Carbon Offset and Its Influence on a Pipeline Construction Project

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Abstract

There is currently an enormous amount of publicity devoted to the environmental issues of climate change, carbon offset, carbon reduction and emissions trading, and a significant part of that is related to the controversy surrounding them. This is matched by the large amount of time spent by politicians trying to legislate and regulate various aspects of, and impacts on, the environment at a State, National and International level.

It is not the intent of this paper to enter into any debate about the veracity of the claims and counter-claims regarding climate change, nor about the politics, motivation or appropriateness of various pieces of legislation. In the interests of balance, a wide range of sources have been used from the internet in an attempt to cover a variety of opinions.

In the main, the intent of this paper is to explain carbon offset background, principles, options and the path taken by one Company to offset most of the carbon dioxide (and the carbon dioxide equivalent) produced on a recent pipeline project—the Jackson to Moomba Oil Pipeline Project—273km of 219mm OD, X70 pipeline.

1 Introduction

1.1 Background

The Intergovernmental Panel on Climate Change (IPCC) is a leading body for the assessment of climate change, established by the United Nations Environment Programme and the World Meteorological Organization (under the United Nations General Assembly Resolution 43/53 of 6 December 1988) to provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences.

- 1988 Intergovernmental Panel on Climate Change (IPCC)
- 1990 IPCC First Assessment Report First Assessment Report[1] that –
  - stated that the IPCC was of the opinion that human activity was "very likely" (greater than 90% chance[2]) responsible for global warming
  - lead to the establishment of the United Nations Framework Convention on Climate Change (UNFCCC)—mandated in 1994.
- 1992 Earth Summit (international environmental treaty – aims to stabilize GHG concentrations)
- 1995 first UNFCCC Conference of Parties (COP-1) in Berlin (these are held yearly)
- 1997 COP-3 resulted in the Kyoto Protocol
- December 2009 COP-15 is to be held in Copenhagen.

The United Nations Framework Convention on Climate Change developed a framework to help maintain greenhouse gases at a level that would not adversely affect the climate system. The UNFCCC entered into force on 21 March 1994.

In the IPCC Second Assessment Report of 1995, the information included provided key input in the way to the adoption of the Kyoto Protocol in 1997. (The IPCC shared the Nobel Peace Prize with former US Vice President Al Gore in 2007.)

In 1997, the Kyoto Protocol was ratified by a number of nations including Australia. The Kyoto Protocol was –

> *"a protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), an international environmental treaty with the goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The Kyoto Protocol establishes legally binding commitment for the reduction of four greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride), and two groups of gases (hydrofluorocarbons and perfluorocarbons). As of January 2009, 183 parties have ratified the protocol, which was initially adopted for use on 11 December 1997 in Kyoto, Japan and which entered into force on 16 February 2005. Under the Kyoto Protocol,*

[1] To date there have been four reports—the third in 2001 and the last in 2007. The next report is due in 2014 and is currently being worked on.

[2] Source: http://www.environment.nsw.gov.au/climateChange/causes.htm – retrieved 09-09-2009

> *industrialized countries agreed to reduce their collective green house gas (GHG) emissions by 5.2% from the level in 1990. National limitations range from the reduction of 8% for the European Union and others to 7% for the United States, 6% for Japan, and 0% for Russia. The treaty permitted the emission increases of 8% for Australia and 10% for Iceland."*[3]

That means that Australia has International obligations not to increase carbon dioxide emissions by more than 8% on the emissions of 1990 *"which equates to nearly a 30 per cent reduction from its 'business as usual' projections"*[4].

Currently in Australia, the following legislation applies:

- *National Greenhouse and Energy Reporting Act 2007* (Cwlth)[5] which is an *"Act to provide for the reporting and dissemination of information related to greenhouse gas emissions, greenhouse gas projects, energy production and energy consumption, and for other purposes."*
- *National Greenhouse and Energy Reporting Regulations 2008* (Cwlth)
- *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Cwlth)

Additionally, a proposed document was released by the Department of Climate Change *Draft National Carbon Offset Standard* [6] dated 19 December 2008 (the standard has not yet been released).

In other words, carbon offsetting may become more than just a recommended practice—it may well become a legal obligation. Presumably, if a company cannot reduce its emissions to a legislated level, it may have to offset the amount above that level or face some form of penalty.

1.2 Carbon Offsetting Questions

To answer the questions of **how** to offset carbon dioxide and the carbon dioxide equivalent amounts, firstly we must answer the questions of –

- what is the problem with carbon dioxide
- why should it be offset
- what are the offset options
- when and where should it be done
- who is responsible for it?

But before that, there must be an explanation of the meaning and usage in this paper of some of terms used.

[3] Source: http://en.wikipedia.org/wiki/Kyoto_Protocol – retrieved 09-09-2009
[4] Source: http://www.aph.gov.au/library/INTGUIDE/SCI/kyoto.htm – retrieved 09-09-2009
[5] Refer: http://www.comlaw.gov.au/ComLaw/Legislation/ActCompilation1.nsf/current/bytitle/DD3EADB1AF11455FCA257577007674B6?OpenDocument&mostrecent=1 – retrieved 07-09-2009
[6] Source: http://www.climatechange.gov.au/carbonoffsetting/ncos/ncos.html – retrieved 07-09-2009

2 Definitions

2.1 General

One definition for carbon offset is

> *". . . a financial instrument aimed at a reduction in greenhouse gas emissions. Carbon offsets are measured in metric tons of carbon dioxide-equivalent (CO2-e) and may represent six primary categories of greenhouse gases. One carbon offset represents the reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases."*[7]

The following definitions are found in the *Draft National Carbon Offset Standard –*

> ***Carbon offset:*** *Represents a reduction in greenhouse gases relative to a business-as-usual baseline. Carbon offsets are tradeable and often used to negate (or offset) all or part of another entity's emissions.*
>
> ***Carbon dioxide equivalence ($C0_2$ -e):*** *A standard measure that takes account of the different global warming potentials of greenhouse gases and expresses the cumulative effect in a common unit.*
>
> ***Carbon footprint:*** *A measure of the carbon dioxide equivalent emissions attributable to an activity; it is commonly used at an individual, household or organisation, product and service level.*
>
> ***Carbon neutrality:*** *Commonly refers to a situation where the net emissions associated with an organisation's activities, product or service are zero.*
>
> ***Scope 1 emissions:*** *The release of greenhouse gas into the atmosphere as a direct result of an activity, or series of activities that constitute a facility.*
>
> ***Scope 2 emissions:*** *The release of greenhouse gas as a result of one or more activities that generate electricity, heating, cooling or steam that is consumed by a facility but do not form part of the facility.*
>
> ***Scope 3 emissions:*** *The release of greenhouse gas into the atmosphere that occurs outside the boundary of a facility as a result of activities at a facility and are not scope 2 emissions.*
>
> ***Sequestration:*** *The removal of atmospheric carbon dioxide, either through biological processes (for example, photosynthesis in plants and trees), or geological processes (for example, storage of carbon dioxide in underground reservoirs).*

The *National Greenhouse and Energy Reporting Regulations 2008* (Cwlth) defines emissions as being either Scope 1 or 2 which are intended to be consistent with the World Business Council for Sustainable Development and World Resource Institute's *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition).* Scope 3 emissions, which are indirect emissions other than Scope 2 emissions (e.g. emissions produced by another facility), are not included in the definition of emissions for the purposes of the Act.

[7] Source: http://en.wikipedia.org/wiki/Carbon_offset – retrieved 09-09-2009

It may be beneficial for the purposes of this paper to use the following loose definitions:

- **Scope 1 – Direct Emissions** (GHG's produced by the company during construction/ production, including those from on-site power generation).
- **Scope 2 – Indirect Emissions** (GHG's produced in the production of energy sources supplied by others—for example, power supplied by Energex—and used by the company for the purposes of construction/ production).
- **Scope 3 – Optional Emissions** (GHG's produced by others, other than for energy production—for example, materials transport and waste disposal—whilst assisting the company in construction/ production).

2.2 Definitions Relating to Climate

The Australian Bureau of Meteorology[8] defines "climate" simply as:

> *"The atmospheric conditions for a long period of time, and generally refers to the normal or mean course of the weather. Includes the future expectation of long term weather, in the order of weeks, months or years ahead."*

However, it may be more beneficial in this paper to use the American Meteorological Society[9] definitions:

> *"**Climate**—The slowly varying aspects of the atmosphere–hydrosphere–land surface system.*
>
> *It is typically characterized in terms of suitable averages of the climate system over periods of a month or more, taking into consideration the variability in time of these averaged quantities. Climatic classifications include the spatial variation of these time-averaged variables[10]. Beginning with the view of local climate as little more than the annual course of long-term averages of surface temperature and precipitation, the concept of climate has broadened and evolved in recent decades in response to the increased understanding of the underlying processes that determine climate and its variability. See also **climate system**, climatology, **climate change**, climatic classification.*
>
> *"**Climate system**—The system, consisting of the atmosphere, hydrosphere, lithosphere, and biosphere, determining the earth's climate as the result of mutual interactions and responses to external influences (forcing).*
>
> *Physical, chemical, and biological processes are involved in the interactions among the components of the climate system."*
>
> *"**Climate change**—(Also called climatic change.) Any systematic change in the long-term statistics of climate elements (such as temperature, pressure, or winds) sustained over several decades or longer.*

[8] Source: http://www.bom.gov.au/lam/glossary/cpagegl.shtml – retrieved 07-09-2009

[9] Source: http://amsglossary.allenpress.com/glossary – retrieved 07-09-2009

[10] The internationally accepted convention, as recommended by the World Meteorological Organization (WMO), is that a 30-year period is a basic climatic time scale. The difference between climate and weather is a matter of time—weather exists in the present and weather forecasts attempt to predict future climatic conditions at a particular point in time.

Climate change may be due to natural external forcings, such as changes in solar emission or slow changes in the earth's orbital elements; natural internal processes of the climate system; or anthropogenic forcing."

*"**Paleoclimatology**—The study of past climates throughout geologic and historic time (paleoclimates), and the causes of their variations."*

2.3 Acronyms

ACCC	Australian Competition and Consumer Commission
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
JMOP	Jackson to Moomba Oil Pipeline Project
NCOS	*National Carbon Offset Standard* (currently in draft form)
NGERA	*National Greenhouse and Energy Reporting Act 2007* (Cwlth)
ppmv	Parts per million by volume
UNFCCC	Also FCCC. United Nations Framework Convention on Climate Change

3 What is the Problem with Carbon Dioxide?

3.1 GHG Emissions

As can be seen from the American Meteorological Society definition of the terms relating to climate, the Earths climate system is extremely complex and not well understood (which is one of the reasons why weather forecasting is so difficult).

However, it is known that greenhouse gases:

- trap heat in the atmosphere and re-emit it back to earth thereby keeping the Earth warmer (about 33ºC[11]) than it otherwise would be
- are both naturally occurring and anthropogenic (caused by humans)

Main contributors[12] to the greenhouse effect are –

- water vapour (somewhere between 36–72% of the total – for example clouds)
- carbon dioxide (9–26%)

[11] Source: http://www.hko.gov.hk/prtver/html/docs/climate_change/global_warming_e.shtml – retrieved 08-09-2009
[12] Source: http://en.wikipedia.org/wiki/Greenhouse_gas – retrieved 07-09-2009

- methane (4-9%)
- ozone (3-7%)
- nitrous oxide & other greenhouse gases (the rest)

Discounting water vapour, the remaining contributing GHG's may be represented graphically as shown in Figure 1 (note that these figures are indicative only, as not all entities agree with them)[13].

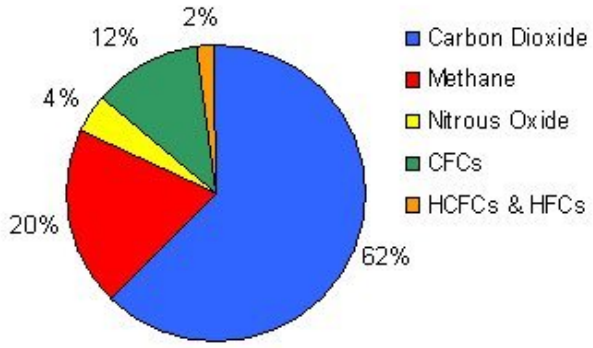

Figure 3-1: GHG Proportion (no Water Vapour)[14]

3.2 Increasing Rate of Carbon Dioxide Emissions

The UK Energy Saving website[15] has this to say:

> *"Greenhouse gas emissions include carbon dioxide, nitrous oxide, hydro fluorocarbons, per fluorocarbons and sulphur hexafluoride, although there are also others. Whilst many of these gases are produced naturally, mankind has significantly increased the rate of greenhouse gas emissions through the burning of fossil fuels at ever increasing rates."*

The Department of Climate Change stated in the Fact Sheet *"The Benefits of Early Action"* (December 2008) –

> *"Delaying action also increases the risks of climate change. It is possible that greenhouse gas emissions will cause the climate to change more quickly than we currently expect. If this turns out to be the case we cannot 'undo' our delay. We risk doing irreversible damage to things we value.*

and further . . .

> *"The existing science indicates that it would be risky and costly to wait for perfect information. Uncertainties about the exact impacts of climate change on Australia do exist and some of these could be reduced by future research. However, the rate at which the world emits greenhouse gases means that if we*

[13] For the benefit of the "naysayers", it may be noted that there is considerable disagreement about the validity of some statistics as evidenced by the document *"Global Warming: Experts' Opinions versus Scientific Forecasts"* prepared for the US National Center for Policy Analysis which states on page 3 that *"Advocates of complex climate models claim that they are based on well-established laws of physics. But there is clearly much more to the models than physical laws, otherwise the models would all produce the same output, which they do not, and there would be no need for confidence estimates for model forecasts, which there certainly is.* ***Climate models are, in effect, mathematical ways for experts to express their opinions****."* (my emphasis) Source: http://www.ncpa.org/pub/st308 – retrieved 12-09-2009

[14] Source: http://www.ace.mmu.ac.uk/Resources/Teaching_Packs/Key_Stage_4/Climate_Change/01p.html – retrieved 08-09-2009

[15] Source: http://www.uk-energy-saving.com/greenhouse_gas_emissions.html – retrieved 10-09-2009

do not begin to act now, the risks of suffering severe climate change impacts increase." [16]

4 Why should Carbon Dioxide be Offset?

4.1 Reasons for Reducing GHG's

The UK Energy Saving website further says that the increasing rate—

". . . has been of concern for many years, but it is only in recent times that governments in the developed world have realised the effects that this is having on the planet. Greenhouse gas emissions are causing climate change at an alarming rate and it is imperative to reduce emissions in order to stave off the worst case scenarios being described by scientists."

The report *Risk in Australia under alternative emissions futures*[17] prepared for the Australian Government Department of Treasury looks at four different scenarios – the GHG emissions continuing to increase at the present rate, and an immediate reduction of the emission of GHG's so that by the end of the century there is no more than 450ppmv, 550ppmv or 750ppmv of CO_2-e.

The report concluded (on page 29 of the pdf file) that –

"All four scenarios . . . suggested that the coping range will be exceeded in all areas of impact in the Australian economy . . . at least by the end of this century. For some areas, this range may be exceeded by 2050."

The *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future– Impact of Climate Change Fact Sheet*[18] lists a range of possible impacts of climate change, ranging from –

- natural disasters—such as bushfires, cyclones, hailstorms and floods
- drought
- severe water resource reductions
- declining agricultural production
- health issues—such as heat-related deaths and food and water-borne contaminants
- increased infrastructure costs—for example climate and population changes could lead to increased road maintenance costs
- rising sea levels flooding vulnerable communities
- climate change adversely affecting flora and fauna.

This would suggest that putting a stop to, or at least, a slowing of the rate of increase in GHG emissions is needed (particularly when read in conjunction with the DCC Fact Sheet

[16] Source: http://www.climatechange.gov.au/whitepaper/factsheets/index.html – retrieved 07-09-2009
[17] Source: http://www.treasury.gov.au/lowpollutionfuture/consultants_report/default.asp – retrieved 08-09-2009
[18] Source: http://www.climatechange.gov.au/whitepaper/factsheets/index.html – retrieved 07-09-2009

"The Benefits of Early Action" as quoted in §3.2 Increasing Rate of Carbon Dioxide Emissions.

As can be seen from Figure 3-1: GHG Proportion (no Water Vapour), a percentage reduction in carbon dioxide would have a considerable affect on the overall amount of GHG emitted. Therefore one of the primary aims in protecting the environment from harm caused by man-made GHG's should be to reduce the amount of CO_2 and CO_2-e emissions.

4.2 GHG Emissions that Cannot be Reduced

However, there may be a limit as to how much can be feasibly reduced (for example 4-WD vehicles on a pipeline project can be made fuel efficient through proper maintenance procedures—but they still have to use fuel to operate—hence there will be some exhaust emissions). Consequently another aim of carbon reduction should be to compensate for the remaining emissions generated.

If elimination of all emissions is not possible, then GHG emissions should be reduced to as low as reasonable practical, and the remaining emissions might then be addressed by –

- Acceptance (no further action taken)
- Mitigation (any carbon offset programs managed by the company).
- Transference (other persons are given the responsibility of dealing with the residual/ excess emissions—for example, carbon emissions trading and carbon offset programs managed by others).

5 What are the Carbon Offset options?

Carbon offset options are typically Projects that invest in –

- forestry / biosequestration – the most common option which may be planting of tress in new areas (afforestation) or reforestation
- renewable energy – wind, solar, biomass and other renewable sources
- energy efficiency – fuel efficiency; substitution with a more efficient fuel; insulation; efficient lighting, cooling and heating systems; subsidizing or encouraging the use of public transport;
- methane projects – affecting the production of methane form livestock, coal mining or landfill
- industrial gas management – substitution of GHG's by less hazardous gases; the capture of carbon dioxide from the combustion of fossil fuels or industrial processes and the long-term storage of these (for example, in underground chambers - this is termed artificial carbon sequestration)
- purchase of –
  - carbon allowances from authorized emissions trading schemes;
  - carbon neutral/offset travel tickets
- any combination of the above.

6 When and Where should Carbon Offset be Done?

The answer is simple—whenever it is mandatory and wherever it is practical. For example, there are laws about excessive emissions (that is, pollution), and switching to energy efficient devices such as lighting will save a company money.

7 Who is responsible for Carbon Offsetting?

The generator of the GHG is responsible for carbon offsetting. As mentioned above, a company may elect to pay others for a program to offset the GHG emissions.

8 Principles

The Draft standard lists the principles as –

a) Relevance – the GHG emissions must be attributable to the company.

b) Completeness – all GHG sources and justifiable exclusions should be noted.

c) Consistency – uniform methods should be used to allow for meaningful analysis.

d) Transparency – calculations, assumptions and exclusions should be auditable.

e) Accuracy – calculations should result in the correct amounts being determined (within the limits of the accuracy of the computation process used).

9 The Basic Calculation Process

9.1 NGA Factors

A large amount of work has been done on conversion factors and these are contained in the Department of Climate Change document *National Greenhouse Accounts (NGA) Factors*[19] latest version June 2009.

The equations are given along with examples, so the calculation process of Scope 1, 2 and 3 emissions is relatively simple.

9.2 Worked Example – Scope 1 Emissions

A company has a number of light vehicles (all post-2004) which use a total of 76,823litres (that is, 76.823kL) of diesel during the course of a project. What is the total CO_2-e for those light vehicles?

Table 4: Fuel combustion emission factors – fuels used for transport energy purposes on page 17 gives the energy content factor (ECF) as 38.6 and the emission factors as 69.2 for CO_2, 0.01 for CH_4 and 0.6 for N_2O.

[19] Source: http://www.climatechange.gov.au/workbook/index.html – retrieved 07-09-2009

Table 4: Fuel combustion emission factors -fuels used for transport energy purposes

Transport equipment type	Fuel combusted	Energy content factor (GJ/kL unless otherwise indicated)	Emission factor kg CO_2-e/GJ (relevant oxidation factors incorporated)		
			CO_2	CH_4	N_2O
Post-2004 vehicles					
	Gasoline (other than for use as fuel in an aircraft)	34.2	66.7	0.02	0.2
	Diesel oil	38.6	69.2	0.01	0.6
	Liquefied petroleum gas	26.2	59.6	0.3	0.3
	Ethanol for use as fuel in an internal combustion engine	23.4	0	0.2	0.2

Total CO_2-e = Quantity x ECF x (Combined Emission Factors)/1,000

Total CO_2-e = 76.823 x 38.6 x (69.2 + 0.01 + 0.6)/1,000

Total CO2-e = 207 tonnes

10 Calculating Emissions on a Pipeline Construction Project

10.1 The JMOP Project Experience

As part of WDS Limited's commitment to reducing the impact on the environment, WDS commissioned Greenfleet (a not-for profit organisation) to offset most of the GHG emissions generated during the construction of the JMOP project through a tree planting process known as biosequestration, where trees capture carbon dioxide from the atmosphere convert it to sugars for plant growth and ultimately store carbon in living matter. This was believed to be a first for the pipeline industry.

Estimating the amount of GHG Emissions was a rather complex and tedious process which included calculating Scopes 1 and 2, as well as Scope 3 GHG emissions.

Whilst Scopes 1 and 2 Emissions were relatively easy to calculate, Scope 3 Emissions took considerable effort, as a system for capturing that information was not in place at the time.

The results estimated the emission of 4,380.4 tonnes of greenhouse gas during the construction period which then identified the need to plant the 16,345 trees in the following year (2009) to offset this amount. The total cost to WDS Limited for the planting of the trees was $60,231.

A report received from them in September 2009 showed that the trees were planted near Wivenhoe Dam in South East Queensland around April 2009 on a state lease water reserve under a grazing lease. The 14 main species of trees are all Australian natives[20], and under the requirements of the Kyoto Protocol, the site had been cleared prior to 1990.

[20] Main species being revegetated are *Alphitonia excels* (Soup Tree); *Araucaria cunninghamii* (Hoop Pine); *Corymbia citriodora* (Lemon-Scented Gum); *Corymbia intermedia* (Pink Bloodwood); *Corymbia tesselaris* – (Moreton Bay Ash); *Eucalyptus crebra* (Narrow-leaved Ironbark); *Eucalyptus moluccana* (Grey-Box); *Eucalyptus siderphloia* (Benth); *Eucalyptus tereticornis* (Forest Red Gum); *Flindersia australis* (Crows Ash); *Flindersia xanthoxyla* (Yellow Wood); *Lophostemon confertus* (Brush Box); *Syncarpia glomulifera* (Turpentine).

During the establishment phase of the trees (approximately five years), about 5% of the offset target is sequestered (that is the trees will have absorbed about 5% of the CO_2-e calculated for the JMOP project). After that, the process speeds up and the offset target will be reached between 17 and 21 years after planting. Measurements will be taken at various intervals to confirm the amount sequestered in accordance with AS 4978.1-2006 *Quantification, monitoring and reporting of greenhouse gases in forest projects - Afforestation and reforestation.*

There are various options available to the company regarding the disposition of the sequestered carbon. These depend on the offset method and carbon offset provider chosen.

10.2 Calculating CO_2-e on a Pipeline Project

Probably the hardest part of calculating total CO_2-e is determining the formulae to use.

The table on the following page provides guidelines on various work activities, the type of scope emissions and the sources of information for calculating the approximate CO_2-e emissions.

The work activities have been based on the construction activities listed in APIA's *Code of Environmental Practice – Onshore Pipelines* [21] (March 2009).

10.3 Obtaining the Information

Projects normally have well developed cost coding, accounting, rosters, accommodation and subcontract management systems, so obtaining information about such things as –

- fuel usage
- power usage
- volumes of waste
- flights undertaken
- road distances

– becomes relatively easy (but in some cases rather time consuming).

Each project/company have their own systems, so the object of the following table is not to specify **how** the information is to be obtained, rather **what** information is required.

Determining what, if any, Scope 3 emissions are to be included is also important. Guidance is provided in *NGA Factors Appendix 4 Scope 3 emission factors*.

[21] Source: http://www.apia.net.au/issues/guidelines-and-publications.cfm – retrieved 11-09-2009

Table 10-1: CO_2-e Calculations by Work-Related Activity

Activity	Performed by	GHG Responsibility	Scope 1 Direct Emissions	Scope 2 Indirect Emissions	Scope 3 Optional Emissions	NGA Factors Table, Information Sources & Comments
Materials Delivery	Subcontractor	Optional	x	x	Mobile Plant Fuel	Not calculated - subcontractor responsibility
Access	Company	Company	Mobile Plant Fuel	x	x	NGA Factors Table 4: Fuel combustion emission factors -fuels used for transport energy purposes
Clearing	Company	Company	Mobile Plant Fuel	x	x	Table 4 . . . (no burning allowed)
Grading	Company	Company	Mobile Plant Fuel	x	x	Table 4
Pipe Stringing	Company	Company	Mobile Plant Fuel	x	x	Table 4
Welding	Company	Company	Mobile Plant Fuel; Welding Rod Emissions	x	x	**Fuel:** Table 4: Fuel combustion emission factors . . . **Welding Rods:** (Not calculated) Emission Estimation Technique Manual for Fugitive Emissions http://www.npi.gov.au/handbooks/approved_handbooks/ffugitive.html Environment Canada website - http://www.ec.gc.ca/pdb/websol/ToolBox/guidance/sect_4_2_e.cfm
Non-Destructive Testing	Subcontractor	Optional	x	x	Mobile Plant Fuel	Not calculated
Trenching	Company	Company	Mobile Plant Fuel	x	x	Table 4
Blasting	Subcontractor	Subcontractor	x	x	Mobile Plant Fuel	Not calculated – None on the project
Boring	Subcontractor	Subcontractor	x	x	Mobile Plant Fuel	Not calculated – local subcontractor responsibility
Directional Drilling	Subcontractor	Optional	Mobile Plant Fuel	x	x	Fuel supplied by Company Table 4
Pipelaying	Company	Company	Mobile Plant Fuel	x	x	Table 4
Backfill	Company	Company	Mobile Plant Fuel	x	x	Table 4
Hydrostatic Testing	Company	Company	Mobile Plant Fuel	x	x	Table 4
Pipeline Purging	Company	Company	Mobile Plant Fuel	x	x	Table 4
Reinstatement & Rehabilitation	Company	Company	Mobile Plant Fuel	x	x	Table 4
Borrow Pits	Company	Company	Mobile Plant Fuel	x	x	Not calculated – None on the project
Construction Camps	Subcontractor	Company	x	x	Mobile Plant Fuel	**Power:** Fuel usage **Waste:** Fuel Usage for transporting waste to approved dump Table 4: Fuel combustion emission factors . . .

Table 10-1: CO_2-e Calculations by Work-Related Activity

Activity	Performed by	GHG Responsibility	Scope 1 Direct Emissions	Scope 2 Indirect Emissions	Scope 3 Optional Emissions	NGA Factors Table, Information Sources & Comments
Watercourse Crossings (Open Cut)	Company	Company	Mobile Plant Fuel	x	x	Table 4
Off-site Fabrication	Company	Company	x	Proportional Energy Supply/Usage	Fuel use for delivery to site	**Power:** Proportioned meter reading **Transport:** Subcontractor transport to site (not calculated) Table 5: Indirect (scope 2) emission factors for consumption of purchased electricity from the grid
Off-site Fabrication	Subcontractor	Optional	x	Proportional Energy Supply/Usage	Fuel use for d\elivery to site	**Power:** Proportioned meter reading (not calculated) **Transport:** Subcontractor transport to site (not calculated)
Road Travel to Site & To & From Site Airports		Company	x	x	Mobile Plant Fuel	**Distances:** Road Maps **Fuel Usage:** ABS http://www.abs.gov.au/AUSSTATS/abs@.nsf/ViewContent?readform&view=ProductsbyCatalogue&Action=Expand&Num=12.2 Table 4
Air Travel To & From Site Airports	Supplier; Subcontractor	Optional	x	x	Road Distance (Fuel) Air Distances (Fuel)	**Distances:** 1) http://www.btre.gov.au/statistics/aviation/air_distances_download.aspx 2) http://www.movable-type.co.uk/scripts/latlong.html **Emissions:** https://secure.greenfleet.com.au/treetotaller/treetotaller.htm
Head Office - Administration	Company	Company	x	Proportional Energy Supply/Usage	Proportional Waste Disposal	**Power:** Proportioned meter reading **Waste:** Proportioned waste Table 5: Indirect (scope 2) emission factors for consumption of purchased electricity from the grid Table 40: Waste mix methane conversion factors

Note that a number of items in the table were not included in calculations for the JMOP Project – see §12 Issues, Considerations and Limitations.

11 After the Calculations

Once the approximate total of CO_2-e has been determined, then a decision needs to be made as to the preferred method of offsetting that amount, and whether or not a carbon offset provider will be used.

Carbon offset providers can be found through various means, one of which is the web[22]. Care should be taken to discuss with the provider exactly how the calculations were made, the assumptions, emission factors used and the omissions (particularly for Scope 3 – Optional emissions).

12 Issues, Considerations and Limitations

12.1 Double Counting

The limits or boundaries of what has been calculated needs to be very clear in order to avoid confusion and possible double counting.

For example:

- If pipes are delivered by a transport provider, the fuel used for the trips to the project should not be counted by the pipeline construction company as well as the transport company.
- If purchasing a carbon neutral airline ticket, that flight should not be included in the air kilometres travelled for the company.
- Subcontractors working on site should not be included in project calculations if their company includes them in their own calculations (for example, materials transport; NDT; local subcontractors; off-site fabrication by others).
- If power used in off-site fabrication is included in corporate calculations, it should not be counted by the project as well.

Double counting also can apply to the carbon offset itself when the offset is not “retired” and two or more businesses claim the same emissions reduction.

12.2 Limited Knowledge

There may be some activities where information on GHG emissions is non-existent, inaccurate, or not readily available. For example, at the time of the calculations for the JMOP Project, no information could be found for emissions of welding rods (however, the fuel used for the welding machines was included).

Since that time a number of sources have been found as noted in Table 10-1: CO2-e Calculations by Work-Related Activity.

[22] Such as Carbon Offset Guide Australia http://www.carbonoffsetguide.com.au/ – retrieved 17-09-2009

12.3 National Greenhouse Accounts (NGA) Factors

Note that the *National Greenhouse Accounts (NGA) Factors* originally used for the calculation of quantities on the pipeline August 2008 were based on the January 2008 edition which had a total of 44 pages and 29 tables.

The current version (June 2009) has 68 pages and 43 tables. As more knowledge and information becomes available, this might grow even bigger.

Whilst all care has been taken in preparing Table 10-1: CO2-e Calculations by Work-Related Activity, each company must ensure the calculations they make are in accordance with Department of Climate Change requirements and recommendations and their relevant work activities.

12.4 Trade Practices Act

There is also an increasing concern about statements made in public which has prompted the Australian Competition and Consumer Commission to produce the document *Carbon Claims and the Trade Practices Act*[23] (published 27th June 2008).

The purpose of this document is to inform companies of their responsibilities because, as noted on page 1 of the document, *"it is essential consumers are provided with accurate and full information about carbon offset claims associated with products or services, in order to make informed decisions."*

The document points out a number of areas companies need to be mindful of about carbon offset claims:

- Additionality – *"the idea that benefits of the carbon reduction under the project were 'in addition' to those that would have happened anyway, perhaps because of regulatory requirements or other pre–existing circumstances."*
- Timing and forward credited offsets – *"When offsets are forward credited, the buyer pays and has the offsets credited to them upfront, although the offsets will be produced in the future."*
- Double counted offsets – as mentioned in §12.1 Double Counting
- Permanence and risk management – *"An emissions reduction project may not be entirely secure or may involve a range of risks. For example, a reforestation project may have risks from fire or pest infestation."*
- Low-quality offsets – *"Different methods of offsetting have different levels of certainty, longevity and timeliness. Some are permanent and immediate, others slow and potentially temporary"* (i.e. are low-quality).

[23] Source: http://www.accc.gov.au/content/index.phtml/itemId/833279 – retrieved 17-09-2009

- Co-benefits – For example: *"An offset project based on planting shrubs and grasses may have co-benefits*[24] *of providing shelter for wildlife, however the project itself may be of questionable quality if it does not sequester as much carbon as claimed."*
- Standards, accreditations and logos – There are laws about the misuse and misrepresentation of standards, accreditations and logos.

Note also that the web site states that *"The ACCC material on carbon offset claims is currently under review in light of the Australian Government's development of a Carbon Pollution Reduction Scheme (CPRS)."*

13 Conclusion

Has the experience of carbon offsetting most of the GHG emissions on a pipeline construction project influenced anything? The short answer is yes.

The process has revealed –

- how complicated and interdependent the environment is
- how difficult it is to understand let alone predict environmental outcomes
- the level and complexity of the regulations that have been, and may be, introduced (for example the carbon emissions trading scheme)
- the importance of accurate calculation of GHG emissions (there are significant costs involved)
- the necessity of keeping up to date with evolving and changing requirements (ignorance is no defence in the eyes of the law).

Finally, the $64,000 question: Who pays for carbon offsetting?

- Should government projects include carbon offset costs?
- Should there be an incentive for carbon offset programs?
- Should private enterprise projects include carbon offset costs in the tender price?
- Should **all** projects include an item for carbon offset costs?
- What should be done on international projects?

To sum up: For the driest continent on Earth (excluding Antarctica), and one of the least vegetated, biosequestration is potentially one of the most important carbon offset programs that can benefit Australia, even if the science behind climate change and carbon offset is in dispute.

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[24] Note that the Australian native trees that have been planted at Wivenhoe will not only sequester carbon dioxide but will provide the potential co-benefits of restoring the land to something like its original state, reducing soil erosion, lowering salinity, improving water flow and water quality, and providing habitat for native wildlife.

Selected Web Sites:

United Nations
http://www.un.org/wcm/content/site/climatechange/gateway

IPCC:
http://www.ipcc.ch/

UNFCCC:
http://unfccc.int/2860.php

Department of the Environment, Water, Heritage and the Arts:
http://www.environment.gov.au/index.html

A listing of State and territory government environment and heritage departments
http://www.environment.gov.au/about/library/govtdepts.html

Australian legislation:
http://www.austlii.edu.au/

ACCC:
http://www.accc.gov.au/content/index.phtml/itemId/142