final report

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Evaluation and recommendations to reduce carbon footprint

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Contents

1. Description of the project

Environmental issues are one of the biggest challenges facing our industry. The introduction of a carbon trading system has serious implications for our industry that are as yet not well understood.

The carbon footprint is a measure of the exclusive global amount of (CO2) and other greenhouse gases emitted by a human activity or accumulated over the full life cycle of a product or service (see Wiedmann and Minx, 2008). In terms of the company, the carbon footprint review was a review of all energy input data and all the waste output data. This data was then used to establish the carbon emissions for the site.

This project involved a processing company understanding the carbon footprint of one of their sites and then developing strategies to reduce and manage this footprint over time in a way that is cost effective and supports their long term sustainability.

2. National Greenhouse and Energy Reporting system (NGER)

This project was initiated to determine the carbon footprint of a processing site. The data collected was consistent with requirements for the new National Greenhouse and Energy Reporting system (NGER). It provides the baseline energy use, energy costs and some data analysis consistent with the requirements of the Energy Efficiency Opportunities Act.

There are currently a number of regulatory requirements relating to energy use, energy efficiency and greenhouse gas emissions which are relevant to the site.

The Energy Efficiency Opportunity Act (EEO) came into force in 2005, and the first trigger year was the 2005-06 financial year.

The National greenhouse and Energy Reporting system (NGER) started on 1st July 2008. The NGER system will use the online reporting system, OSCAR, which is currently in place in the site. NGER requires reporting for Scope 1 and 2 emissions. Scope 1 emissions are direct emissions that occur onsite and include boiler fuel use, transport fuels, waste, wastewater and refrigerant emissions. Scope 2 emissions are indirect emissions from the consumption of electricity, where the emissions do not occur onsite. The Government expects 800 firms to be captured by the NGER system.

The data captured by the NGER system will feed into the Australian Carbon Pollution Reduction Scheme (CPRS). For the CPRS, only direct onsite emissions (Scope 1 under NGER) are included and the threshold is 25,000 CO2 per site. Given that the current proposal is for no allocation of free permits to emissions intensive trade exposed companies (EITE companies), and a probable permit value of $23-$40 per tonne of carbon dioxide equivalent, it is important for the company to understand the extent of its potential liability. Agricultural emissions are excluded from the CPRS until 2015, but how emissions from agriculture are handled in the system could also add to the regulatory cost burden for the company. It is anticipated that downstream users of agricultural

products, such as meat processing plants using livestock, will be the liable parties for on-farm emissions.

3. Key energy consumption areas measured

Data collected to measure consumption included in the carbon footprint project included:

- Electricity purchased off the grid and used onsite (Electrical Energy use)
- Boiler fuel purchased and used onsite (Stationary Energy)
    - Black coal for the main boilers
    - Natural gas for the blood dryer
    - LPG used in the laundry
- Transport fuels purchased and used onsite (Transport Energy use)
    - Diesel for 4 forklifts, LPG for 1 forklift
    - Petrol used for small onsite motors (insect fogger, leaf blower, weed eater/whipper snipper)

Greenhouse emissions were calculated for the Electrical, Stationary and Transport energy use consumption outlined above, and for additional sources of emissions, namely:

- Emissions from the wastewater system
- Emissions from onsite waste management
- Emissions from the refrigeration system

Data was collected for 3 full financial year periods on a monthly basis for each of the above emission sources, namely 2005-06, 2006-07 and 2007-08.

For energy consumption, data was taken directly from bills from suppliers, so should be accurate.

For waste production and wastewater emissions, estimates were used. Wastewater volumes are not metered entering the anaerobic pond, so the metered figure for water purchased by the plant was used, and it was assumed that 100% of this water ended up in the wastewater treatment system. Wastewater quality readings for BOD are measured entering the anaerobic pond and leaving the anaerobic pond as part of wastewater pond performance monitoring.

This project did not include:

- Emissions from livestock transport to the plant
- Emissions from product transport from the plant
- Emissions from solid waste treatment offsite by waste treatment company
- Emissions from livestock (methodology has not been finalised by the Government)

These emission sources were excluded as they did not meet the “Operational Control” test outlined in the NGER requirements, namely that the company does not have the ability to develop and implements Occupational Health and Safety or any other policy within the organisations such as the transport companies.

4. Results

Energy use has increased over each of the 3 years investigated. Approximately 30% of the energy used onsite is electricity, while the majority is used as boiler fuel.

In terms of greenhouse emissions, the total emissions from the site include direct onsite emissions (such as boiler fuel and wastewater emissions) and indirect emissions as a result of electricity consumption. Total site emissions increased over each of the 3 years investigated.

Direct (Scope 1) emissions, which are to be included in the Carbon Pollution Reduction Scheme, were above 25,000 t CO2, and about 40% were due to emissions from the wastewater treatment system when using NGER method 1 for wastewater. Between 2005-06 and 2007-08, production increased by about 19%, while total site energy use only increased by about 14%.

5. Seasonal variation in energy use

There is a certain amount of seasonal variation in consumption even when shutdown impacts are accounted for.

If the key performance indicators are looked at on a month-by-month basis, differences in seasonal consumption and the impact of the annual shutdown period become apparent.

The 2007-08 data was significantly higher during January 2008 when there was very little production. This is largely due to the fact that the refrigeration system is not configured to allow the refrigerant to be removed to a holding tank during shutdowns, so the plant still has to be operated to prevent leakages of ammonia, and the fact that both the electricity and boiler fuel were impacted by the shutdown.

Similarly, boiler fuel usage increases slightly during the cooler winter months, which is consistent with higher losses from the system and incoming water being at a lower temperature and therefore requiring more energy to be converted to steam. In terms of total energy use, there are currently large sections of the hot water system which are not insulated, which means that the hot water must be generated to 92°C to achieve a required delivery temperature of 82 °C

6. Wastewater emissions

The NGER system currently includes 3 different calculation methods for estimating emissions from wastewater. Method 1 is the simplest and requires only the production rate (t HSCW) to calculate wastewater emissions, as it uses industry defaults for the other values such as the volume (kL water/t HSCW), quality (mg/l COD into pond system) and fraction degraded anaerobically.

Method 2 uses actual plant data for volume and quality, but requires COD rather than BOD readings. If COD readings are not available, then the BOD value must be multiplied by a factor of

2.6, which could lead to an overestimation in emissions as the factor is usually more likely to be 1.4 for meat plants. It uses the default value for the proportion of COD converted anaerobically (ie 40%).

Method 3 uses site data for quality, volume and % converted anaerobically. In some meat processing plants, the percentage of COD converted anaerobically is higher than 40%, ranging up to 80-90%.

The methods were compared, and due to the above factor, Method 1 provided the simplest method for estimating wastewater emissions. In part, this was due to an absence of data, for example, it is unclear how representative the COD or BOD values recorded are of the total flow into the anaerobic pond system. This may mean that the current recorded values are overstating the total COD or BOD load on the anaerobic pond system, which in turn would lead to an overestimate of total methane emissions from the pond.

The NGER Regulations require that companies have 95% confidence in the numbers they are reporting, and given the substantial variation between the results from the 3 NGER methods and the variation in the monthly BOD readings into the pond, additional work is definitely required.

7. Recommendations

1. It would be advisable for the company to obtain a clearer picture of the total COD-BOD load on the pond system by conducting a more detailed sampling program, such as:
- undertaking a program of testing of COD over a 24 hour period on different days of the week, to reflect differences in onsite operations during a day and during the week.
- Investigate installation of a continuous sampler for quality testing of water entering anaerobic pond (if available and accurate)
- Install metering to ensure that volume entering pond is accurately recorded.
- Use the data gathered to obtain a clearer picture of the total COD load into the anaerobic pond system.

2. Wastewater emissions estimating (NGER) – use Method 1 at present but investigate if other methods using volume and COD into and out of anaerobic pond will result in more accurate estimate of emissions (ie more detailed sampling program)

3. Investigate efficiency projects such as:
- Insulation of hot water system (between steam heat exchangers and point of use)
- Refrigeration system – refrigerant pump out facility
- Economiser on boiler stacks
- Installing a more efficient heat exchanger on cooker condensate system, to maximise heat recovery from rendering
- Insulating tallow tanks

4. Investigate expediting metering projects which have already been identified, to enable connection of metering to SCADA system which will allow automatic tracking of energy use.