federal Minister for the Environment made the methodology determination for industrial electricity and fuel efficiency on 25 March 2015 (available at www.comlaw.gov.au/Details/F2015L00346).

The intent of the Methodology is to account for real and additional to business-as-usual industrial emissions reductions arising from reduced energy consumption or increased energy efficiency. Emissions reductions can be 'direct' (Scope 1) or 'indirect' (Scope 2). Direct emissions reductions can be from equipment used to generate electricity, undertake useful physical work (such as shaft power, chemical energy storage, pumping water, or gas compression), or provide cooling, heating or steam (on- or off-site). Indirect emissions reduction relate to equipment that consume electricity.

The Methodology is based on a similar method under the New South Wales Energy Savings Scheme, however has a number of differences in design and coverage. For example, fuels other than electricity are included as the purpose of the ERF is emissions reductions from a range of sources and not just electricity as is the case with the NSW scheme.

5.1 Industrial Applications

Greenhouse gas emissions arise from industrial activities such as fuel combustion in boilers, furnaces and generators (called direct or Scope 1 emissions) as well as from electrically powered systems such as motors, pumps and compressed air (called indirect or Scope 2 emissions). There are a range of opportunities to reduce these emissions. For example, replacement or modification of boilers or heating systems; heating, ventilation and cooling (HVAC) systems; control systems and process improvements; waste heat capture and re-use; crushing or grinding equipment efficiency improvement; low efficiency motor, fans or pumps replacement; variable speed drives (VSDs) installation; compressed air process improvement; and fuel switching.

5.2 Overview of Industrial Fuel and Energy Efficiency Methodology

The Methodology provides a high-level, activity-neutral (in other words, suitable for all businesses) framework for calculating abatement. The intent is to provide flexibility around what fuel or energy efficiency activities are most appropriate for each site. Specific activities listed in the Methodology include:

a) modifying, removing or replacing existing energy-consuming equipment

b) installing energy-consuming equipment as part of replacing, modifying or augmenting existing energy-consuming equipment

c) changing the way existing energy-consuming equipment is controlled or operated

d) changing the energy sources or mix of energy sources used by existing energy-consuming equipment

e) modifying, installing, removing or replacing equipment that affects the energy consumption of existing energy-consuming equipment

f) installing equipment that generates electricity at a location where existing

energy‐consuming equipment consumes electricity obtained from an electricity grid and the electricity generated by the installed equipment will be used in substitution for the electricity obtained from an electricity grid.

'Greenfields' plants and substantial plant expansions (for example new equipment with no baseline) are excluded. The Explanatory Statement for the Methodology states: 'The installation of new equipment, where the installation is not to replace, modify or augment existing equipment, or does not involve the installation of electricity producing equipment that offsets another existing source of electricity, is not an eligible activity. The purpose of this exclusion is to make it clear that the methodology does not provide for calculating emissions reductions from installing new equipment in circumstances where there is no baseline data, such as 'greenfield' plants or substantial plant expansions.' Other exclusions include electricity generators (over 30 MW) and renewable electricity generation that receives support from other government programs (such as the *Renewable Energy (Electricity) Act 2000*).

The level of abatement is calculated by comparing baseline emissions with project emissions (those that occur post installation). Baseline emissions are estimated using a modeling approach to work out what the emissions would have been in the absence of the project. Importantly, the level of emissions before project implementation is adjusted based on highly correlated variables (for example, energy consumed per unit of production) to allow appropriate crediting of abatement delivered by project activities even if production increases or decreases.

Project emissions are estimated by either monitoring fuel and/or electricity use and applying standard emissions factors to estimate emissions or through the use of an operating emissions model, which allows monitoring of variables that correlate with emissions instead of monitoring direct energy use.

With reference to the modelled baseline emissions, one example for energy efficiency is to correlate the amount of natural gas consumed (dependent variable) to steam (independent variables of steam tonnes per hour generated, steam pressure and temperatures). Within the heat process sector, efficiency could be modelled by comparing natural gas consumed per day (dependent variable) to head per day or HSCW tonnes per day. The calculations presented in this report have assumed a constant heat load for both the baseline and project scenarios with all natural gas use being off-set by biogas, hence no correlation model was required to calculate abatement.

The two sub-methods for calculating the net abatement from the project are:

- Sub-method 1: the difference between the total modelled baseline emissions and the total ***measured*** operating emissions from the consumption of operating relevant energy for the implementation for the reporting period
- Sub-method 2: the difference between the total modelled baseline emissions and the total ***modelled*** operating emissions for the implementation for the reporting period.

5.3 Important Notes for Meat Processing Facilities

The critical rules of note for meat processing facilities are bullet pointed below [followed by commentary in square brackets for the use of biogas to generate process heat]:

- if a project proponent uses a sub-method to work out the emissions abated by the implementation for the first reporting period and then uses an alternative sub-method to work out the emissions abated by the implementation for a later reporting period, the alternative sub-method must be used for all subsequent reporting periods [sub-method 1 is the likely method to be used in industry if all dependent variables can be directly measured]
- baseline must be a period that accounts for the typical range of operating conditions for the equipment and reasonably represent operating conditions for the equipment where, having undertaken the implementation, it is likely that the fuel or electricity consumption by the equipment would increase.
- the same measurement time interval must be used for the baseline, measurement and reporting period [for example, a period of one standard operating year]
- an emissions model for an implementation must be developed using regression analysis to relate independent variables to the dependent variable for the implementation with the following included as independent variables: output of equipment, service levels provided by the equipment, and variable output or quality or site constants
- minimum statistical requirements are required, for example each independent variable coefficient must have a t-statistic that is greater than the value for the t-distribution at the 97.5 per cent single-sided confidence level for the number of degrees of freedom in the regression [equivalent to 95 per cent confidence in a two-sided distribution]
- baseline emissions from a model must reasonably reflect emissions that would have occurred if the implementation had not been undertaken
- the baseline and operating emissions model must be based on a period that covers at least one full operating cycle for the equipment and covers the full range of operating conditions for the equipment likely to exist during the crediting period [for example, a period of one standard operating year]
- the project proponent must choose a start date and time and an end date and time for the baseline measurement period. The start date for the baseline measurement period must be no earlier than 24 months before the date the implementation commences. The end date for the baseline measurement period must be before the date the implementation commences.
- an independent variable must be independent from any other independent variable used in the emissions model, vary over time, be measured or derived using a mathematical formula without loss of precision and explains changes in emissions from the consumption of relevant energy.

6.0 Participating in the Emissions Reduction Fund

There are four main steps to participation in the Emissions Reduction Fund covering registration, wining an ERF contract, reporting and audit, and delivery and payment.

6.1 Step 1: Market Entry

Register project and open an account in the Australian National Registry of Emissions Units (ANREU). The registration requirements are summarised as follows:

- abatement calculation (t CO_2-e), justifications from relevant method, qualifications of person undertaking calculations
- legal right to carry out project
- can nominate an agent
- newness requirement
- start date (default is project registration date)
- estimate of peak period (month and year, or year 1, 2, etc.)
- regulatory approvals: land use, environment, water
- ANREU account
- applicant is fit and proper person: no prior convictions or history of non-compliance under a range of laws (Australian Federal Police national police check form).

New projects must have the minimum total quantity offered for sale by the participant of more than 2,000 ACCUs per year on average over the term of the contract.

6.2 Step 2: Contracts and Auctions

Some relevant points of note for the requirements of the contracts and auctions includes:

- commercial terms application received at least 20 business days before auction
- delivery terms (abatement volume and delivery schedule) 5 business days before auction
- financial terms delivered while auction is open - single-round, pay-as-bid, sealed-bid
- contract automatically commences if no conditions precedent (CER discretion)
- obligation not to disclose bidding strategy
- eligible bid: within time window, GST-exclusive unit price per ACCU in whole cents and dollars, first eligible bid only
- Clean Energy Regulator will set a benchmark (or ceiling) price for each auction
- eligible bids can be withdrawn within time window

- ACCUs offered for sale will be added to a notional pool of ACCUs. If the total number of ACCUs in the pool does not exceed 80 per cent of the overall volume, then that bid will be selected. 'Overall volume' means the cumulative total volume of ACCUs offered for sale less than the benchmark price
- auction format and minimum bid size published approximately 3 months before auction day
- auction date and bidding window approximately 6 weeks before auction day
- registration by 5 days before; results by 5 days after.

6.3 Step 3: Report and Audit

Offsets reports are required every 6 – 24 months; with at least 3 audits and the potential for unscheduled audits. Most abatement projects for red meat processing facilities would expect to be in the 'small' category as per Figure 4.

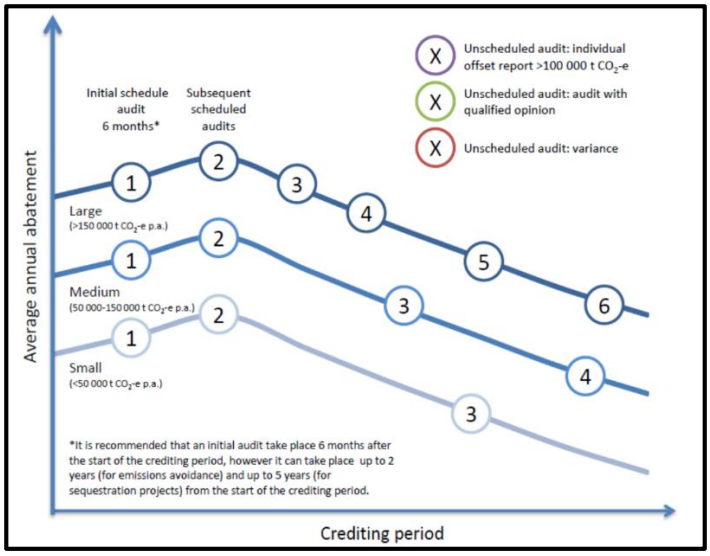

Figure 4: Indicative schedule of audit timing[2].

6.4 Step 4: Delivery and Payment

Participants who have a contract with CER are required to deliver ACCUs according to the contracted schedule. Participants will then be paid at the price agreed to at auction and set out in the contract. The delivery transaction will occur via the Australian National Registry of Emissions Units (ANREU). Shortfall management is required (for under delivery of contracted ACCUs). For more information refer to www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-

[2] Clean Energy Regulator, "Guidance for Audits under the Emissions Reduction Fund", http://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Guidance%20on%20Audits%20under%20ERF.pdf

Emissions-Reduction-Fund

7.0 Results of First Auction

CER held the first ERF auction during 15-16 April 2015, with 107 Carbon Abatement Contracts awarded, totalling 47 million t CO_2-e abatement. The total value of contracts awarded was $660 471 500 (or 26 per cent of the $2.55 billion budgeted for the ERF), averaging $13.95 / t CO_2-e abatement.

The Carbon Abatement Contracts were awarded to 43 contractors covering 144 projects. The majority of projects applied under sequestration methods (28 million t CO_2-e) and landfill and alternative waste treatment methods (18 million t CO_2-e), predominantly due to the methods for these projects being available longer.

Contract lengths ranged between three and 10 years with the largest single contract for 3.5 million t CO_2-e and the smallest for 12 000 t CO_2-e.

A detailed table of the carbon abatement contracts is available at www.cleanenergyregulator.gov.au/ERF/Published-information/auction-results/auction-results-april-2015/Carbon-Abatement-Contracts-table

In an interview with the ABC on 23 April 2015, CER chief executive Chloe Munro said people should not be concerned or draw any conclusions from the amount spent in the first auction and warned against extrapolating results from a single auction to other auctions (questions were raised about such a large percentage of the ERF budget being used in a single auction). CER stated that it could not have asked for a better level of participation.[3] It is anticipated that auctions would be held approximately quarterly, however as of mid-June 2015 no date had been set for further auctions.

[3] http://www.abc.net.au/news/2015-04-23/government-buys-47m-tonnes-of-carbon-abatement-in-erf-auction/6415532

8.0 Conclusions / Recommendations

Red meat processors in Australia with open anaerobic lagoons, the potential to utilise biogas on-site and with plans for energy efficiency projects should consider participating in the ERF.

With 26 per cent of the allotted ERF budget accounted for participants should look at registering projects as soon as possible. Projects other than engineered anaerobic digesters may not create sufficient abatement to be directly contracted under the ERF or may have onerous auditing requirements. Hence, making use of an 'aggregator' or third party to manage the process could reduce the amount of time and effort required by meat processors to participate in the ERF. However there are costs associated with using a third party need to be taken into when determining the overall economic viability of projects.

Recommendations for further R&D include:

- reviewing the type and size of projects that are contracted under the ERF to keep the red meat processing industry informed of the results of the auctions
- assisting and targeting specific operators that have the greatest abatement potential
- writing up of appropriate case studies on successful contracts
- continue to discuss creating a method for the upgrading and re-instigation of digester systems
- periodically reviewing available technologies and cost of implementation in order to keep the industry informed for cost effective abatement technologies.