watersecurity
MAJOR PROJECTS

Appendix Q

Greenhouse gas emissions strategy

Environmental impact statement

February 2009

ACTEW
CORPORATION

watersecurity
MAJOR PROJECTS

Water Security - Major Projects
Greenhouse Gas Emissions Strategy

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1 Introduction

Exigency Management was commissioned by ACTEW Corporation to provide strategic advice on fulfilling its commitment to the Chief Minister to: "voluntarily offset additional greenhouse gas emissions associated with the operation of all water security projects[1]". Exigency was also tasked with assessing the implications of offsetting the construction-related emissions.

The Water Security Projects include:

- Cotter Dam, including: enlarged Cotter Dam; Cotter Pump Station; and Cotter Recreational Precinct;
- Murrumbidgee to Googong Water Transfer Project;
- Murrumbidgee to Cotter Water Transfer Pipeline; and
- Demonstration Water Purification Plant and Salt Reduction Scheme at Lower Molonglo Water Quality Control Centre.

This report sets out our approach, findings and recommendations.

[1] *http://www.chiefminister.act.gov.au/media, 23 Oct 2007*

2 Approach

A process was established with the water security alliance teams to identify:

1. The expected emissions footprint (construction and operation) of each water security project, as per the current project scopes (“Preliminary design for Total Outturn Cost - TOC”);

2. The realistic opportunities for reducing the emissions footprint beyond the current project scope, and the additional cost of doing so; and

3. The cost of offsetting the emissions associated with the construction phase as well as the operation of each water security project.

Steps 2 and 3 were designed to determine the least cost means of emissions abatement, by trading off incremental investments in water security infrastructure to reduce the emissions footprint and incremental investments in emissions off-sets.

3 GHG Emissions Footprint of Preliminary Designs

The emissions footprints were calculated by the alliance teams using international best practice carbon accounting methodologies and applied to the design assumptions as at 30th September 2008. That is, standard emissions factors were used and by exception, bottom-up methodologies were applied for non-standard items such as bio-emissions. Where relevant, operations footprints reflect hydrological modelling based on the conservative CSIRO prediction for 2030 climate[2].

The following table summarises the forecast GHG emissions footprints for each of the water security projects as stand-alone activities:

Project	Construction Emissions Tonnes CO_{2-e}	Operating Emissions Tonnes CO_{2-e}/year
Enlarged Cotter Dam & Cotter Precinct	106,000[3]	0
Cotter Pump Station Upgrade	4,000	8,000
Murrumbidgee to Googong Pipeline	30,000	8,500
Murrumbidgee to Cotter Pipeline	2,000	500
Water Purification Scheme & Salt Reduction Scheme	3,000	11,000
Totals	**145,000**	**28,000***

Sources: BWA: Water Security Projects Greenhouse Gas Assessment – 23/12629/143337 (Version 2). WPS: Technical Memorandum GHG Emissions Baseline Inventory for 8.3 MLD WPP – Stage 1. Figures rounded for presentation purposes.

[2] *2008 Review of Planning Variables for Water Supply and Demand Assessment, Infrastructure Development Branch, July 2008.*

[3] *includes a one-off emission of 1000 tonnes for GHG releases following inundation at the Enlarged Cotter Dam – strictly, an operating emission*

4 Rationale and Implications of Offsetting Construction-Related Emissions

Under the National Greenhouse and Energy Reporting System (NGERS) and proposed Carbon Pollution Reduction Scheme, organisations are under no obligation to report, or acquire emissions permits for, their scope 3, (construction) emissions.

On the other hand, there are only weak incentives on constructors to minimise these emissions beyond those resulting from general sustainability principles. The regulatory lacuna that has led to this means that, without change, a large volume of Australian infrastructure projects planned over the foreseeable future, will contribute significantly to the nation's total emissions.

Preliminary workshops have identified a number of promising opportunities to reduce the overall footprint of the water security projects, and the construction-related footprint in particular. Consequently, there is merit in reducing and offsetting the construction-related emissions, if these can be achieved at a reasonable additional cost.

Ideally, offsets should match emissions in the year in which they arise. However, the offset market is currently immature and there is a general lack of quality credits. Consequently, a decision to offset the construction-related emissions would necessitate amortizing them over an appropriate period.

5 Offset Strategy

An offset strategy may be viewed as a form of financial risk management. Consistent with this, a successful strategy would be based on the following principles:

- a diversified portfolio of offsets, including carbon sinks and renewable power generation, rather than relying on a specific project or asset class;
- fixed forward commitments for an initial period, with exposures in future years being firmed up progressively on a rolling basis;
- taking custody of credits wherever possible, and obtaining warranties and/or independent assurance where certificates are unavoidably held by third parties;
- limiting exposure to offset-providing counterparties with good credit risk and potentially, the right to secure offsets and underlying assets in the event of default;
- hedging at or slightly above the expected level of emissions, to avoid short-falls in the short run to protect reputational risk and retain any surplus offsets for future years;
- Matching operating liabilities (emissions) and assets (offsets) on an annual basis where possible; and
- Amortizing construction emissions over a suitable timeframe.

If a decision was taken to offset construction-related emissions, Exigency considers that an amortization period of 30 years would be appropriate, as this broadly matches the active sequestration period of typical carbon sink schemes and the economic life of typical renewable schemes.

Following these broad principles, the offset strategy would need to be refined in the light of further emissions and offset information and, following implementation, managed on an ongoing basis.

6 Offset Categories

Four generic means of achieving offsets were considered:

1. Renewable energy schemes as accredited under the Mandatory Renewable Energy Target (MRET), such as hydro, biomass, wind, solar and geothermal;

2. Carbon sinks such as forestry, soil carbon sequestration and carbon geo-sequestration;

3. Investment in energy efficiency technologies, such as through the Greenhouse Gas Abatement Scheme National Energy Efficient Target; and

4. Acquisition and surrender of emissions permits under the proposed Carbon Pollution Reduction Scheme.

1 In general terms, renewables are credited with the reduction in fossil fuel emissions associated with displacing grid-supplied electricity. The amount of reduction varies between jurisdictions, in accordance with the local power generation mix. For the purpose of first-pass evaluations, a conversion factor of 1 tonne CO_{2-e}/MWh was used[4]. Over time, the offset value of a REC may be expected to decline, as the generation mix adjusts to reflect the declining proportion of fossil-fuelled generation. Whilst current demand for Renewable Credits (RECs) has driven up market prices beyond $40/MWh (presumably to support GreenPower commitments), renewable schemes can potentially provide credits "in perpetuity", relative to carbon sinks, which have a natural capacity limit.

2 Carbon sinks reflect the removal of CO_2 from the atmosphere, either by fixing carbon as biomass or by injecting the gas into geological structures. Any given sink has a natural limit to its capacity, beyond which additional land resources would need to be acquired for further offsets. Currently, forestry sinks provide amongst the lowest-cost source of offsets.

3 Emissions reduction technologies include energy efficiency measures such as low-energy light bulbs, or home insulation to reduce fossil fuel consumption and switching to low GHG refrigerants. The challenge for energy efficiency measures is determining the point at which they become "business as usual" (as has occurred with government intervention to phase out incandescent light filaments).

4 By removing emissions permits from circulation, an overall reduction in GHG may be achieved, subject to the emissions trading design and rules. It must be note that such a strategy would be ineffective, if, for example, too many permits were issued in the first place (as happened in Europe), or Government yielded to industry pressure to issue more permits as a result of voluntary action by third parties to remove them from circulation.

6.1 Note on MRET

The MRET scheme currently runs until 2020. The Federal Government has signalled its intent to increase the scheme target over the period to 2020. This is at odds with the final Garnaut report which recommends the discontinuation of MRET in favour of incorporating renewable schemes within the CPRS framework. There is further speculation that MRET will be retained and extended, possibly to 2035. Meanwhile, RECs may be nominated for surrender on a voluntary basis, so as to ensure additionality.

Prima Facie, MRET termination poses a regulatory risk to the offset strategy. However, under a voluntary arrangement, whereby the credits are not acquired for re-sale purposes, the purchaser may choose to secure RECs until the scheme is wound up and thereafter, obtain verification of the credits by an

[4] *NGER emissions factor for ACT/NSW is 1.06 tonnes CO_{2-e}/MWh, after accounting for transmission losses*

independent third party. The ability to make longer term commitments potentially creates a source of buying power, relative to REC traders and other investors.

7 Offset Selection

Exigency identified a number of generic solutions and specific schemes (such as hydro) with the potential to form part of an offset portfolio. These were then screened based on their ability to meet all of the following internationally-recognised best practice criteria:

1. Real (proven to have genuinely taken place);
2. Measurable (can be quantified using recognised measurement tools);
3. Permanent (will achieve a permanent reduction in overall GHG emissions);
4. Additional (over and above that which would otherwise occur); and
5. Independently Verifiable (verified by an independent third party).

Offset Criteria	1	2	3	4	5	Comment
On-site Hydro	√	√	√	√	√	Potential 1-2MW scheme at Corin Dam. NB energy recovery schemes would not be accredited but would result in lower reported emissions under NGERS
On-site Solar	√	√	√	√	√	Photovoltaic or solar thermal options
On-site Wind	√	√	√	√	√	Subject to wind mapping and land use limitations. Anticipated local objections on visual amenity grounds
On-site Steam Turbine	√	√	√	√	√	Potential 0.3 MW at Lower Molonglo. However, may be more carbon-efficient to use heat for brine evaporation
Green Power	√	√	√	√	√	Currently unclear whether this would be recognised under NGERS reporting. Subject to final position, may be used as short-term (3-5 years) element of portfolio
Spot Market Renewable Energy Certificates	√	√	√	?	√	A proportion of spot market purchases could emanate from non-additional pre-scheme investment (e.g. Tasmania Hydro)
Renewable Energy Schemes	√	√	√	√	√	Schemes include: biomass, wind, solar and geothermal
National Energy Efficiency Target Schemes	√	√	√	?	√	Difficult to demonstrate additionality beyond scheme targets and/or “business as usual” activities
Feed-in Tariff schemes (PV, micro-wind turbines)	√	√	√	?	√	Difficult to demonstrate additionality beyond scheme targets and/or “business as usual” activities
Carbon Geo-sequestration	√	√	√	?	√	International Energy Agency unable to confirm whether permanent oxygen removal has been modelled. Referred to UN- IPCC Working Group 3
Soil Carbon sequestration	√	√	√	√	?	Contemplated in Green Paper[5]. Further decision on inclusion due in 2013. Potential value in profiling as part of forestry scheme for future accreditation

[5] *Carbon Pollution Reduction Scheme Green Paper July 2008*

Offset Criteria	1	2	3	4	5	Comment
Carbon Forest Sinks	√	√	√	√	√	Includes commercial and non-commercial plantations subject to land use as at 31.12.1989[6]
Carbon Pollution Reduction Scheme	?	√	√	√	√	Emissions reduction may be achieved by acquiring and retiring Permits, but depends on successful regulatory management of scarcity

[6] *Under Kyoto rules, land use that was forestry as at 31.12.1989 can not be accredited as a carbon sink*

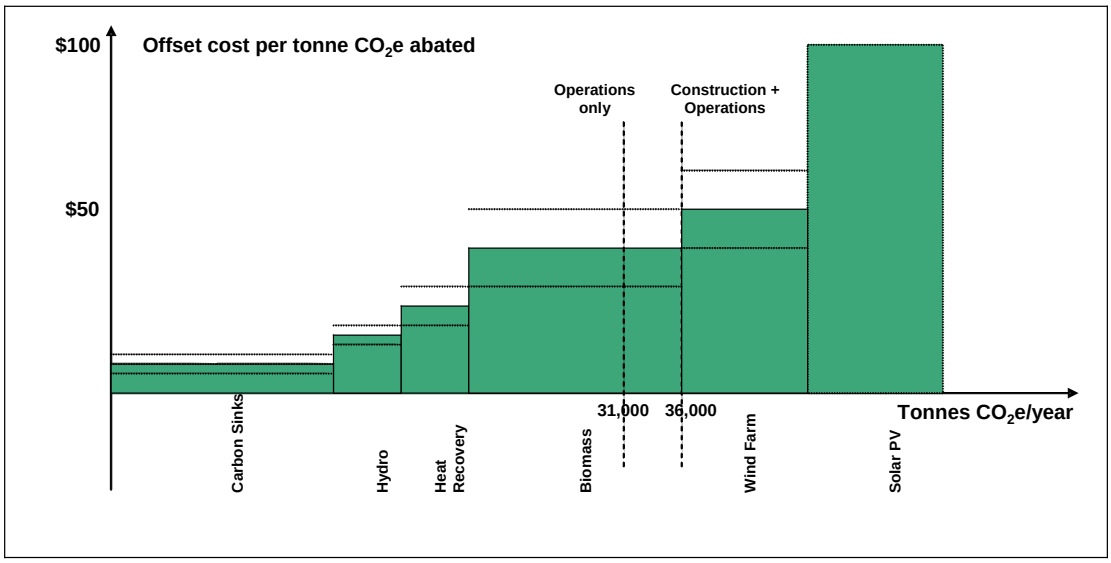
8 Domestic versus International Offsets

As a general observation any credits available through existing international schemes have questionable governance arrangements and potentially, their validity is dubious[7]. It is therefore likely that the burden on ACTEW to verify and source offsets available internationally would be onerous. Consequently, Exigency considers that only offsets created in Australia should form part of the offset portfolio.

[7] *A Realistic Policy on International Carbon Offsets, Wara and Victor, Program on Energy and Sustainable Development, Stanford University April 2008.*

9 Cost Curve for Short-Listed Offsets

The following cost curve is based on offsetting the operating and construction emissions of the preliminary designs (i.e. without value engineering to reduce the emissions footprint). Construction emissions are assumed to be amortized over 30 years, or 6,000 tonnes $CO_{2\text{-}e}$ per year. Finally, a margin of 3,000 tonnes $CO_{2\text{-}e}$ per year has been added to cover for short-run peaks in operating emissions and/or shortfalls in offset credits, totalling 36,000 offset credits per year.



Based on an offset target of 36,000 tonnes $CO_{2\text{-}e}$ per year, Exigency concludes that the offset portfolio could be constructed at a cost of $25-$38 per tonne $CO_{2\text{-}e}$. These costs can be confirmed following detailed feasibility studies or formal requests for proposals as appropriate.

10 Determining the Optimal Mix of Offsetting and Footprint Minimisation

If the emissions footprints of the water security projects can be reduced for less than the cost of offsets, then it is rational to do so.

A series of workshops has been initiated to identify potential scope to reduce the emissions footprint of the preliminary water security project designs. The following potential reduction measures have been identified, but have not yet been subject to detailed evaluation:

- Use of low-emissions (pozzolan) cement for construction
- Use of zero-rated biofuels for plant, generators and machinery during construction
- Energy recovery from dam construction conveyor
- Energy storage/recovery schemes – e.g. holding dam on Murrumbidgee to Googong transfer
- Energy efficient pumps and machinery for water security project operations
- Head reduction (tunnelling) for Murrumbidgee to Googong transfer
- Surface burial of sections of Murrumbidgee to Googong transfer
- Heat recovery at Lower Molonglo for Water Purification Scheme brine evaporation (as alternative to steam turbine)

11 Recommendations

Exigency recommends that:

- Detailed feasibility studies be carried out on short-listed renewable power schemes;
- Requests for proposal be made for accredited carbon sinks from suitably qualified organisations;
- Further research be commissioned into geothermal energy and soil carbon sequestration as promising potential future offsets; and
- Further engineering design be undertaken to determine the economic trade-off between offsets and emissions footprint reductions.