11.1 Introduction

URS undertook an assessment of the greenhouse gas (GHG) implications of the proposed Biomass Power Plant (Power Plant). The full report is contained in **Appendix F**.

11.2 Methodology

11.2.1 Treatment of Biomass and Biomass Waste

Under international accounting rules for energy, CO_2 emissions from combustion of biomass are not included in the national greenhouse accounts as they are considered zero rated. Biomass combustion also releases a very small quantity of non CO_2 gases. While these gases comprise less than 1% of emissions, international accounting rules require them to be included in national inventories.

The 2006 IPCC Guidelines state that emissions of CO_2 from biomass fuels are estimated and included in the Agriculture, Forestry and other Land Use sector. Therefore biofuel emissions should not be included in the sectoral totals to avoid double counting, but instead are reported as information items.

For wood waste, the national guidance takes the view that if fuel that would otherwise be flared, or heat that would otherwise be wasted, is used for electricity generation, then it is considered that generation does not increase emissions compared to what they would otherwise be. Where a fuel that would otherwise be vented is burned for generation, or waste material is used for generation, the consideration is more complex. There will be additional combustion emissions, but if the energy output is lower in emission intensity than the pool coefficient, there will be greenhouse benefits. Cellulosic or lignocellulosic wastes which have no further economic use including biomass wastes, are be "zero-rated" for CO_2 emissions, but emissions of CH_4 and N_2O are be accounted for.

Wood waste used in the Power Plant will originate from sustainably harvested forests. Where a generator uses biomass that is not sustainably harvested, all emissions from combustion of the non-sustainably harvested biomass must be accounted for, including the CO_2 emissions. The term 'sustainably harvested biomass' (in relation to sawmill residues) is defined as:

- All sawmill residues from trees that have been taken from forests that are "well managed" and subject to the conditions that no additional trees from a native forest are harvested specifically for biomass.
- The term well managed means the forest has been certified as 'well managed' or sustainably harvested under the Australian Forestry Standard or by using an internally recognised process such as the Forest Stewardship Council (FSC).

SEFE operates a Chain of Custody (CoC) System which is certified to the CoC Standard (AS 4707-2006). This is an inventory control system that tracks the pathway that forest products take from a Defined Forest Area (DFA) or stated source to the final customer. CoC certification is complementary to both SEFE's Environmental Management System certified to ISO 14001:2004 and Forest Management Plan certified to Australian Forestry Standard AS 4708-2007 (AFS). It indicates to SEFE's customers that the products purchased come from well managed sustainable forests.

SEFE, Vic Forests and Forests NSW hold AFS certifications. As a result, approximately 91% of all wood currently received through SEFE's gate is certified.

Chapter 11 Greenhouse Gas Emissions

11.2.2 Accounting and Reporting Principles

The Greenhouse Gas Protocol (the Protocol) identifies accounting and reporting principles for greenhouse gasses (World Business Council for Sustainable Development & World Resources Institute 2004). The emission inventory for the Project follows the methodology detailed in the Protocol and relevant emission factors in the National Greenhouse Account (NGA) Factors June 2009, the Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2006 – Energy (Stationary Sources) and the relevant IPCC Good Practice Guidance.

11.2.3 Reporting Boundaries

Inventory Operational Boundaries

The Protocol defines direct and indirect emissions through the concept of emission "scopes":

- **Scope 1** (Direct Greenhouse Emissions): direct emissions occur from sources that are owned or controlled by the company, for example emissions from combustion in owned or controlled boilers, furnaces and vehicles. This does not include CO_2 emissions from the combustion of biomass, which should be reported separately;
- **Scope 2** (Electricity Indirect Emissions): greenhouse emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the company. Scope 2 emissions physically occur at the facility where the electricity is generated; and
- **Scope 3**: Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Examples of Scope 3 activities are extraction and production of purchased materials, and the use of sold products and services.

Emissions that fall inside the operational boundary for the greenhouse gas assessment comprised only those which would be modified as part of the proposal, and / or occur at a point beyond which the waste product was initially generated. The prime site function of generating wood chips for sale will remain unchanged when the Power Plant is built, and hence is not included in the inventory. The following Scope 1 emissions fall within the operational Greenhouse Gas Inventory:

- combustion of biomass for electricity generation (CH_4 and N_2O emissions only. CO_2 emissions are considered to have a neutral impact) (Scope 1);
- combustion of supplementary fuel oils to aid biomass combustion at start-up (Scope 1);
- increase in use of fossil fuels on site for operational or maintenance purposes (predominately due to increase in use of one front loader) (Scope 1); and
- emissions from construction vehicles and plant operating on the site (Scope 1).

Upstream and downstream (Scope 3) emissions have also been evaluated including:

- wood waste combustion at third party sawmills;
- composting of wood waste generated at third party sawmills;
- transport emissions from the distribution of wood waste from third party sawmills to SEFE which remain unchanged from the current practice scenario;
- transport of wood waste from third party sawmills sold as landscaping to market;
- disposal of ash waste generated by third party sawmills;
- extraction and distribution of distillate fuel used at SEFE to fire the Power Plant;
- composting of wood waste generated at SEFE;
- distribution of mulch from SEFE to the end-use locations;
- disposal of ash generated at SEFE; and
- emissions produced through the manufacture and transport of plant, materials and equipment to be installed at the site (construction emissions).

The following emissions fall outside the operational Greenhouse Gas Inventory boundary as they are considered to be the same for the current site practice and proposed use, or likely to comprise incidental emissions:

- emissions associated with timber product manufacture, such as harvesting the plantations and the milling of the timber, are not considered as there would be no change in emissions compared to the current practice;
- transport of biomass fuels to the Power Plant, except where additional fuels are brought to the site from other sawmills; and
- site electricity drawn from the NSW Electricity Grid, which remains unchanged from the current practice scenario, with the exception of the parasitic load on the Power Plant.

Materiality

Materiality' is a term that has been defined in a number of sources. For example, ISO 14064.1-2006 provides the following definition:

> "**Materiality** – concept that individual or an aggregate of actual errors, omissions and misrepresentations in the GHG assertion that could affect the decisions of the intended users"

ISO 14064 also states that acceptable materiality is determined by the validator, verifier or GHG program, based on the agreed level of assurance.

In practice, and as the Greenhouse Gas Protocol states, as a rule of thumb, an error is considered to be materiality misleading if its value exceeds five percent of the total inventory.

Chapter 11 Greenhouse Gas Emissions

All emissions within the organisational boundary are included in the inventory unless they are excluded on materiality grounds or data was otherwise unavailable at the time of preparing the greenhouse gas assessment. The following emissions are not included on the basis of materiality:

- employee travel emissions from six additional employees during plant operations;
- employee travel emissions produced by 40 personnel during the construction period; and
- emissions associated with decommissioning.

11.2.4 Calculation Approaches

The greenhouse emissions inventory for the Project is based on the methodology detailed in the Greenhouse Gas Protocol and relevant emission factors in the NGA Factors and the relevant IPCC Good Practice Guidance. The NGA Factors methodology is consistent with the National Greenhouse and Energy Reporting System, Method of Measurement 1.

A spreadsheet model was specifically developed for the Project and uses data sources and emission factors to calculate current practice and project emissions for an average year of operation.

In line with international greenhouse gas accounting approaches, the NGA factors method does not take into consideration CO_2 emissions from combustion or decomposition of biomass. At the SEFE site the majority of wood waste is sold for mulch and this would provide reduced greenhouse gas emissions when compared to combustion of the wood waste as some of the carbon mass would be sequestered into the soil. Given the uncertainty regarding the estimation of long term soil carbon sequestration from recycled organic materials such as mulch, an estimation of potential soil carbon sequestration from the mulch product has not been included in the greenhouse gas inventory for the project. Whilst the reduction in greenhouse gas emissions has not been quantified, the true emissions would be reduced in comparison to the results of the inventory.

There are several greenhouse gases including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) that are relevant to the Project. In order to simplify inventory accounting, carbon dioxide equivalents (CO_2-e) is used. This accounts for the various greenhouse warming potentials of non CO_2 gases, which is a measure of the amount of infrared radiation captured by a gas in comparison to an equivalent mass of CO_2, over a fixed lifetime. Following this convention, greenhouse inventories in this report are expressed as mass of CO_2-e released.

11.2.5 Emission Factors

Direct measurement of greenhouse emissions at the source will give the most accurate and precise assessment of emissions. This is not typically feasible in development projects, so emission factors remove the need for site specific testing of emissions. They are a factor expressed as the amount of greenhouse gas emitted per unit of activity, which is then used to determine inventories for a site.

Emission factors can be identified from various sources, including international, national and state guidance. The majority of emission factors used in this report have been sourced from the Department of Climate Change NGA Factors Workbook, June 2009.

The moisture content of the biomass material has been established as 40% calculated on the basis of wet tonne weight. In accordance with the NGA technical guidelines, the fuel supply can be classified as, and the emission factor applied for, green and air dried wood, which is defined as having a moisture content of more than 20% on a wet basis and is combusted to produce heat or electricity.

11.3 Project Emissions

Greenhouse gas emissions have been estimated for the construction and operation of the Power Plant. Estimated greenhouse gas emissions from the project have been compared to emissions generated by the current practice. For the purposes of this comparison it has been assumed that the volume of wood waste material processed by SEFE on an annual basis will be the same as that consumed by the proposed Power Plant, although in practice the volumes processed over the last four years are slightly lower than the volumes that will be burnt.

11.3.1 Construction / Decommissioning Phase Emissions

Construction

Greenhouse gas emissions associated with construction have been estimated using data in equipment specifications provided by SEFE. The majority of construction materials would comprise concrete and steel. Estimations of greenhouse gas emissions are provided in **Table 11-1**. Where quantities have not been provided, estimations have been made based on URS experience.

Table 11-1 Summary of Emissions – Construction Phase

Source	Description	Emissions (t CO_2-e)
Emissions derived from embodied energy of plant materials	Plant materials including concrete foundations, slab, turbine, condenser, boiler, ESP, stack and structure, seawater delivery system. Assumes that the boiler, ESP, stack and structure will comprise 200 t of material. Concrete being readymix and steel being tinplate processed at Port Kembla.	1,315
Concrete Delivery	Assumes a truck capacity of 15 t and delivery will be from 40 km distance	8.5
Delivery of other materials	Assumes that delivery of other materials will be in 20 loads from 420 km distance	26.6
Total		**1,350**

Construction emissions will be offset by emissions savings within the first month of the plant's operation due to the emissions avoided through not having to purchase electricity.

Decommissioning

There would be emissions associated with decommissioning the plant and removing it from the site at the end of its life. Options for the plant at this time have not been assessed. Due to uncertainties as to the fate of the plant, the timing of the works and the market for recycled materials, it is not possible to quantify greenhouse gas emissions associated with decommissioning, although typical greenhouse gas sources would include fuel use in mobile plant, trucks transporting waste materials offsite and crushing plant used to break up concrete foundations, and waste processing. It is likely that emissions associated with decommissioning would not be material in the context of the whole of life emissions of the project. As such, no assessment of the decommissioning emissions has been made.

11.3.2 Operational Emissions

Operational emissions are described according to scope for each year of operation.

Direct Emissions (Scope 1)

Direct emissions from the project and current practice are summarised in **Table 11-2** with a discussion on the assumptions used following.

Table 11-2 Scope 1 Emissions

Emission Source	Current Practice t CO_2-e	Power Plant t CO_2-e
Wood waste combustion at SEFE	19	767
Combustion of transport fuels	81	146
Combustion of fuel oil	-	0.5
Total	**100**	**913**

Wood waste combustion at SEFE

The current practice at SEFE is to dispose of the larger SEFE mill wood waste in an onsite incinerator. Typically, between 1,144 t and 1,250 t of waste is currently incinerated each year. During the operation of the Power Plant SEFE will incinerate 35,100 t. National guidance (**Section 11.2.1**) indicates that if fuel that would otherwise be wasted, such as wood waste, is used for electricity generated, then it is considered that the generation does not increase emissions compared to what they would otherwise be and results in emissions reductions compared to fossil fuel generation. Therefore carbon emissions have not been accounted for in this assessment. However, combustion of biomass does produce small quantities of CH_4 and N_2O, which are accounted for. Combustion of wood waste on site currently results in the emission of 19 t CO_2-e and will result in approximately 767 t CO_2-e for each year of operation of the Power Plant.

Combustion of fuels for on site vehicles, specifically the operation of the front end loader

Diesel will be consumed by on-site vehicles, primarily by a front end loader. Currently, the front end loader is used for 1,500 hours per annum. During the operation of the Power Plant it is estimated that use of the front end loader will increase to approximately 2,700 hours per annum. Diesel consumption by the front end loader is around 0.02 kL per hour resulting in current annual emissions of 81 t CO_2-e and approximately 146 t CO_2-e for each year of the life of the project.

Combustion of fuel oil for boiler start up

The Power Plant will be restarted approximately four times per year. It is estimated that the plant will consume approximately 50 L of fuel oil per start up with a total fuel consumption of 0.2 kL. Combustion of fuel oil during start up will account for approximately 0.5 t CO_2-e per annum.

Indirect Emissions (Scope 2)

Scope 2 emissions account for emissions from the generation of purchased electricity consumed. The facility's current annual electricity consumption is 6 GWh. This will not increase as a result of the operation of the Power Plant. However, the parasitic load of the Power Plant itself will be approximately 550 kW. When calculating the total power exported to the electricity grid, this power consumption has been subtracted from the generator output. Hence electricity consumption associated with Scope 2 has been addressed in the forecast of electricity sent out. Electricity consumed when the plant is non-operational is considered to be below the materiality threshold.

Indirect emissions relating to purchased electricity for the remainder of the SEFE facility are not included as part of this assessment, as the consumption of purchased electricity will remain the same for the current practice and proposed Power Plant scenarios.

Upstream and downstream emissions (Scope 3)

In accordance with the Director-General's Requirements upstream and downstream emissions have been evaluated. The paragraphs below contain a description of Scope 3 activities which have been identified as constituting upstream and downstream emissions for both the proposed Power Plant and the current practice. **Table 11-3** provides a summary of upstream and downstream emissions. The total upstream and downstream emissions are 8,549 t CO_2-e pa for the current practice and 227 t CO_2-e for the proposed Power Plant. The higher emissions for the current practice are due to increased transport emissions and that the main disposal activity (combustion of biomass) in the proposal scenario is included elsewhere in the inventory (Scope 1).

Table 11-3 Scope 3 Emissions

Emissions Source	Current Practice t CO_2-e	Power Plant t CO_2-e
Upstream		
Wood waste combustion at third party sawmills	244	0
Composting of wood waste generated at third party sawmills	1,921	0
Transport of wood waste sold as landscaping materials to market	480	0
Transport emissions associated with the distribution of wood waste from third party sawmills to SEFE	0	212
Disposal of ash waste generated by third party sawmills	0.1	0
Extraction and distribution of distillate fuel used at SEFE	6	11
Total Upstream Emissions	**2,651**	**223**
Downstream		
Composting of wood waste generated at SEFE	4,522	0
Distribution of mulch from SEFE to market	1,376	0
Disposal of ash generated at SEFE	0	4
Total Downstream Emissions	**5,898**	**4**
Total Scope 3	**8,549**	**227**

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Although the current practice appears to be associated with higher emissions than the proposed power plant due to transport emissions and combustion of biomass, this assessment does not consider carbon dioxide emissions from either the combustion or decomposition of biomass (as discussed in **Section 11.2.4**). Given the uncertainty regarding the estimation of long term soil carbon sequestration from recycled organic materials such as mulch, this reduction in greenhouse gas emissions has not been quantified. Therefore, the approach does not reflect the reduced greenhouse gas emissions that would result from mulching when compared to combustion of biomass due to some of the carbon mass being sequestered into the soil making comparison between the current practice and proposed power plant difficult.

Upstream

Approximately 22,600 t of wood waste for the Power Plant will be imported from other sawmills. Approximately 30% of this waste is disposed of by incineration at the sawmill site and a further 20% is disposed of by incineration and generation of process heat for food processing. An additional 7,000 t is exported by SEFE to a third party site for combustion and generation of process heat. Greenhouse gas emissions from wood waste combustion at third party sawmills account for 244 t CO_2-e.

Approximately 50% (11,300 t) of the wood waste generated at third party sawmills is sold as mulch for landscaping in the Canberra, Sydney and Wollongong metropolitan areas. For this assessment it has been assumed that emission factors for CH_4 and N_2O for composting as provided in the NGA Factors, June 2009, will be appropriate for the final treatment of waste material removed offsite for processing as mulch. Composting is described in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories as an aerobic process which results in a large fraction of the degradable organic carbon being converted to CO_2. CH_4 is formed in anaerobic sections of the compost, but is oxidised to a large extent in the aerobic sections of the compost. Using published emission factors for composting will likely provide an overestimate of emissions associated with mulch for landscaping, as anaerobic sections of the material, and therefore methane emissions will be minimised. Composting of waste generated at third party sawmills currently generates 1,921 t CO2-e.

Based on information received from SEFE, it has been assumed that the sawmills are located an average of 335 km away from the market depots. On this basis, wood waste transport from third party sawmills to market currently accounts for 480 t CO_2-e.

The operation of the Power Plant will require that approximately 22,600 t of wood waste will be transported from third party sawmills to the SEFE Power Plant. Based on preliminary supply information provided by SEFE, three sawmills will be involved in the supply of wood waste to SEFE for fuelling the Power Plant. One of these mills is local and assumed to be located 35 km away and the other two are approximately 100 km from SEFE. The number of loads per annum have been calculated as approximately 900 based on a load capacity of 25 t of material. Emissions from the transport of wood waste are calculated to be 212 t CO2-e.

One of the three sawmills that will supply SEFE with wood waste disposes of the waste via incineration, which in turn produces ash waste which needs to be disposed of. For the purposes of this assessment, it has been assumed that this ash is disposed of in an on-site landfill. Combustion of diesel fuels for transport of waste ash from the third party sites is around 0.1 t CO_2-e.

Scope 3 emissions from the extraction and distribution of diesel fuel and fuel oils used at the SEFE facility, have been calculated as 6 t CO_2-e for current practice and 11 t CO_2-e for the proposed practice. This takes into consideration only the operation of the front loader and fuel oil used during start-up of the Power Plant. Other fuel combustion emissions will remain unchanged.

Downstream

Currently 76%, or 26,600 t of wood waste is composted and provided as landscaping material. Distribution of the mulch to market currently produces 1,376 t CO_2-e per annum, based on 60% of the mulch being transported to the Sydney / Wollongong area and the remainder sent to Canberra. Emissions from composting have been calculated using the same methodology as composting of wood waste generated at third party sawmills. Emissions are estimated to be 4,522 t CO_2-e.

Emissions from transport of waste ash have been calculated on the basis of 90% being spread on plantations approximately 85km away and 10% being provided to landfill in close proximity to the SEFE site. Emissions associated with this current practice are 0.11 t CO_2-e. This will increase to 4.3 t CO_2-e per annum during the operation of the Power Plant.

11.3.3 Best Practice Management of Wood Waste

The Director-General's requirements require that the greenhouse emissions intensity of the Power Plant be compared with best practice, if possible. The UK Environment Agency notes that for waste feedstocks such as wood waste, where there are a number of potential alternative uses for the wood apart from disposal to landfill and combustion for electricity generation (Environment Agency 2009). Clean wood waste can also be composted to produce mulch, and GHG emissions associated with this may be low. It is considered that a mulch disposal scenario would be the best practice wood waste processing method in terms of reduction of greenhouse gas emissions. Given that the current practice at the SEFE facility is predominantly to sell waste as mulch material (around 76%), current practice is considered to be very close to best practice and therefore a comparison between the Power Plant and a best practice mulch disposal scenario has not been made as part of this assessment.

11.3.4 Summary of project emissions

Table 11-4 summarises the component emissions associated with the operation of the Power Plant on an annual basis. The greenhouse gas emissions associated with the project are estimated to be 1,140 t CO_2-e per annum. This represents a decrease compared to current practice emissions by 7,508 tonnes CO_2-e.

Table 11-4 Summary of Project Emissions

Emissions Source		Current Practice t CO_2-e	Power Plant t CO_2-e
Scope 1		100	913
Scope 2		0	0
Scope 3	Upstream	2,651	223
	Downstream	5,898	4
	Total	8,549	227
Annual emissions during operation		8,648	1,140
Change in emissions from current practice		-7,508	

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The Director-General's Requirements state that the "*Greenhouse emissions intensity (per unit of production) should be compared before and after the project, and if possible, with best practice".* Whilst it is not possible to compare the emissions intensity per unit of production with best practice, as there is no energy production in the current practice scenario, the emissions intensity per tonne of wood waste processed is comparable. Using the NGA factors methodology, the emissions intensity of the current practice is 0.15 t CO_2-e per tonne of wood waste processed (including wood waste processed at the SEFE facility and at third party sites). The emissions intensity for the proposed plant is 0.02 t CO_2-e per tonne of wood waste processed using the same methodology.

The low greenhouse gas emissions associated with the project are accounted for by the good practice activities inherent within the proposal design. In particular:

- more than 90% of the biomass fuel originates from sustainably managed forests as defined by the Australian Forestry Standards. The remaining proportion is waste originating from other sawmills that would be generated regardless of whether the Power Plant was in operation or not;
- transport of biomass will be minimised as most of the fuel comprises waste already available at SEFE. Therefore emissions associated with transport would also be minimised. Transporting fuels very long distances is known to reduce the emissions savings made by using biomass fuels compared with natural gas by between 15% and 50% (Environment Agency (UK) 2009);
- wood waste will be the fuel source for the Power Plant. It generally produces lower emissions in terms of intensity than other biomass feedstock, in part due to the absence of energy needed to process the fuel prior to use in the Power Plant and absence of the need for nitrogenous fertilisers to the crop (Environment Agency (UK) 2009); and
- the Power Plant would result in a reduction of transmission losses, which have not been quantified in this assessment.

11.3.5 Avoided Emissions

Sent out generation by the Power Plant will be 28 GWh per year (22 GWh sent to the grid and the remainder consumed by the SEFE site). This generation will offset the same quantity of generation per year which would have otherwise been produced from the NSW electricity production pool.

The availability of an additional 28 GWh supply from a renewable biomass source reduces the need for supply from fossil fuel sources such as coal, gas or a combination of these and can reduce the carbon intensity of electricity supplied to the NSW grid. This translates to a net greenhouse benefit where a low greenhouse emission energy supply displaces higher greenhouse emission intensity forms of electricity generation.

To gain an indication of the net greenhouse gas benefit of electricity supply from biomass relative to the existing supply to the NSW grid, the existing emissions for a comparable supply of 28 GWh have been calculated using the published National Greenhouse Accounts Factor for consumption of purchased electricity by end users in NSW and ACT of 0.89 kg CO_2-e/kWh. The factor of 0.89 reflects the emissions from a mix of predominately coal and gas and to a lesser extent of renewable energy sources. The actual emission savings through implementation of the Power Plant depend on the type of generation displaced and are greatest for displacement of coal fired electricity generation.

Whilst emissions intensities are commonly compared to the NSW GGAS Pool Coefficient, it is considered that the National Greenhouse Accounts Scope 2 emission factor of 890 kg CO_2-e/MWh provides a more relevant basis for comparison. The NSW Pool Coefficient only includes a subset of electricity generators, and does not include the full suite of Scope 3 emissions associated with fuel combustion.

The existing NSW grid emissions associated with the production of 28 GWh are 24,900 t CO_2-e pa, therefore operation of the Power Plant will result in the abatement of approximately 23,780 t CO_2-e of emissions (**Table 11-5**). The emissions intensity associated with electricity production by the proposed power plant is 41 kg CO_2-e/MWh. This is a decrease of 849 kg CO_2-e/MWh when compared to the NSW average of 890 kg CO_2-e/MWh.

Table 11-5 Annual Avoided Emissions

Avoided Emissions	Units	Quantity
Electricity (sent out generation)	GWh	28
NSW grid average electricity generation intensity	kg CO_2-e/MWh	890
SEFE electricity generation emissions intensity	kg CO_2-e/MWh	41
Emissions for the same electricity production produced by NSW Pool	t CO_2-e	24,900
SEFE generation emissions	t CO_2-e	1,140
Avoided Emissions	**t CO_2-e**	**23,780**

11.3.6 Greenhouse Gas Intensity Performance

The proposed Power Plant will produce electricity at a lower greenhouse intensity than the existing NSW average. **Table 11-6** shows the emissions intensity of the proposed Power Plant against the emission intensities for a range of generator types in NSW. When performing comparisons it should be noted that the data presented in **Table 11-6** represent the instantaneous emissions intensity of each technology type operating at its peak efficiency and does not include fuel consumption associated with start-up and shutdown of the plant.

Table 11-6 Emissions Intensity of Various Generator Types

Generator Type	Emissions Intensity kg CO_2-e / MWh
SEFE Biomass Power Plant	41
Open Cycle Gas-Fired Turbine	~600 – 700
Combined Cycle Gas Turbine	~400 – 500
Coal-Fired – Best Existing Australian Plant	830
Coal Fired World's Best Practice	~ 800 – 810

11.3.7 Comparison to National and NSW Greenhouse Gas Inventories

The National Greenhouse Gas Inventory 2007 (Department of Climate Change, 2009) is the latest available national account of Australia's greenhouse gas emissions. Australia's net direct greenhouse gas emissions across all sectors totalled 597.2 Mt CO_2-e in 2007, with the stationary energy sector being responsible for 291.7 Mt CO_2-e (**Table 11-7**).

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Table 11-7 Comparison of Project Emissions with Australian and State Emissions

	Total Emissions	Contribution by Project	Emissions reduction by Project
	Mt CO_2-e	%	%
Total Australian Emissions	597.2	0.0002	0.0040
Australia Stationary Energy	205.9	0.0006	0.0115
Total NSW emissions	160.7	0.0007	0.0148
NSW Stationary Energy	47.1	0.0024	0.505

According to the National Greenhouse Gas Inventory, NSW net direct greenhouse gas emissions were estimated to be 162.7 Mt CO_2-e. Stationary energy sources were estimated to account for 79.4 Mt CO_2-e of NSW emissions, equating to approximately 49% of total NSW greenhouse gas emissions. The electricity supply industry therefore has an important role to play in reducing Australia's greenhouse gas emission industry. The greenhouse emissions that will be generated by the Power Plant will be insignificant in comparison to national and state total and stationary energy sector emissions, however operation of the plant will lead to a minor reduction in these inventories.

11.3.8 Renewable Energy Target (RET)

The Office of the Renewable Energy Regulator (ORER) is the statutory authority established to administer the Government's *Renewable Energy (Electricity) Act 2000* and the *Renewable Energy (Electricity) Regulations 2001*. The policy that underpins the Act and Regulations is commonly referred to as the Mandatory Renewable Energy Target (MRET) scheme. The objectives of the MRET are to encourage the additional generation of electricity from renewable resources, reduce emissions of greenhouse emissions and ensure that renewable energy sources are ecologically sustainable.

The MRET is a market-based measure that encourages renewable energy deployment by creating an obligation for electricity retailers and large users to purchase Renewable Energy Certificates (RECs) that are created by renewable energy generators. Under the scheme a legal liability is placed on wholesale purchasers of electricity to proportionately contribute towards the generation of an additional 9,500 GWh of renewable energy per year by 2010. All retailers and large buyers are required to maintain the 9,500 GWh of new renewables between 2010 and 2020 to provide investment certainty up to 2010.

Demand is created by legally obliging parties who buy wholesale electricity to source an increasing percentage of their electricity purchases from renewable-based generation, or pay a penalty of $65 per MWh of shortfall. A supply incentive is created by enabling an extra revenue stream to be earned for generating this additional renewable-based electricity. This revenue stream, which is additional to the price a generator would receive for the electricity, is achieved by creating a tradeable REC.

The measure provides that one REC may be created for each MWh of electricity generated by accredited power stations using eligible renewable energy sources. As at December 2008, a total of 37,111,281 RECs had been created in the REC registry for the generation years. RECs created by wood waste generators account for 2.4% of this total (892,384 RECs) (ORER 2009).

In 2008 the Federal Government committed to introducing an expanded Renewable Energy Target (RET) scheme to subsume the MRET scheme and ensure that 20% of Australia's electricity supply is provided by renewable energy by 2020.

Key attributes of the RET include:

- ensuring that at least 20% of Australia's electricity supply (approximately 60,000 GWh) is generated from renewable sources by 2020, by maintaining 15,000 GWh of existing renewable energy capacity as well as providing 45,000 GWh of additional generation;
- maintaining the same eligibility criteria as in the current MRET scheme and retaining the eligibility of all renewable energy projects that have been approved under existing state-based schemes; and
- phasing out the RET between 2020 and 2030 as the proposed CPRS matures and carbon prices become sufficient to ensure the RET is no longer required.

The *Renewable Energy Act 2000* defines renewable energy sources eligible under the MRET and RET. The list of eligible renewable energy sources includes wood waste. As identified in **Section 4.2.2**, Regulation 8(1)(b) of the *Renewable Energy (Electricity) Regulations 2001* identifies a category of the wood waste as being "a manufactured wood product or by-product from a manufacturing process". This category applies to the biomass material to be consumed by the Power Plant and has been confirmed by the ORER.

Using the ORER Fact Sheet: Information for Applicants who Intend to Apply for Accreditation of a Power Station, Updated March 2009, SEFE's proposed Power Plant would be eligible to generate approximately 26,831 RECs annually.

11.4 Mitigation Measures

The greenhouse gas assessment indicates that although the Power Plant will lead to increased greenhouse gas emissions compared to the current practice, avoided emissions due to electricity production from a renewable source will result in an overall reduction in emissions. Given this, further mitigation measures not considered necessary.