20. GREENHOUSE GAS

Atmospheric greenhouse gases play an important role in regulating the earth's temperature. Anthropogenic greenhouse gas emissions have been associated with changes in the earth's climate. This chapter provides an inventory of expected project greenhouse gas emissions. Environmental protection objectives have been developed and the mitigation and management measures to achieve these objectives identified. The residual impact assessment assumes the effective application of proposed mitigation and management measures.

This chapter is based upon the findings of a greenhouse gas impact assessment conducted by PAEHolmes (Appendix 13, Greenhouse Gas Impact Assessment).

Objectives have been developed based on the relevant legislative context, with the aim of protecting the existing environment and identified environmental values. The objectives for greenhouse gas are provided in Box 20.1.

Box 20.1 Objectives: Greenhouse gas

- To estimate the greenhouse gas emissions resulting from the construction and operation of the Arrow LNG Plant.
- To identify methods to economically minimise greenhouse gas emissions associated with construction and operation of the Arrow LNG Plant.

The existing air quality environment in the project area is described in Chapter 21, Air Quality.

20.1 Legislative Context and Standards

The applicable international, national and state regulatory framework specific to greenhouse gas emissions is described below.

20.1.1 Statutory Legislation and Standards

The following international bodies are relevant to the management of greenhouse gas:

- Intergovernmental Panel on Climate Change (IPCC). The IPCC was established to provide independent scientific advice on climate change. The aims of the IPCC are to assess scientific information relevant to human induced climate change and to provide options for adaptation and mitigation. The initial report by the IPCC (IPCC, 2004) was used as the basis for negotiating the United Nations Framework Convention on Climate Change.
- United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC establishes an overall framework for intergovernmental efforts to deal with the challenge posed by climate change. It recognises that the climate system is a shared resource that can be affected by industrial and other emissions of carbon dioxide and greenhouse gases. The convention members comprise 172 countries including Australia.
- Kyoto Protocol (UN, 1998). Australia ratified the Kyoto Protocol in March 2008. This protocol builds upon the UNFCCC by committing member countries to limit or reduce their greenhouse gas emissions. The protocol requires each member country to put in place its own policies and measures to meet the country’s negotiated target. Australia’s binding 2012 target is 108% of the country’s 1990 emissions levels.

The following Commonwealth legislation and policies are relevant to the management of greenhouse gas:

- *National Greenhouse and Energy Reporting Act 2007* (NGER Act). The act establishes a national system for reporting greenhouse gas emissions, as well as triggers for corporate and facility reporting thresholds for greenhouse gas emissions, energy consumption or energy production. Arrow Energy currently triggers the corporate reporting threshold requirements.
- *Energy Efficiency Opportunities Act 2006*. The energy efficiency opportunities program developed under the act is designed to improve the energy efficiency of large businesses. Participation is mandatory for corporations that use more than 0.5 PJ of energy. Arrow Energy is expected to trigger the 0.5 PJ energy consumption threshold and, as such, is required to report under the energy efficiency opportunities program.
- Clean Energy legislative package. On 10 July 2011, the Australian Government announced the Clean Energy Plan, which will implement a carbon pricing mechanism. From 1 July 2012, certain industries in Australia will be required to pay for greenhouse gas emissions (Australian Government, 2011a). This mechanism has the following distinguishing features (KPMG, 2011):
  - The mechanism will consist of two separate stages. For the first three to five years, a fixed price will be set and all carbon permits will be determined by the government. After this period, a flexible cap and trade emissions scheme will be implemented.
  - No international offsets will be accepted as currency as an alternative to purchasing Australian permits during the fixed price stage.
  - Before the flexible price period, annual caps on pollution for the first five years will be set by the government. These caps will be extended each year to assist businesses in planning their compliance strategies.

Arrow Energy will be a direct participant in the carbon price mechanism and will report emissions and hold emission permits at the end of each period.

The following Queensland Government strategies and schemes are relevant to the management of greenhouse gas:

- ClimateQ (DERM, 2009a). ClimateQ is a commitment to reduce Queensland's greenhouse gas emissions by 60% by 2050, in line with the Australian Government's long term target. This reduction will be achieved through a variety of short, medium and long term strategies, including:
  - Improving energy efficiency.
  - Reducing the emissions intensity of the Queensland energy sector.
  - Mode switching and fuel efficiency in the transport sector.
  - Reducing land clearing.
  - Carbon sequestration.
- Queensland Gas Scheme (DEEDI, 2009c). This scheme aims to reduce greenhouse gas emissions from the stationary energy sector by forcing Queensland electricity retailers and large electricity users to source a portion of their electricity from gas fired generation.

  The Queensland Gas Scheme does not directly apply to the Arrow LNG Plant as it will not produce electricity for retail use. However, the scheme is relevant to the project because it is likely to stimulate increased local demand for gas for the purpose of electricity generation.

20.1.2 Arrow Energy's Greenhouse Gas Standard

Arrow Energy recognises the challenges posed by climate change and intends to develop a greenhouse gas standard as part of its integrated health, safety and environmental management system (HSEMS). It is expected that the standard will cover items such as:

- Arrow Energy's commitment to reduce the greenhouse intensity of its operations.
- Compliance with relevant greenhouse legislation on emissions reporting, energy efficiency and greenhouse management.
- Targets, including their evaluation and reporting.
- Preparing for the changes relating to carbon constraints.
- Venting and flaring commitments.

The standard will reflect Arrow Energy's support for the development of technologies and management practices that reduce greenhouse emissions and will identify reporting and measurement systems.

20.2 Assessment Method

Kyoto recognised greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluororocarbons and sulfur hexafluoride. For the purpose of the assessment, carbon dioxide, methane and nitrous oxide emissions from the project have been calculated in the form of carbon dioxide equivalents. Calculations were based on emission estimates in both the construction and operation phases of the project.

20.2.1 Baseline Assessment

The effects associated with greenhouse gas emissions are global in nature so there is no defined study area for this assessment. Applicable emissions relate to all emissions (expressed as carbon dioxide equivalent) resulting from the construction and operation of the Arrow LNG Plant. The potential impacts associated with greenhouse gas emissions from the project will be in proportion with its contribution to global greenhouse emissions.

Relevant baseline data includes current estimations and trends for greenhouse gas emissions for Australia and Queensland.

20.2.2 Impact Assessment

Greenhouse gas emissions have been assessed based on the methods outlined in the following documents:

- Greenhouse Gas Protocol (WRI & WBSCD, 2004).
- The National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Determination) made under the NGER Act.
- The NGER technical guidelines to support the above determination (DCCEE, 2010e, 2010d).
- The National Greenhouse Accounts (NGA) factors (DCCEE, 2010a).

The Greenhouse Gas Protocol (WRI & WBSCD, 2004) categorises the sources of emissions into three 'scopes' (scope 1, scope 2 and scope 3) for greenhouse gas accounting and reporting purposes. This terminology has been adopted in Australian greenhouse gas reporting and

measurement methods, and has been used in this assessment. For inventory purposes, the scopes are defined as follows:

- Scope 1 direct greenhouse gas emissions, which are defined as emissions occurring from sources owned or controlled by the reporting entity. Scope 1 emissions relating to the project include:
  - Generation of electricity where emissions result from combustion of fuels in stationary sources. Generation of electricity at the LNG plant using gas turbine generators will be defined as a scope 1 activity.
  - Transport of materials, waste and employees, where emissions result from the combustion of fuels in Arrow Energy owned or controlled mobile combustion sources such as buses and cars.
  - Construction activity, where emissions result from fuel combustion in Arrow Energy owned or controlled industrial vehicles and equipment, such as excavators, graders, truck mounted drilling rigs and land clearing equipment.
  - Planned or unplanned releases of gas from venting or flaring.
  - Fugitive emissions from equipment.
- Scope 2 indirect greenhouse gas emissions are those emissions that occur from the procurement of electricity from third parties. Emissions will not occur at the LNG plant site, but will occur at the third party facility producing electricity; hence, the term ‘indirect greenhouse emission’.
- Scope 3 other indirect greenhouse gas emissions are all other emissions not included in scope 1 and scope 2 emissions, e.g., emissions associated with fuel cycles, the end use of produced gas, and third party infrastructure required to export the gas as LNG.

Methods for estimating scope 1 and scope 2 emissions were consistent with those described in the NGER Determination under the NGER Act and their supporting technical guidelines. Methods for estimating scope 3 emissions were consistent with the NGA factors.

Construction

The estimation of construction emissions assumed that the two construction phases (stage 1 being the construction of LNG trains 1 and 2; stage 2 being the construction of trains 3 and 4) will result in similar emissions. The exception is land clearance, which is expected to only take place during the first year of construction.

Scope 3 emissions associated with upstream activities (i.e., extraction and processing coal seam gas) were estimated based on average scope 1 emissions and average coal seam gas throughput (see Appendix 13, Greenhouse Gas Impact Assessment).

Operation

Greenhouse gas emissions will vary depending on whether the LNG plant is powered by onsite gas turbine generators (mechanical) or by power taken from the electricity grid (electrical). The assessment examined two scenarios:

- Scenario 1 (all mechanical): base case mechanical drive with four LNG trains operating.
- Scenario 2 (all electrical): all electric power with four LNG trains operating.

These two scenarios have been evaluated as they represent the two extremes of the operational options under consideration. The all mechanical scenario exclusively employs gas to operate the LNG plant, and the all electrical scenario exclusively employs imported electricity to operate the LNG plant.

Start up flaring emissions were only included for years one and nine, when the LNG trains are brought online. Operation emissions were estimated based on the number of trains in operation, based on the project's timeline (see Chapter 6, Project Description: LNG Plant).

20.3 Existing Environment and Environmental Values

The global greenhouse gas emissions associated with the consumption of fossil fuels for 2007 (the most recent data available under current Kyoto accounting provisions) are presented in Table 20.1, along with Australia's energy sector and Queensland's total emissions.

Table 20.1 Estimates of greenhouse gas emissions

Geographic Area	Source Coverage	Timescale	Emissions per Annum (Mt CO2-e/annum)
Global[1]	Consumption of fossil fuels	2007	29,335
Australia[2]	Energy sector	2007	408.2
Queensland[2]	Total greenhouse gas emissions including land use, land use change and forestry	2007	181.6

[1] UNSD (2011).

[2] DCC (2009b).

Note: CO_2-e: carbon dioxide equivalent.

Australia's greenhouse gas emissions increased by 9.3% between 1990 and 2007. The largest increase was in the energy sector, with emissions increasing by 42.5% between 1990 and 2007. In particular, the stationary energy subsector (which includes emissions associated with non-transport fuel combustion) increased by 49.5% (96.6 Mt CO_2-e) between 1990 and 2007. The largest contribution to stationary energy comes from electricity generation (68.4%). Emissions from the Arrow LNG Plant will be categorised as part of the energy sector.

Queensland has the highest per capita greenhouse gas emissions of all Australian states. Queensland's net greenhouse gas emissions increased by 8.9% (15.2 Mt CO_2-e) between 1990 and 2007. The stationary energy sector contributes the most to Queensland's emissions. Factors supporting growth in the stationary energy sector include increasing residential electricity demand and the export of Queensland's generated electricity to other Australian states.

20.4 Issues and Potential Impacts

This section describes the activities that will give rise to greenhouse gas emissions during project construction and operation. Direct and indirect greenhouse gas emissions will vary over the life of the project.

20.4.1 Construction

During construction, direct (scope 1) emissions will result from the combustion of fuels used to construct the LNG plant, and from vegetation clearance. Indirect scope 2 emissions will result from electricity consumption at the mainland temporary workers accommodation facility (TWAF). Scope 3 indirect emissions will result from fuel cycle energy consumption.

Estimates of project construction emissions for the all mechanical and all electrical scenarios are summarised in Table 20.2 below. The all electrical scenario has used the default Queensland

power grid greenhouse gas emission intensity factor to provide a conservative estimate of scope 2 greenhouse gas emissions. In practice, this factor is not constant and varies according to the greenhouse gas emission intensity at the time of electricity consumption (i.e., electricity generated by a coal fired power station will produce more greenhouse gas emissions than electricity generated at a gas fired power station, and the overall scope 2 greenhouse gas emission intensity will change with time depending on the varying contributions of electricity to the grid from these sources). Therefore, the actual range of scope 2 greenhouse gas emissions associated with the all electrical scenario will vary from emissions comparable to the all mechanical option to the values shown in Table 20.2.

Table 20.2 Direct and indirect construction greenhouse gas emissions

Scope	Category	Activity	Total[1] CO_2-e
All Mechanical Scenario			
Scope 1	Fuel combustion	Construction power, dredging equipment and passenger and marine vessels.	59,074
	Land clearing	Vegetation removal.	(64,032[2])
Scope 2	Energy consumption	Electricity consumption at the TWAF.	17,483
Scope 3	Energy consumption/ production	Full fuel cycle (marine vessels, TWAF and construction activities).	7,022
Overall			**83,579**
All Electrical Scenario			
Scope 1	Fuel combustion	Dredging, passenger and marine vessels, and passenger transport.	(10,115 [2])
	Land clearing	Vegetation removal.	
Scope 2	Energy consumption	Electricity consumption for power generation and LNG trains and energy consumption at the TWAF.	151,913
Scope 3	Energy consumption/ production	Full fuel cycle (electricity at TWAF, marine vessels, and electricity for construction power).	20,371
Overall			**182,398**

[1] Total CO_2-e emissions (tonnes CO_2-e/annum) include CO_2, CH_4 and N_2O.

[2] Vegetation removal only included in Year 1 - excluded from overall total.

The total (scope 1, scope 2 and scope 3) greenhouse gas emissions associated with construction of the project have been estimated to be approximately 83.6 kt CO_2-e/annum (excluding one off vegetation clearing) for the all mechanical scenario versus up to 182.4 kt CO_2-e/annum for the all electrical option, with the difference being due to energy (electricity) consumption for construction power.

Scope 1 construction emissions are higher for the all mechanical scenario, compared to the all electrical scenario. Scope 1 construction emissions for the all mechanical scenario accounted for 70.7% of total construction emissions. Scope 1 construction emissions for the all electrical scenario accounted for 5.5% of the total construction emissions. Gas combustion in turbines for mains electricity supply constitutes the majority of scope 1 emissions for the all mechanical scenario. Greenhouse gas emissions from fuel combustion in marine vessels for the transport of passengers and vehicles account for the largest portion of scope 1 emissions under the all electrical scenario.

Scope 2 emissions for the all mechanical scenario are associated with electricity consumption at the TWAF. Scope 2 emissions under the all mechanical scenario account for 20.9% of total greenhouse gas emissions. Scope 2 construction emissions for the all electrical scenario are

associated with electricity consumed at Curtis Island for construction activities, and account for 83.3% of total all electrical emissions.

Scope 3 emissions for the all electrical scenario is nearly three times higher than the all mechanical scenario. Scope 3 emissions arise as a result of the extraction, production and transport of fuel combusted for fuel generation and electricity losses in the transmission and distribution process. Scope 3 emissions for both scenarios constitute a small proportion of their respective overall emissions.

Emissions associated with power consumption during construction for the all electrical scenario (134 kt CO_2-e/annum) are nearly three times greater than those for the all mechanical scenario (49 kt CO_2-e/annum). The all electrical scenario therefore generates almost three times the emissions to meet the power supply requirement during construction of the LNG plant.

20.4.2 Operation

Direct and indirect operation emissions are detailed below:

- Scope 1 direct emissions sources associated with the Arrow LNG Plant are listed below:
  - Fugitive emissions of coal seam gas from transmission pipeline.
  - Gas turbine generators, which provide power for gas processing and compression.
  - Fugitive emissions associated with gas compression, piping and venting.
  - Flaring of coal seam gas.
  - Fuel consumption for transport (personnel, vehicles, bulk material and LNG movements).
- Scope 2 indirect emissions from the generation of energy products purchased by the project, including purchased electricity.
- Scope 3 indirect emissions associated with the Arrow LNG Plant are listed below:
  - Fuel cycles of all fuels including coal seam gas, diesel and fuel oil.
  - Electricity consumption from the grid.
  - Fugitive emissions associated with gas compression, piping and venting.

Estimates of project operation emissions for the all mechanical and all electrical scenarios are summarised in Table 20.3.

The total (scope 1, scope 2 and scope 3) greenhouse gas estimates associated with the operation of the Arrow LNG Plant are approximately 67.5 Mt CO_2-e/annum (excluding start up flaring) for the all mechanical option, and 70.3 Mt CO_2-e/annum for the all electrical scenario. Scope 3 emissions account for 88.4% of emissions for the all mechanical scenario and 90.5% of emissions for the all electrical scenario. These emissions are primarily through LNG combustion by the end user and subsequently not part of Australia's greenhouse gas emissions.

Table 20.3 Direct and indirect operation greenhouse gas emissions

Scope	Category	Activity	Total[1] CO_2-e
All Mechanical Scenario			
Scope 1	Fuel combustion	Stationary engines – power generation for utilities and LNG trains, passenger and marine vessels, and passenger transport.	6,380,431 (97,334[2])
	Fugitive emissions	Venting from acid gas removal unit, start-up flaring[2], pilot and maintenance flaring, facility level fugitives and transmission.	

Table 20.3 Direct and indirect operation greenhouse gas emissions (cont'd)

Scope	Category	Activity	Total[1] CO_2-e
All Mechanical Scenario (cont'd)			
Scope 2	None applicable		0
Scope 3	Energy consumption and production	End use LNG, full fuel cycle (coal seam gas processed) and full fuel cycle (marine vessels).	61,117,866
Overall			**67,498,296**
All Electrical Scenario			
Scope 1	Fuel combustion	Passenger and marine vessels and passenger transport.	1,453,934 (97,334[2])
	Fugitive emissions	Venting from acid gas removal unit, start-up flaring[2], pilot and maintenance flaring, facility level fugitives and transmission.	
Scope 2	Energy consumption	Electricity consumption for power generation and LNG trains.	6,726,247
Scope 3	Energy consumption/ production	End use LNG, full fuel cycle (coal seam gas processed), full fuel cycle (marine vessels), and full fuel cycle (operation power and accommodation).	62,100,351
Overall			**70,280,553**

[1] Total CO_2-e emissions (tonnes CO_2-e/annum) include CO_2, CH_4 and N_2O.

[2] Start up flaring only included in Year 1 and 9 - excluded from overall total.

Scope 1 operation emissions for the all mechanical scenario are more than twice that of the all electrical scenario. This difference is primarily due to the power required under the all mechanical scenario for power generation for the utilities and LNG trains. Scope 1 operation emissions for both scenarios made up only a small percentage of the total emissions: 9.5% for the all mechanical scenario and 2.1% for the all electrical scenario. Scope 1 emissions for the all mechanical scenario were constituted mainly of emissions from coal seam gas combustion in generators. The majority of scope 1 emissions under the all electrical scenario are expected to be from facility level fugitive emissions.

Scope 2 emissions are associated with electricity consumed at the LNG plant and Curtis Island accommodation under the all electrical scenario. The all mechanical scenario does not involve any scope 2 emissions due to electricity consumption because its power requirement is met through combustion of coal seam gas in gas turbines.

Scope 3 emissions for both scenarios are made up primarily by the LNG combustion of end users, which will occur in jurisdictions outside of Australia. Scope 3 operation emissions for both scenarios made up a substantial percentage of the total emissions: 91.1% for the all mechanical scenario and 88.4% for the all electrical scenario. However, as these will occur outside of Australia, they do not count toward Australia's greenhouse targets under the Kyoto Protocol.

20.4.3 Estimation of Impacts

Project greenhouse gas emissions as CO_2-e are expressed as a percentage of global, Australian and Queensland greenhouse gas emissions in Table 20.4. The aggregate scope 1 and scope 2 emissions from the project associated with the all electrical (worst case) scenario were calculated. The predicted greenhouse gas CO_2-e emissions for the project were equivalent to 0.028% of

2007 global emissions for the worst case operational year and the potential impacts associated with climate change directly attributable to the project are negligible.

Scope 3 emissions do not contribute to the Queensland or Australian annual emissions as scope 3 emissions will occur outside of Australia.

Table 20.4 Project contribution to estimates of greenhouse gas emissions

Source	Emissions per Annum (Mt CO_2-e/annum)	Arrow LNG Plant Contribution		
		Scope 1 (%)	Scope 2 (%)	Scope 1 and 2 (%)
Global[1]	29,321	0.005	0.023	0.028
Australia (Energy Sector only)[2]	408.2	0.367	1.64	2.01
Queensland (Total)[2]	181.6	0.826	3.69	4.52

[1] UNSD (2011).

[2] DCC (2009b).

20.5 Avoidance, Mitigation and Management Measures

This section describes measures to minimise greenhouse gas impacts associated with the project.

20.5.1 Arrow Policy and Energy Management

A greenhouse gas standard will be developed and implemented as part of Arrow's integrated HSEMS. [C20.01]

The company recognises the challenges presented by climate change and will set out objectives in the standard to address these challenges in relation to its own activities. Arrow supports the development of technologies and management practices that reduce greenhouse gas emissions, will maintain effective reporting and measurement systems.

20.5.2 Project Design

The estimated project emissions are based on the current Arrow LNG Plant design, which incorporates measures to mitigate greenhouse gas emissions. The emissions intensity (emissions per GJ fuel produced) will decrease as measures are implemented to improve energy efficiency. Potential measures relate to LNG processing, power generation and compression and are set out in Table 20.5.

Table 20.5 Potential measures to reduce greenhouse gas emissions intensity

Process Section	All Mechanical Option	All Electrical Option
Driver type	Aero derivative gas turbines have been chosen as process drivers. This type of turbine offers increased energy efficiency over industrial machines, and allows variable drive speeds to account for fluctuations in gas flow.	N/A
LNG operating pressure	The operating pressure of LNG has been maximised to the limits of the piping class. Maximising operating pressure increases LNG production. Typically LNG production increases by 0.3 to 0.5% for every 1 bar increase in liquefaction pressure.	
Compressor configuration	A configuration of parallel compressors has been chosen, leading to almost full use of gas turbine capacity, allowing operation at higher gas turbine efficiency.	N/A

Table 20.5 Potential measures to reduce greenhouse gas emissions intensity (cont'd)

Process Section	All Mechanical Option	All Electrical Option
Regeneration gas	The regeneration gas will be heated in a regeneration gas heater, which utilises heat from the hot exhaust of the process drivers. This increases energy efficiency as all the LNG's facilities heating requirements are provided by recovering heat that would be otherwise rejected to atmosphere via the exhaust stacks reduced. There are no gas-fired heaters used in the LNG plant.	N/A
Intercooling	Compressor intercooling stages have been incorporated into the design. This reduces the power requirements associated with compression. The main refrigerant compressors driver uses intercooling, which reduces energy requirements by maximising efficiency.	
Cooling method	Air cooling has been maximised to achieve tighter approach temperatures and therefore the condensing pressure required in the refrigerant loops. This reduces the required refrigerant compressor discharge pressure and reduces the driver fuel consumption. The use of variable speed electric motors is applied to maximise efficiency and minimise energy use.	N/A
Acid-gas removal unit solvent selection	The acid-gas removal unit uses the Adip-X solvent, which has lower hydrocarbon co-adsorption and lower hydrocarbon losses, compared with other solvents that could be used.	

Arrow Energy will continue to identify and consider measures to reduce emissions intensity and improve the energy efficiency of the different project components throughout the design process. [C20.02]

20.5.3 Other Measures

Other measures to minimise greenhouse gas impacts associated with the project include:

- Fugitive losses. Opportunities to minimise fugitive emissions will be sought through plant maintenance and monitoring programs such as monitoring gas flow rates throughout the LNG liquefaction process and carrying out minimal venting. Where planned venting occurs, gas should be flared to convert CH_4 to CO_2. Routine maintenance of LNG plant equipment (particularly gaskets and seals) will also assist in minimising fugitive losses.
- Gas processing and compression emissions. These emissions could be reduced by adding additional refrigerant pressure levels to increase process efficiency, by using LNG and pressure expanders to reduce energy consumption, and by the use of best available technology.
- Emissions offsetting. By investing in third party projects that reduce emissions below a demonstrated baseline, Arrow Energy could offset its greenhouse gas emissions. Third party projects may include forestry projects and renewable energy projects (e.g., solar, wind).
- Emissions trading. Arrow Energy may be able to trade emissions permits during the second phase of the carbon price mechanism if the internal costs of abatement are higher than the price of permits. Alternatively, Arrow Energy may trade permits to directly reduce emissions if internal costs of abatement are lower than the price of permits.

Greenhouse gas emissions will also be minimised through the progressive clearing of areas and by implementing rehabilitation as soon as practical. [C20.03]

20.5.4 Decommissioning

During the decommissioning phase, greenhouse gas emissions will be minimised through application of the relevant measures put in place during the operational phase, including selection of equipment and transport logistics.

20.6 Residual Impacts

The global contribution of the Arrow LNG Plant to greenhouse gas emissions is negligible, accounting for less than 0.03% of global emissions under a worst-case scenario (see Table 20.4).

The avoidance, mitigation and management measures outlined above will avoid some impacts, reduce the overall level of greenhouse gas emissions from the LNG plant, and hold the level of impacts at negligible.

20.7 Inspection and Monitoring

Arrow Energy will assess the energy efficiency opportunities and monitor greenhouse gas emissions associated with the construction and operation of the project in accordance with regulatory requirements.

Arrow Energy will report on annual greenhouse gas emissions, and energy consumption and production from the project as required under the NGER Act and the Energy Efficiency Opportunities program (DRET, 2006), as well as future carbon price mechanisms.

20.8 Commitments

The measures (commitments) that Arrow Energy will implement to manage greenhouse gas impacts are set out in Table 20.6.

Table 20.6 Commitments: Greenhouse gas

No.	Commitments
C20.01	Develop and implement a greenhouse gas standard as part of Arrow's HSEMS.
C20.02	Identify and consider measures to reduce emissions intensity and improve the energy efficiency of the different project components throughout the design process.
C20.03	Minimise greenhouse gas emissions through the progressive clearing of areas and implement rehabilitation as soon as practical.