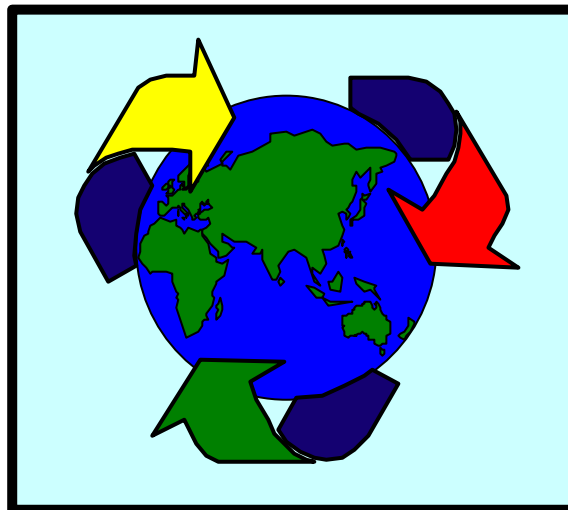


Greenhouse Emissions Reduction A Framework for the Victorian Water Industry



October 2006

Table of Contents

1. <i>Executive Summary</i>	3
2. <i>The Challenge</i>	5
3. <i>Greenhouse Emission Profile and the Victorian Water Industry</i>	8
4. <i>The Working Group</i>	10
5. <i>The 5 Goals</i>	11
6. <i>Capacity to Deliver</i>	12
7. <i>Recommendations</i>	15
8. <i>Implementation</i>	28
9. <i>References</i>	30
<i>Appendix A - Strategic considerations influencing 'the Framework'</i>	31
<i>Appendix B - Greenhouse Emissions by the Victorian Water Industry 2004/05</i>	35
<i>Appendix C - Current Strategic Status of Sustainability and Greenhouse Emissions Reduction in the Victorian Water Industry</i>	36
<i>Appendix D - Sustainable Energy Use - Opportunities for the Water Industry</i>	52
<i>Appendix E - Renewable Energy Capacity in the Victorian Water Industry</i>	60

1. Executive Summary

The Water Industry has been identified as a sector that is highly vulnerable to climate change. Reduced security of supply of water and increased population growth will require new thinking if the needs of future generations are to be provided for.

The Water Industry is a key consumer of electricity in Victoria, with water businesses in aggregate being counted amongst the top twenty electricity consuming businesses. Growth of electricity consumption by this industry is expected to increase from 1990 levels by up to 50% over the next ten years due to population growth, increased standards for water and wastewater treatment, piping of channels and development of water recycling schemes. In 2004/05 the Victorian Water Industry was responsible for more than 810,000 tonnes of carbon dioxide equivalent (CO₂e) emissions. This is equivalent to the pollution from an additional 187,000 cars driving on Victoria's roads each year.

The Victorian Water Industry is also a key player in the renewable electricity supply industry hosting up to 70% of current renewable generating capacity. This equates to 7% of the total power generation capacity for Victoria which has a total capacity of approximately 8,500 MW.

To respond to the challenge for the Victorian Water Industry to reduce greenhouse emissions whilst providing services to a growing population with a reduced water supply, a Working Group was established in December 2005. Membership of the Working Group includes the Victorian Water Industry, VicWater, Sustainability Victoria, EPA Victoria and the Department of Sustainability and Environment.

The 5 Goals for Greenhouse Emission Reduction by the Victorian Water Industry are to:

1. Demonstrate leadership in greenhouse gas reduction.
2. Set realistic stretch greenhouse gas reduction targets for a benchmarked water industry.
3. Influence behaviour change based on communication and education.
4. Influence adoption of a whole of system method to infrastructure design and operation and new markets.
5. Incorporate an industry wide collaborative and cooperative approach.

Table 1.1 outlines the 5 recommendations made by the Working Group to reduce greenhouse emissions from the Victorian Water Industry.

The industry was given one month (July 2006) to review the recommendations provided in the Greenhouse Emissions Reduction Framework ('the Framework') and provide comment to the Working Group. 17 water businesses provided comment, along with EPA Victoria, DSE and VicWater. All significant issues raised were then worked through with the individual organisations.

The Sustainability Task Group then reviewed 'the Framework' and recommended that the VicWater Board formally endorse 'the Framework'. The VicWater Board subsequently endorsed 'the Framework' at their meeting on the 26 October 2006.

Table 1.1: Summary of Greenhouse Emission Reduction Recommendations

	Respons. Org	Recommendation	Time Frame
1	DSE	The Department of Sustainability and Environment should modify the Statement of Obligations to include a statement that the Water Authority will consider reduction of greenhouse emissions as part of conducting business in a sustainable manner.	Dec 2006
2	Part 1: Sust Victoria, EPA Victoria, VicWater, Water Authority Part 2: Water Authority	Part 1: Sustainability Victoria, EPA Victoria and VicWater should develop a process to assist Water Authorities to: <ul style="list-style-type: none"> a. Identify sources of greenhouse gas emissions b. Measure and report greenhouse gas emissions production using a common framework and key performance indicators c. Recommend the best means for reducing greenhouse gas emissions including identifying energy efficiencies, offsets and renewable energy opportunities Part 2: Each Water Authority will adopt a greenhouse emissions reduction target and renewable energy target (if applicable) based on the information determined in Part 1 and in alignment with Victorian Government policy.	June 2007
3	Water Authority	Based on the information provided in Recommendation 2: Part 1: Each Water Authority should prepare an Action Plan outlining how they will manage reduction in greenhouse emissions over the next 5 years. Part 2: Each Water Authority is encouraged to forward the Action Plan to EPA Victoria and work in partnership to maximise the opportunities for implementation.	Sept 2007
4	VicWater	VicWater to collect data from the 20 Water Businesses and report yearly on the key performance indicators: <ul style="list-style-type: none"> • Greenhouse pollution (tonnes CO₂e) - calculated using Australian Greenhouse Office approved methodology • Total Energy Consumption for Water, Wastewater & Whole of Business (Gigajoules/ML) • Renewable Energy Used or Produced as % of Total Energy Consumption 	June 2007
5	Water Authority, VicWater, Sust Victoria	Sustainability Victoria, VicWater and Water Authorities to provide practitioner support and education programs including: <ul style="list-style-type: none"> a. Ongoing operation of the Working Group b. Establish a webpage c. Water Authority communication and education of climate change impacts on their business and opportunities for greenhouse emissions reduction d. Water Authority adoption of an environmental whole of system approach to infrastructure design, installation and operation e. Identification and utilisation of greenhouse champions 	Dec 2007

2. The Challenge

In 2002 Victoria's greenhouse pollution was responsible for 117 million tonnes of carbon dioxide equivalent (CO₂e). This is more than the total emissions of many nations, including industrial nations with significantly higher populations such as Austria, Hungary, Portugal, Slovakia, Sweden and Switzerland. This corresponded to an increase of 10.5 million tonnes or 9.9% over 1990 levels.¹

In 2004-05 the Victorian Water Industry was responsible for more than 810,000 tonnes CO₂e of pollution.² This is equivalent to the pollution from an additional 187,000 cars driving on Victoria's roads each year.

The Victorian Government's Greenhouse Action Plan Update 2005 outlines that in 2002 on a per capita basis, Victoria's greenhouse pollution was equivalent to 24 tonnes CO₂e in comparison to Australia's per capita emissions of 28 tonnes CO₂e. This is higher than any other developed country including America.

For strategic considerations influencing greenhouse emissions reduction policy in Victoria please refer to **Appendix A**.

Climate Change and the Water Industry

In 2004 the Victorian Government funded a CSIRO study into the effect of climate change on Victoria³. Significant findings for the Water Industry include the following predictions by 2070:

- > Average temperatures to be 0.7 to 5°C warmer than 1990
- > More hot days and fewer frosts
- > Rainfall decreases are likely, particularly in winter and spring: annual rainfall changes from +10 to -25% in the south, and +10 to -40% in the north
- > More intensive extreme rainfall events
- > Increased evaporation rates and drier conditions
- > Increased bushfire risk
- > Sea level rise by 7 to 55cm

As a result of these findings, the Australian Greenhouse Office has identified a number of priority vulnerable sectors. These priorities reflect considerations of climate vulnerability, the significance of the systems at risk and the likely need for government intervention to encourage a timely and efficient adaptation response. The priority sectors identified were water supply, ecosystems and biodiversity, agriculture, energy, settlements and emergency services.

The effect of increasing greenhouse emissions on climate change has a direct impact on the operation of water businesses. The Victorian Water Industry recognises this issue and several examples of industry leadership already exist but more can be done. So VicWater has partnered with Sustainability Victoria to develop 'this Framework' and address these issues.

¹ Sustainable Energy Authority Victoria (2004) Business Plan 2004-2005

² Victorian Water Review 2004/2005

³ Adapting to Climate Change: enhancing Victoria's capacity

Electricity Consumption and the Victorian Water Industry

Currently in Victoria, access to significant brown coal resources has resulted in highly competitive electricity prices, and over 90% of Victoria's electricity needs are met by a small number of brown coal fired generators. These generators are the most greenhouse emission intensive in Australia.

The Victorian Water Industry is a key consumer of electricity, with water businesses being counted amongst the top twenty electricity consuming businesses in the State. Growth of electricity consumption by this industry is also expected to increase by up to 50% over the next ten years from levels measured in 1990 due to population growth, increased community standards for water and wastewater treatment, piping of channels and development of water recycling schemes. A key opportunity exists to increase the overall energy efficiency of the Victorian Water Industry and mediate the impacts of predicted growth in future energy consumption (see **Figure 2.1**).

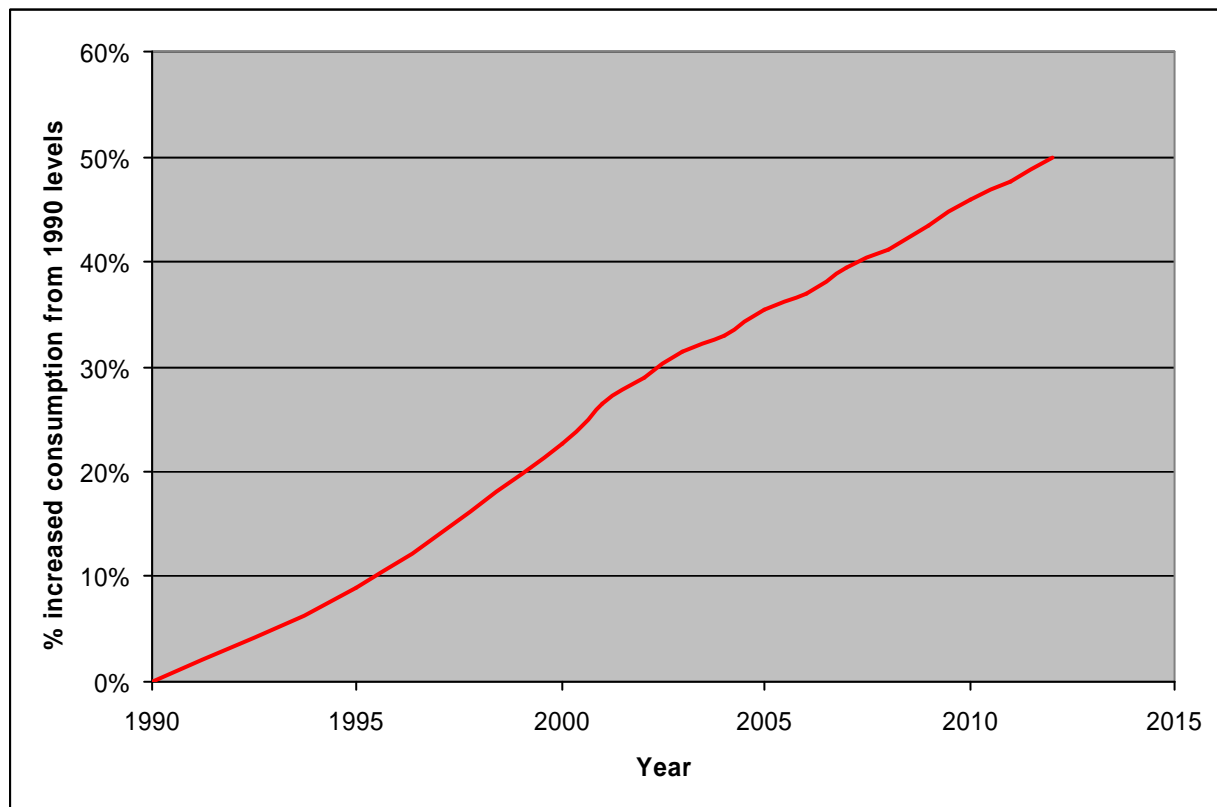


Figure 2.1: Victoria - Predicted electricity consumption increase for the Water Industry from 1990 levels (source: National Institute of Economic and Industry Research - 6 July 2004)*

* The data does not include any predictions on potential desalination projects.

Renewable Energy and the Victorian Water Industry

The Victorian Government aims to develop Victoria as a world leader in environmental sustainability by promoting changes in the way that we use energy, water, waste and other resources. A target is being developed for Victoria that will potentially substantially increase the proportion of electricity consumption from renewable sources to 10% by 2010.

The Victorian Water Industry is a key player in the renewable electricity supply industry hosting up to 70% of current renewable generating capacity in Victoria. This equates to approximately 580 megawatts (MW) of renewable energy capacity in Victoria with an estimated further 30 MW generating capacity planned to be installed by 2009 which is approximately 7% of the total power generation capacity for Victoria. The total power generation capacity of Victoria is approximately 8,500 MW.

The Water Industry has the ability to further develop significant renewable energy resources in the form of biogas generation and mini-hydro. Development of these resources to date has been limited due to a variety of institutional, technological and financial barriers.

The Challenge

Over the next decade a range of factors will affect how climate change is managed at a global and local level:

- > International action on climate change will see increasing pressure on all countries to reduce pollution from energy sources
- > New technologies will be developed which reduce greenhouse emissions
- > Global demand for energy is forecast to increase 50% over the next ten years
- > Many countries will increase the diversity and distribution of their energy supplies to reduce the risk of major shocks or disruptions to energy systems

The challenge for the Victorian Water Industry is to reduce greenhouse emissions whilst providing services to a growing population with a reduced water supply.

A successful transition to a sustainable future for the Victorian Water Industry will be characterised by clear progress on meeting this challenge over the next decade.

3. Greenhouse Emission Profile and the Victorian Water Industry

In 2004-05 the Victorian Water Industry was responsible for more than 810,000 tonnes CO₂e of greenhouse emissions. The Melbourne Metropolitan region was responsible for more than half of these emissions (see **Figure 3.1**).

Across the Industry, sewerage treatment and management contributed over 60% of emissions, with water treatment and supply responsible for nearly 30% (see **Figure 3.2**).

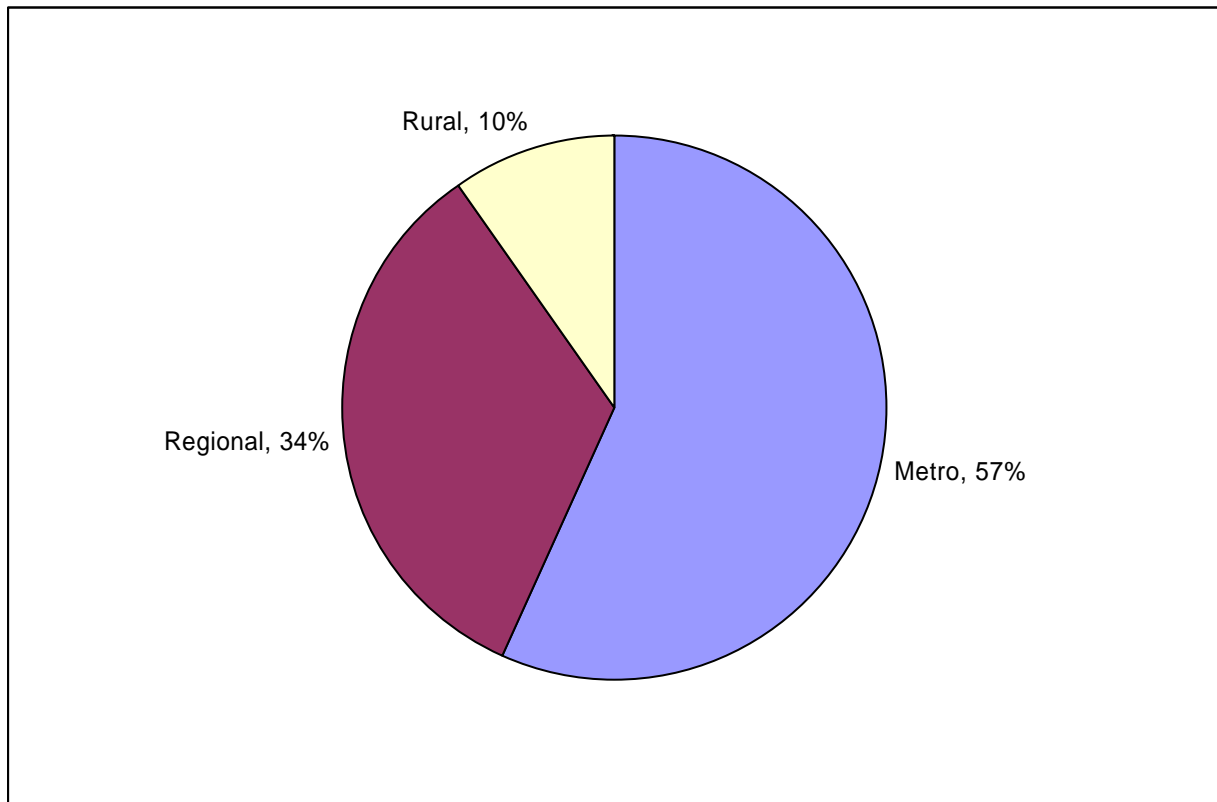


Figure 3.1: % Greenhouse Emissions per Water Authority Region

For more detail on the greenhouse emissions per Water Authority please refer to **Appendix B**.

Appendix B highlights that a range of calculation methods have been previously utilised by Water Authorities to calculate greenhouse emissions. To get an accurate picture of emissions for the Industry these numbers will need to be verified and a consistent method of calculation utilised going forward.

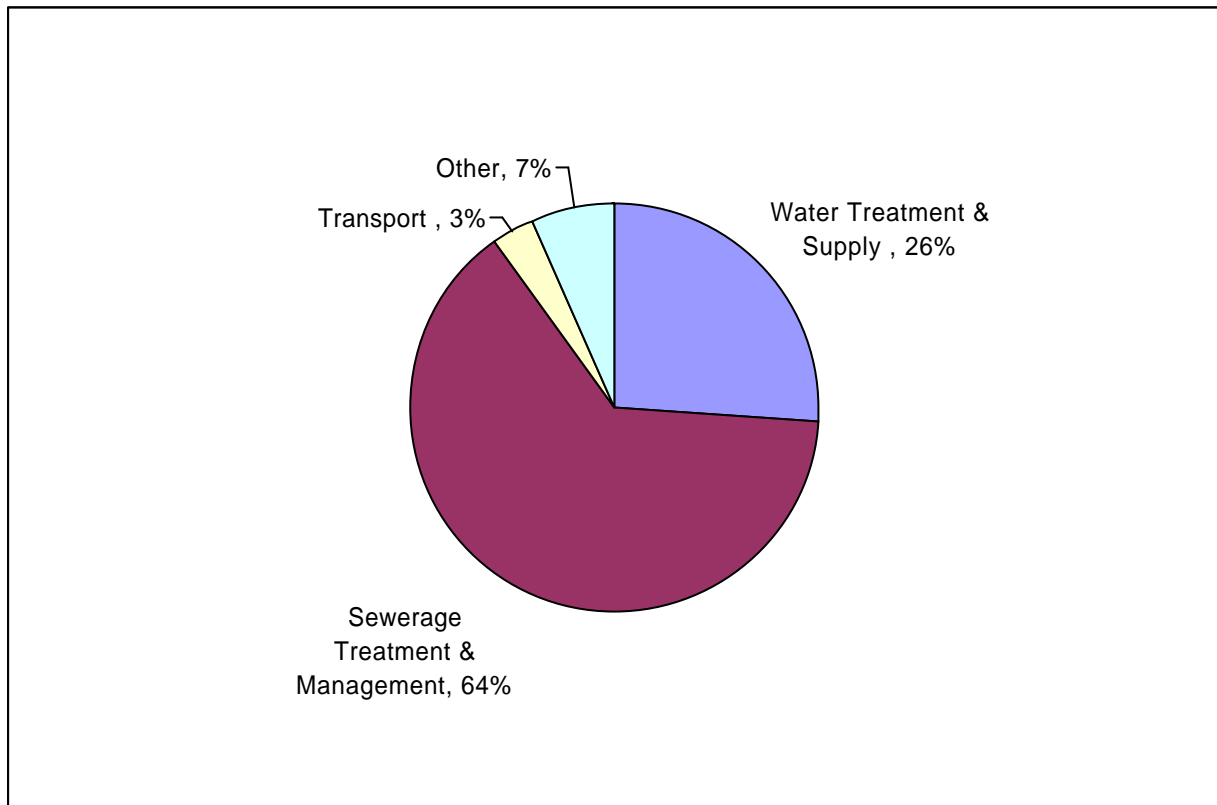


Figure 3.2: % Greenhouse Emissions per Water Authority Operational Area

The significant contribution of sewerage management and water supply highlighted in **Figure 3.2** is largely due to electricity supply for pumping however greenhouse emissions from sewerage treatment plants are also significant.

These numbers highlight the opportunities and key areas to target to reduce greenhouse emissions. However, although transport was a relatively low contributor at 3%, it should not be ignored as it may be economically feasible to induce change in this area with the additional benefit of encouraging cultural change within organisations.

4. The Working Group

A Working Group was established in December 2005 by the Victorian Water Industry, VicWater, Sustainability Victoria, EPA Victoria and the Department of Sustainability and Environment (DSE) to address the greenhouse emission challenge for the Victorian Water Industry.

Membership of the Working Group is as follows:

Chair Gillian Sparkes - Sustainability Victoria

Working Group Members

Lauren Mahoney	- Barwon Water	Danny McLean	- Central Highlands Water
Michelle Pinan	- City West Water	Leanne Cini	- Coliban Water
Mark Noyce	- DSE	Amanda Smith	- EPA Victoria
Damon Jones	- EPA Victoria	Greg Clayson	- Gippsland Water
Peter Gall	- Goulburn Valley Water	Pat Feehan	- Goulburn-Murray Water
Nigel Binney	- GWMWater	Susan Saris	- Lower Murray Water
Ken Baxter	- Melbourne Water	Louise Maconachie	- North East Water
Don Chambers	- North East Water	Gordon Logan	- South East Water
Isabelle Gabas	- Southern Rural Water	Peta Maddy	- Sustainability Victoria
Nathan Smith	- VicWater	Vanessa Lenihan	- Wannon Water
Ray Borg	- Western Water	Ken Thompson	- Yarra Valley Water

Water Authorities not represented on the Working Group were kept informed of its progress and contributed to the recommendations in 'the Framework' by email. A "buddy system" was also implemented which allowed neighbouring organisations to provide updates to organisations not represented on the Working Group and ensure that actions were carried out.

The following Charter was developed by the Working Group:

The Working Group Charter

- **Greenhouse Emissions Reduction Framework to be presented to all of the Victorian Water Authorities in June 2006 outlining recommendations for Greenhouse Gas reduction by the Victorian Water Industry**
- **Influence regulation of the Victorian Water Industry to include greenhouse gas reduction and renewable energy targets**
- **Increase support networks in the Victorian Water Industry**
- **Inspire individuals to initiate change within their own organisations**
- **Identify resources to assist water businesses in meeting the targets**

5. The 5 Goals

The Working Group developed 5 goals to ensure that there was an agreed outcome and understanding amongst the group.

The following is the 5 goals developed by the Working Group:

The 5 goals for Greenhouse Emission Reduction by the Victorian Water Industry are to:

- 1. Demonstrate leadership in greenhouse gas reduction.**
- 2. Set realistic stretch greenhouse gas reduction targets for a benchmarked water industry.**
- 3. Influence behaviour change based on communication and education.**
- 4. Influence adoption of a whole of system method to infrastructure design and operation and new markets.**
- 5. Incorporate an industry wide collaborative and cooperative approach.**

6. Capacity to Deliver

All 20 of the Water Authorities responded to a survey in February 2006 on their current capability to meet the 5 Goals including current capacity based upon expertise, staffing levels, strategic direction and progress if any. **Figures 6.1 to 6.5** outline the results of that assessment.

The results of this survey reflect that whilst most organisations have begun to respond to the issue of greenhouse emissions for their businesses they either have neither the skills, resources nor the business drivers to actively pursue the issue.

A recurring theme in the feedback from this survey was that as the industry is now regulated by the Essential Services Commission that the Statement of Obligation for each Water Authority would need to include a specific sustainability/greenhouse reduction statement before organisations would be able to adequately respond. This feedback is key information for shaping the recommendations of 'the Framework', as whilst a number of recommendations can be made it is unlikely that they will be implemented across the industry without the key policy driver being in place.

More detail on the current strategic status of the each of the Victorian Water Authorities with respect to greenhouse emissions reduction and sustainability strategies are available in **Appendix C**.

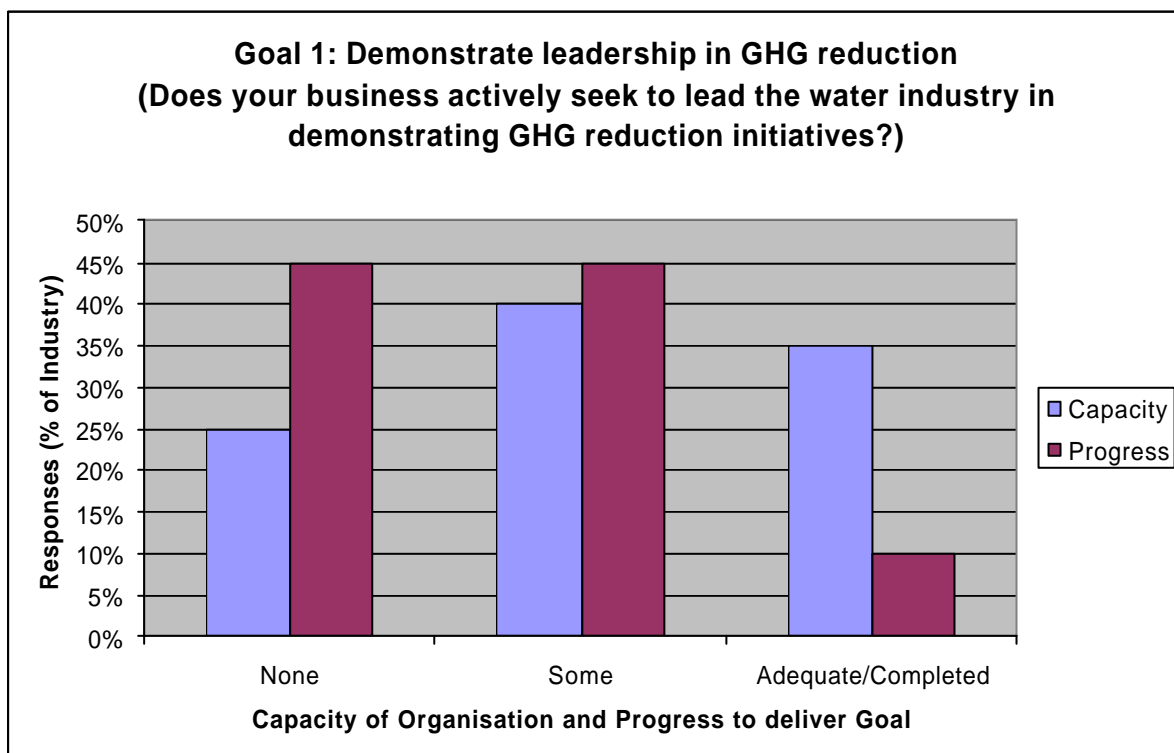


Figure 6.1: Demonstrate leadership in greenhouse gas reduction

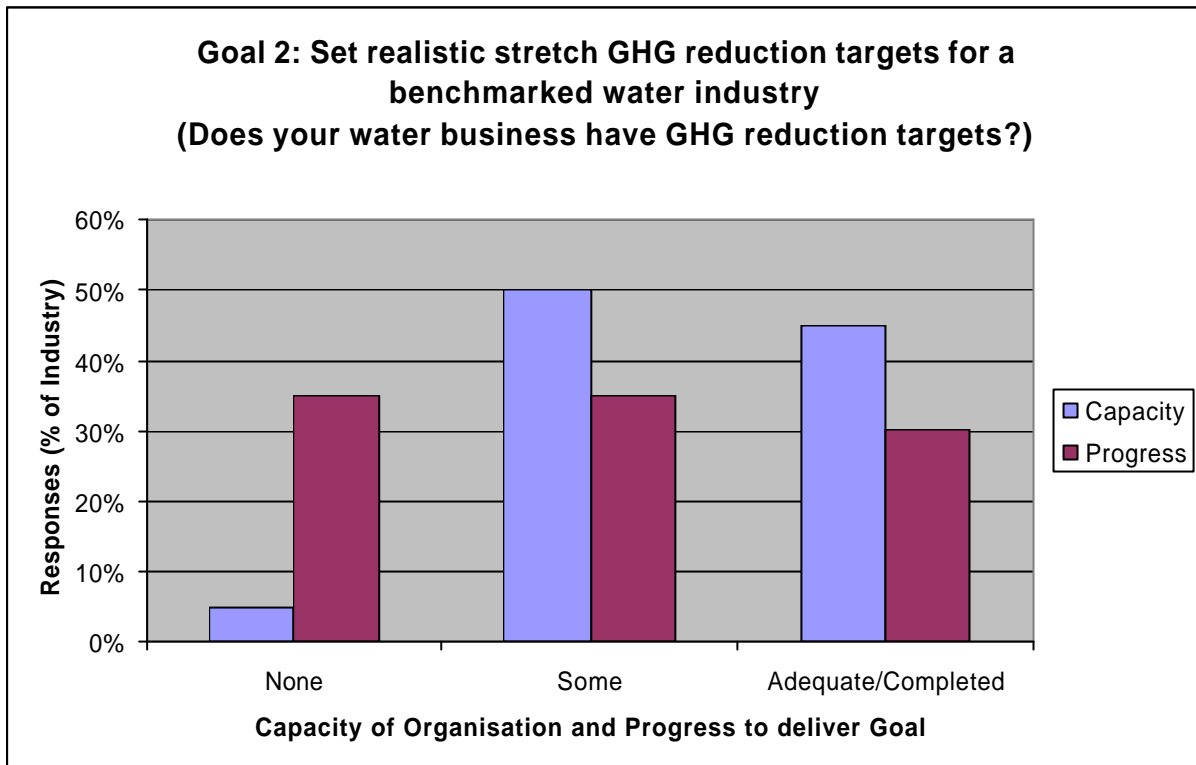


Figure 6.2: Set realistic stretch greenhouse gas reduction targets for a benchmarked water industry

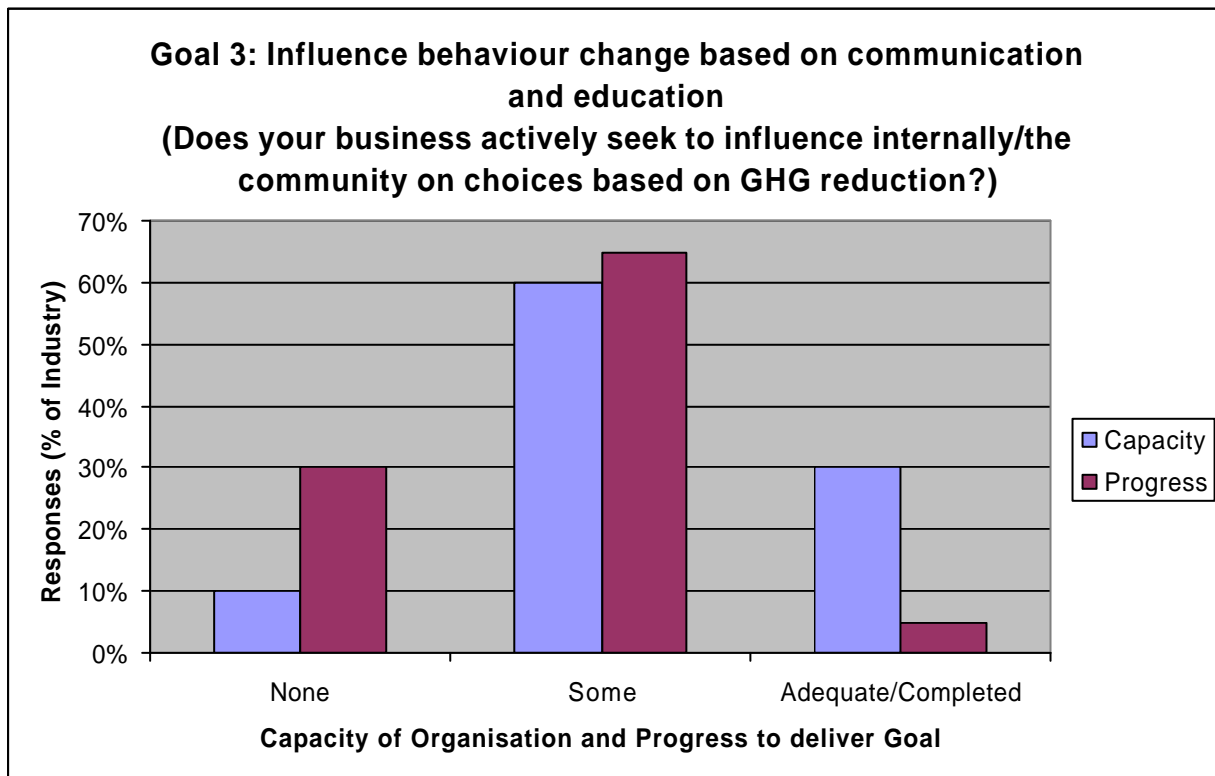


Figure 6.3: Influence behaviour change based on communication and education

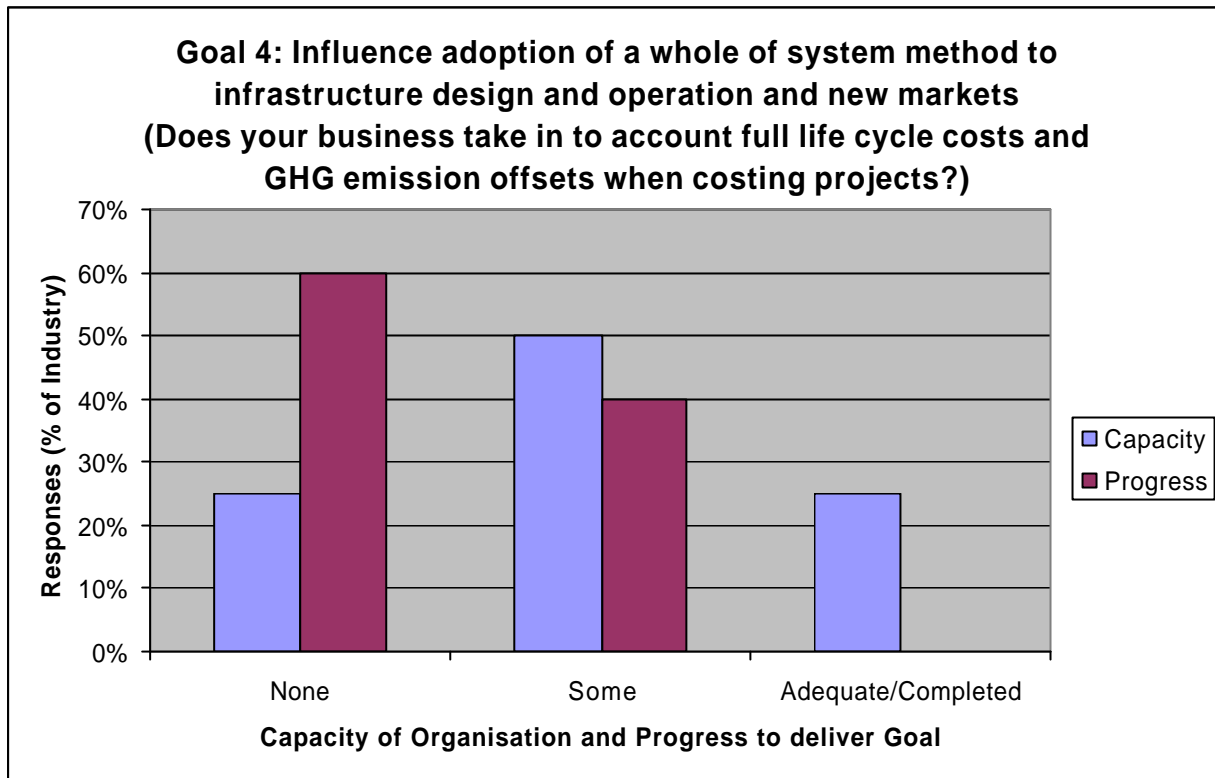


Figure 6.4: Influence adoption of a whole of system method to infrastructure design and operation and new markets



Figure 6.5: Incorporate an industry wide collaborative and cooperative approach

7. Recommendations

The recommendations have been structured in such a way as to respond to each of the 5 Goals as key actions to deliver the desired outcome. The recommendations were workshopped by the Working Group and represent a collective view on the best way to deliver each of the 5 Goals. Due to the broad variation of operating conditions amongst the water businesses, it will be the responsibility of each organisation to find the best fit for their business in achieving these recommendations.

Delivering Goal 1 - Demonstrate Leadership in Greenhouse Gas Reduction

Recommendation 1:

The Department of Sustainability and Environment should modify the Statement of Obligations to include a statement that the Water Authority will consider reduction of greenhouse emissions as part of conducting business in a sustainable manner.

Delivery Date: December 2006

The Victorian Water Industry currently outlines decision making in a 3 year Water Plan which underpins the Essential Services Commission's price determinations. The Statement of Obligations complements the Water Industry Regulatory Order in requiring the development of the Water Plans.

Any actions regarding greenhouse gas reduction will be outlined in the Water Plan in accordance with the requirements of the Statement of Obligations. Currently the Statement of Obligations states that "...the Authority must...minimise the impacts of its activities on the environment..." The Essential Services commission does not recognise this statement as specifically relating to greenhouse emission reduction.

The Statement of Obligations for each authority is under review in line with changes recommended in the *Our Environment Our Future* Sustainability Action Statement 2006. In the Action Statement it was recommended that the Statement of Obligations be adjusted to reflect the responsibility of each Water Authority "...to improve sustainability beyond water savings." This includes development of renewable energy and energy efficiency opportunities.

The Department of Sustainability and Environment (DSE) is currently undertaking consultation with key stakeholders to ensure that the changes are agreed to and aims for this process to be signed off by the Minister for Water in consultation with the Treasurer by September 2006.

Delivering Goal 2 - Set realistic stretch greenhouse gas reduction targets for a benchmarked water industry

Recommendation 2:

Part 1

Sustainability Victoria, EPA Victoria and VicWater should develop a process to assist Water Authorities to:

- a. Identify sources of greenhouse gas emissions**
- b. Measure and report greenhouse gas emissions production using a common framework and key performance indicators**
- c. Recommend the best means for reducing greenhouse gas emissions including identifying energy efficiencies, offsets and renewable energy opportunities**

Part 2

Each Water Authority will adopt a greenhouse emissions reduction target and renewable energy target (if applicable) based on the information determined in Part 1 and in alignment with Victorian Government policy.

Delivery Date: June 2007

Sustainability Victoria will work with each of the Water Authorities to determine the current status of greenhouse gas emissions data collection.

A number of Water Authorities have already undertaken significant work in the area of energy efficiency therefore the development of a target would need to ensure that early leaders are not penalised. In addition, a number of organisations do not have energy/greenhouse data prior to the last three years so it will be important to adopt a target that captures these issues.

Before a greenhouse emissions reduction target is set for each Water Authority, the current greenhouse emissions status and data availability for each organisation will need to be established. Sustainability Victoria will work with the Water Authorities to ascertain the current level of data available and previous work that has been undertaken. This will allow for Water Authorities to be benchmarked with consistent emissions data available across the Industry and realistic targets can then be established. It is proposed that this work be completed by June 2007.

The Water Authorities will adopt greenhouse gas emissions reduction targets based on the information determined with Sustainability Victoria and in alignment with the Victorian Government Greenhouse Gas Emission Reductions Program.

Sustainability Victoria will undertake a review of the renewable energy generation opportunities available to the Water Industry across Victoria including hydro, solar, biogas, biofuels and wind.

Sustainability Victoria will conduct a review of the renewable energy generation opportunities available to the Victorian Water Industry with the opportunities ranked in order of commercial and technical viability. The results of this high level review will then be released to each of the Water Authorities who will be responsible for investigating if it is feasible for the more highly ranked opportunities to be implemented within their infrastructure. Any opportunities identified with a less than 5 year pay back time could then be adopted.

Refer to **Appendix E** for the renewable energy capacity hosted by Water Authorities and projects that are currently under investigation.

The Water Authorities will adopt renewable energy targets (if applicable) based on the information determined with Sustainability Victoria and in alignment with the Victorian Government Renewable Energy Target (VRET).

The information made available from the review of the renewable energy opportunities by Sustainability Victoria will assist in informing each Water Authority of potential projects within their region and to allow for a realistic renewable energy target to be established for each Authority if applicable. It is proposed that this work be completed by June 2007.

The Working Group will act as an advisory group to oversee the choice of specialist consultants utilised for the review of greenhouse emissions and renewable energy opportunities and to review documentation produced. The Working Group will be particularly crucial in reviewing recommendations for targets and providing advice on the feasibility of these targets for the Water Authorities.

It is likely that the outcome of this work will highlight that the opportunities for greenhouse emissions reduction and renewable energy generation varying significantly for each of the Water Authorities. Therefore a single target may not be able to be set across the Water Industry; however individual targets could be set for each organisation. These targets could be expressed as a combined target for the Industry with the contribution by each Water Authority highlighted. An example of how this form of target setting may work is outlined in **Table 7.1**.

Table 7.1: Example of development of a combined renewable energy (RE) target

Water Authority	Energy Consumed (GJ)	RE Generation Potential (GJ)	Current RE Generation (GJ)	Predicted RE Generation for 2012 (GJ)	% RE target
X	120,000	80,000	40,000	60,000	50%
Y	50,000	10,000	500	2,000	4%
Z	10,000	1,000	0	200	2%
Total	180,000	91,000	40,500	62,200	34.5%

Therefore, in the above example the combined Renewable Energy target for the Water Industry is 34.5%. The same type of calculation would be utilised for a greenhouse emissions reduction target.

The Victorian Government has legislated a mandatory renewable energy scheme, the Victorian Renewable Energy Target (VRET). Under VRET, Victoria's level of renewable energy will be lifted from the current 4% up to 10% by 2016. It is predicted that VRET will create up to \$2 billion in capital investment mainly in regional Victoria. VRET should provide added support for investment in renewable energy infrastructure by the Victorian Water Industry.

Recommendation 3:

Part 1

Each Water Authority should prepare an Action Plan outlining how they will manage reduction in greenhouse emissions over the next 5 years.

Part 2

Each Water Authority is encouraged to forward the Action Plan to EPA Victoria and work in partnership to maximise the opportunities for implementation.

Delivery Date: September 2007 (in alignment with the Water Plan submission)

Whole of Business Greenhouse Action Plan

This whole of business Action Plan should include long and short term actions on how the Water Authority will manage reduction in greenhouse emissions over the next 5 years. Action Plans should be prepared in alignment with the Water Plan submission due to EPA Victoria in September 2007.

For example, the actions may cover energy efficiency/greenhouse reduction measures with short payback periods or longer term actions that take into account plans to upgrade facilities or significant asset replacements. An Action Plan could also identify measures to source renewable energy, recover waste energy or make the organisation carbon neutral. Potential joint projects with other water organisations could also be proposed in an action plan.

The proposed Action Plan will be a rolling 5 year plan (or will be in alignment with the Water Plan submission period), to be updated internally every 12 months.

Water Authorities will be encouraged to forward the initial Action Plan to the Environment Protection Authority (EPA) Victoria, which can assist Water Authorities to identify energy or emission reduction opportunities with some technical guidance around methodologies for quantifying emissions and energy use from different treatment processes. EPA Victoria can also assist in ensuring that all Action Plans submitted are of comparable quality and could liaise with the Working Group to present feedback and learning from the Action Plan development and implementation process.

Progress on the implementation of the Action Plans could also be included in annual reports to EPA Victoria, in alignment with existing reporting requirements for Water Authorities.

The intention is for the Action Plans to be developed and implemented in co-operative partnership with EPA Victoria and to operate alongside (and where appropriate in satisfaction of) any current and future regulatory requirements that apply to licensed sites. This partnership arrangement will include EPA Victoria providing advice and assistance to help maximise the opportunities identified in the Action Plans and to ensure actions are effectively implemented by water businesses.

Sustainability Victoria could also assist water businesses in preparing the initial Greenhouse Action Plan for 2007 by providing technical expertise and assistance in plan writing.

Building on Existing Requirements

Recommendation 3 proposes to build on the model provided by EPA Victoria Industry Greenhouse Program by having each Water Authority prepare an action plan that includes the whole of each water business rather than just the licensed sites. The whole of business approach may enable Water Authorities to identify opportunities that go beyond the requirements of the Industry Greenhouse Program eg actions with longer paybacks, transport, non-licensed sites or infrastructure.

Water Authorities are already required to prepare and implement an action plan for their licensed sites under the Industry Greenhouse Program operated by EPA Victoria.

This EPA Victoria Program requires an approved action plan to be implemented and the following information included in the annual report for each water business to EPA Victoria:

- Annual energy consumption, and the greenhouse gas emissions associated with this energy consumption;
- Where applicable, annual non-energy related greenhouse gas emissions; and
- A summary of actions implemented from the Action Plan over the year, and a list of actions to be implemented in the following year.

Further details of the Program are outlined in **Appendix A**.

Delivering on this Recommendation

Note that some organisations have already completed this recommendation and others have less capacity to deliver on this action. Therefore it may be necessary for some skill sharing across the industry and assistance to be provided by Sustainability Victoria and EPA Victoria to ensure that this recommendation can be successfully delivered.

It will also be important for the Action Plans to include reference to the achievements that water businesses have already completed. Recognition of these achievements will help define the possible actions included in the plans.

Greenhouse Reduction Principles

The Greenhouse Reduction Principles could form the hierarchy for decision making by the individual Water Authorities in guiding prioritisation of identified opportunities in the Greenhouse Action Plan. The Greenhouse Reduction Principles are based on the EPA Victoria Waste Hierarchy. In accordance with the Waste Hierarchy, greenhouse emissions are considered a waste and the options have been modified to suit this context.

The EPA Victoria Waste Hierarchy states that wastes should be managed in the following order of preference from most favoured option to least favoured:

1. Avoidance
2. Reuse
3. Recycling
4. Recovery of energy
5. Repository storage
6. Treatment
7. Containment

Adapting this approach, the following Greenhouse Reduction Principles in order of priority are:

1. Avoid greenhouse emissions
2. Reduce greenhouse emissions
3. Use renewable energy
4. Recover waste energy
5. Sequestration and abatement schemes

See **Appendix D** for an explanation of some existing opportunities for greenhouse reduction that could be further explored by Water Authorities.

Recommendation 4:

VicWater will collect data from the 20 Water Businesses and report yearly on the key performance indicators:

- **Greenhouse pollution (tonnes CO₂e) - calculated using Australian Greenhouse Office approved methodology**
- **Total Energy Consumption for Water, Wastewater & Whole of Business (Gigajoules/ML)**
- **Renewable Energy Used or Produced as a % of Total Energy Consumption**

Delivery Date: June 2007

VicWater collects annual performance information from the Victorian water industry in order to publish a comparative performance report for the entire industry. The report, titled the "Victorian Water Review" (VWR) compares the environmental, social and economic performance of businesses by publishing a set of Key Performance Indicators (KPIs). The report also publishes trend series data to illustrate changes in each business' performance over time.

The 2005/2006 Victorian Water Review will publish a reduced number of KPIs (from previous year's reports) and will include a series of best practice case studies. KPIs and case studies will cover the most critical performance areas of the industry in relation to social, environmental and economic factors.

The 2005/2006 Report will again report greenhouse emissions as in the 2004/2005 Report. VicWater will also provide the option for water businesses to report the two new Energy KPIs for 2005/2006 if they have the data available. The 2005/2006 Report is expected to be released in December 2006.

To enable consistent reporting, it is important that key performance indicators definitions are robust and not open to interpretation. Therefore it will be important that greenhouse pollution is calculated using Australian Greenhouse Office approved methodology.

Delivering Goal 3 - Influence behaviour change based on communication and education

Recommendation 5:

Sustainability Victoria, VicWater and Water Authorities to provide practitioner support and education programs including:

- a. Ongoing operation of the Working Group**
- b. Establish a webpage**
- c. Water Authority communication and education of climate change impacts on their business and opportunities for greenhouse emissions reduction**
- d. Water Authority adoption of an environmental whole of system approach to infrastructure design, installation and operation**
- e. Identification and utilisation of greenhouse champions**

Delivery Date: December 2007

The Greenhouse Reduction Working Group should continue to operate to allow delivery of the recommendations within 'the Framework'.

Each Water Authority should ensure a high level of awareness of climate change impacts on their business and opportunities for greenhouse emission reduction through communication and education of customers, industry and within the workplace.

An opportunity exists to expand on the successful *Our Water Our Future* advertising and education campaign to incorporate messages about climate change impacts on water businesses and opportunities for greenhouse emission reduction. This would build on the broad public awareness of the need to conserve water and the steps that can be taken to do so.

Greenhouse pollution is a global problem. The impacts of a water authority's efforts in emission reductions on reducing climate change will be relatively small and undetectable compared to world wide impact. It can be argued that, in addition to addressing our own greenhouse emissions, we need to assist others reduce their greenhouse emissions if we are to avoid the serious consequences of climate change.

Therefore an additional challenge for each water authority could be to encourage the transfer of energy efficient and greenhouse gas reduction technologies and practices beyond their own operations. An example of this approach is for water authorities to facilitate the installation of water saving showerheads in customers' homes. These have the added benefit of saving greenhouse emissions as well as water.

Actions such as these could then lead towards increasing the water-energy link in media and customer communications particularly in the delivery of water. Other examples of how climate change messages can be communicated to customers and industry include potentially adding greenhouse emission statements to water bills and including information in customer newsletters.

It is also important to incorporate messages about climate change impacts and opportunities for greenhouse emission reduction around the workplace to ensure that the Water Industry is informed. Examples within the workplace include establishing an office footprint and encouraging energy saving behaviour such as auditing computer turn off rate, training and encouraging lower energy use in plant operation.

Delivering Goal 4 - Influence adoption of a whole of system method to infrastructure design, operation and new markets

Each Water Authority should adopt an environmental whole of system approach to infrastructure design, installation and operation.

By adopting and utilising a whole of system approach during decision making processes, Water Authorities will be able to investigate long term impacts of projects on greenhouse emissions and energy consumption. This will ensure that long term sustainable decisions are made.

There are a number of environmental decision making tools available. One option that is utilised for taking a holistic approach and evaluating the environmental impacts of a product or service from cradle to grave is the Life Cycle Assessment (LCA) decision tool.

The LCA tool provides a technique for assessing the environmental impacts of a product or system over its life cycle. For example, the tool takes into account the environmental impacts from the mining of the raw materials required to manufacture a product through to the operational life of a product such as its energy requirements and consequent greenhouse emissions. A life cycle assessment therefore accounts for all the physical resources used and the consequent environmental by-products (eg emissions and releases) related to the product or system being studied. The LCA tool translates this information into the possible harm (or benefit) to the environment and human health.

LCA can be applied in varying degrees, from 'Life Cycle Thinking' (e.g. the adoption of philosophy and principles) to a full detailed analysis of different product or service options. The key outcome of a life cycle assessment is that it provides critical information to the decision maker. This information assists in prioritising improvements to current products and services for better environmental outcomes and the ability to make comparisons of the overall environmental impacts between new products and services.

In order to share water industry experiences of applying the LCA tool and with the objective to assist the Water Industry make more environmentally sustainable decisions, an LCA Working Group was established in 2005. The LCA Working Group has representation from a number of Victorian water businesses, EPA Victoria and the Department of Sustainability & Environment. The group is currently defining its purpose and role, and will be coordinated by EPA Victoria on an interim basis.

Delivering Goal 5 - Incorporate an industry wide collaborative and cooperative approach

The Water Authorities should nominate greenhouse champions who can provide expertise and advice to other Water Authorities if required.

Based on the individual assessments of current capacity within the Victorian Water Industry to deliver greenhouse emission reduction strategies and actions (refer to **Section 6**) it is recognised that not all organisations will currently have the available resources to provide comprehensive Greenhouse Action Plans. By identifying individuals within the Victorian Water Industry who do have the necessary skills, it is intended that these people can be available to provide advice and share examples that can guide the building of capacity in other organisations.

There may also be opportunities for Water Industry bodies to work with other organisations involved in greenhouse emission reduction. Catchment Management Authorities (CMAs) and municipal groups may be leading projects of direct relevance to the water businesses. Mutual benefits from these partnerships may include access to funding sources and active participation in the regional community.

The Working Group can be utilised to maintain the communication links in the industry and to provide connections between organisations with Sustainability Victoria providing a coordinating role.

This concept may be extended to project sharing where the knowledge gained on a new and innovative project is shared between organisations or a joint project is invested in between Water Authorities.

Collective purchasing may also be considered for the purchasing of power products such as Green Power.

VicWater and the Working Group will establish and maintain a Water Industry "Greenhouse & Sustainable Energy" webpage to assist knowledge transfer between water businesses.

The VicWater "Greenhouse & Sustainable Energy" webpage will be developed and maintained by VicWater and the Working Group. The webpage is to include links to appropriate sites and act as a hub of industry-relevant greenhouse/energy information such as embedded energy in infrastructure, energy efficient products, renewable energy opportunities, and offset/abatement schemes. The webpage will also provide the industry with an opportunity to showcase best practice activities through a series of case studies.

VicWater will also actively promote greenhouse and sustainable energy events and appropriate case studies through the quarterly electronic Sustainability Newsletter, and by engaging relevant stakeholders to present at annual seminars/conferences and at Sustainability Task Group (STG) meetings.

8. Implementation

The 5 recommendations outlined in this Greenhouse Emission Reduction Framework were endorsed by the Working Group in June 2006. The industry was given one month (July 2006) to review 'the Framework' and provide comment to Sustainability Victoria. 17 water businesses provided comment, along with EPA Victoria, DSE and VicWater. All significant issues raised were then worked through with the individual organisations.

The VicWater Sustainability Task Group (Chaired by Tony Kelly, Managing Director Yarra Valley Water) also reviewed the document and recommended that the VicWater Board formally endorse 'the Framework'. The VicWater Board subsequently endorsed 'the Framework' at their 26 October 2006 meeting. 'The Framework' forms the basis for the Water Industry to address long term energy consumption, efficiency issues and greenhouse emissions issues. The recommendations are now to be implemented by the nominated organisations within the timeframes allocated as outlined in **Table 8.1**.

It should be noted that the recommendations outlined in 'the Framework' are voluntary and not enforceable. Therefore it will be up to each individual business to determine to what extent they wish to implement the recommendations. However with the recommendations to change the regulatory environment being taken up by DSE this will ultimately impact on how the individual businesses are operated with respect to greenhouse emissions.

Sustainability Victoria has committed to the recommendations allocated to them in 'the Framework'. EPA Victoria is also supportive of the recommendations in particular the development of the Greenhouse Action Plans. EPA Victoria will work with water businesses to provide advice and assistance on the development of the Greenhouse Action Plans and to ensure that they are implemented via the Water Plan process.

Table 8.1: Summary of Greenhouse Emission Reduction Recommendations

	Respons. Org	Recommendation	Time Frame
1	DSE	The Department of Sustainability and Environment should modify the Statement of Obligations to include a statement that the Water Authority will consider reduction of greenhouse emissions as part of conducting business in a sustainable manner.	Dec 2006
2	Part 1: Sust Victoria, EPA Victoria, VicWater, Water Authority Part 2: Water Authority	Part 1: Sustainability Victoria, EPA Victoria and VicWater should develop a process to assist Water Authorities to: <ol style="list-style-type: none"> Identify sources of greenhouse gas emissions Measure and report greenhouse gas emissions production using a common framework and key performance indicators Recommend the best means for reducing greenhouse gas emissions including identifying energy efficiencies, offsets and renewable energy opportunities Part 2: Each Water Authority will adopt a greenhouse emissions reduction target and renewable energy target based on the information determined in Part 1 and in alignment with Victorian Government policy.	June 2007
3	Water Authority	Based on the information provided in Recommendation 2: Part 1: Each Water Authority should prepare an Action Plan outlining how they will manage reduction in greenhouse emissions over the next 5 years. Part 2: Each Water Authority is encouraged to forward the Action Plan to EPA Victoria and work in partnership to maximise the opportunities for implementation.	Sept 2007
4	VicWater	VicWater to collect data from the 20 Water Businesses and report yearly on the key performance indicators: <ul style="list-style-type: none"> Greenhouse pollution (tonnes CO₂e) - calculated using Australian Greenhouse Office approved methodology Total Energy Consumption for Water, Wastewater & Whole of Business (Gigajoules/ML) Renewable Energy Used or Produced as % of Total Energy Consumption 	June 2007
5	Water Authority, VicWater, Sust Victoria	Sustainability Victoria, VicWater and Water Authorities to provide practitioner support and education programs including: <ol style="list-style-type: none"> Ongoing operation of the Working Group Establish a webpage Water Authority communication and education of climate change impacts on their business and opportunities for greenhouse emissions reduction Water Authority adoption of an environmental whole of system approach to infrastructure design, installation and operation Identification and utilisation of greenhouse champions 	Dec 2007

9. References

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Appendix A - Strategic considerations influencing 'the Framework'

There are a number of strategic considerations which must be taken into account in the development of a Greenhouse Emissions Reduction Framework for the Victorian Water Industry. By highlighting and utilising existing Victorian Government initiatives, the Victorian Water Industry can lead the way in identifying means for greenhouse pollution reduction, energy conservation and harnessing renewable energy demonstrating through leadership how resources such as energy and water will be viewed in Victoria in the future.

The following is a brief outline of the key Victorian Government initiatives which the Greenhouse Emissions Reduction Framework for the Victorian Water Industry supports and provides a tool for implementation.

Our Environment Our Future

Our Environment Our Future is Victoria's Environmental Sustainability Framework. In April 2005, the Framework was launched as a key driver by the Victorian Government to make Victoria "...a world leader in environmental sustainability."

The aim of the Framework is to make environmental sustainability a significant part of Victoria's future whilst maximising economic growth, maintaining quality of life and protecting the environment.

The Framework:

- Outlines the key environmental challenges for Victoria
- Defines environmental sustainability and outlines its importance
- Identifies strategic direction for becoming environmentally sustainable
- Sets objectives and interim targets
- Identifies actions for delivering the Framework

The Department of Sustainability and Environment is leading the implementation of the Framework.

Growing Victoria Together

Growing Victoria Together is the Government's vision for Victoria now and into the future. It expresses a balanced approach to achieving progress and increasing the common good - equally valuing economic, social and environmental goals.

Growing Victoria Together notes that:

"Our most critical natural resource issues are greenhouse gas emissions, water and waste. To allow our population to grow whilst avoiding placing serious stresses on the environment, each of us needs to use less water and energy and cut down on creating non-recyclable waste. Our approach to reducing greenhouse gas emissions will focus attention on the need to move to a less greenhouse gas intensive economy over time. This is critical if Victoria is to play its part in national and global efforts to address the threat of climate change over the coming century."

Growing Victoria Together includes a measure to reduce greenhouse pollution from the production and use of energy. It is proposed to use the following two indicators to report on this measure:

- > Total greenhouse pollution
- > Stationary energy greenhouse pollution per \$ million GSP (gross state product)

Key greenhouse and industry related issues outlined in Growing Victoria Together are:

- > Greenhouse pollution from the production and use of energy will be reduced
- > The quantity of solid waste generated will be reduced and the amount recovered for reuse, recycling and energy generation will increase
- > Victoria's productivity and competitiveness will increase
- > There will be more and better jobs across Victoria
- > A greater share of national business investment will be in Victoria
- > Victoria will increase exports

Environmental Sustainability Framework

Another key initiative is the Environmental Sustainability Framework, introduced under *Our Environment, Our Future*. The Framework sets the directions for environmental sustainability whilst providing the broad strategic context for existing strategies. It also informs future policy initiatives.

The Environmental Sustainability Frameworks is outlined as follows in Table A.1.

Table A.1: Environmental Sustainability Framework

Strategic Directions	Guiding Principles	Environmental Objectives
1. Maintain and enhance our natural assets	<ul style="list-style-type: none"> • Maintain and restore natural assets to maintain ecosystem services • Use renewable natural assets in ways that don't irreversibly damage them or the surrounding ecosystems • Carefully manage non-renewable natural assets • Establish the real economic value of natural assets and use in incentives and pricing 	<ul style="list-style-type: none"> • Healthy and productive land • Healthy and productive water systems • Healthy marine and coastal areas • Flourishing biodiversity within functioning ecosystems
2. Produce more value from less resources	<ul style="list-style-type: none"> • Invent, seek out and use resource efficient practices • Identify and reduce wasteful practices • Consider full life cycle impacts and costs when making decisions about resource use 	<ul style="list-style-type: none"> • Reduced climate impact • Less waste and increased resource efficiency
3. Reduce our everyday environmental impacts	<ul style="list-style-type: none"> • Make it easy for people to do the right thing, and harder to do the wrong thing • Measure, understand and take action to reduce your everyday environmental impacts • Consider potential environmental impacts in the early stages of decision making and seek the best environmental, economic and social outcomes • Work together to reduce our impacts 	<ul style="list-style-type: none"> • Liveable settlements and responsible development • Communities with a water, energy and material savings ethic

Victorian Greenhouse Strategy

The Victorian Greenhouse Strategy Action Plan Update was recently released by the Victorian Government and includes specific policies and programs within six action areas:

1. Positioning Victoria's economy for a low carbon future
2. Communities shaping their future through action on abatement and adaptation
3. Transforming urban areas for sustainability
4. Adapting to climate change
5. Reducing net emissions from land management in rural Victoria
6. Government leadership

Renewable Energy Strategy

The Renewable Energy Strategy is currently being developed as part of the Greenhouse Challenge for Energy. The Strategy highlights that renewable energy will require support in the short-term in order to operate competitively in the long term.

The strategy seeks to strengthen the investment market for renewable energy and address barriers that limit the implementation of renewable energy infrastructure. The strategy focuses on delivery of targets to 2010 that will include:

- > Wind industry established
- > Bioenergy industry emerging
- > Small-scale hydro opportunities realised
- > First energy crops established in salinity affected areas
- > Demonstration wave and tidal projects operating successfully
- > Photo-voltaic industry small and still requiring government support
- > Market support for all renewables in place
- > Niche manufacturing established

Energy Efficiency Strategy

Another component of the Greenhouse Challenge for Energy is the Energy Efficiency Strategy which is also due to be released. The Energy Efficiency Strategy will outline that there will be significant benefits that can be realised in the short-term from increased energy efficiency.

The Strategy highlights that the following targets will need to be realised by 2010:

- > National Framework for Energy Efficiency (NFEE) Stage1 measures implemented and savings realised
- > NFEE Stage 2 developed
- > Energy performance contracting develops into an established industry
- > Minimum Energy Performance Standards (MEPS) continue to become more stringent
- > Cost-reflective pricing trialled

Key dimensions of the Energy Efficiency Strategy include a range of levers to accelerate the uptake of energy efficiency:

- > Standards - suppliers pushed to higher levels of energy efficiency.
- > Disclosure - makes energy performance visible, comparisons drive consumer "pull"
- > Training and Accreditation - builds capacity and underpins long-term cultural change
- > Awareness and Information - addresses information barriers and raises awareness of energy efficiency potential
- > Demonstration - makes technical possibility visible and reduces risk profile
- > Technology and Innovation - defines future best practice and creates room for more stringent standards

EPA Victoria Industry Greenhouse Program

The EPA Victoria Industry Greenhouse Program is an initiative operated by EPA Victoria under the Victorian Greenhouse Strategy and applies to existing and new EPA Victoria licensees and works approval applicants. The program is aimed at improving the energy efficiency of, and reducing the greenhouse gas emissions from, a range of industries in Victoria.

The program's statutory requirements are enacted through the *State Environment Protection Policy (Air Quality Management)* and the incorporated *Protocol for Environmental Management (Greenhouse Gas Emissions and Energy Efficiency in Industry)*.

EPA Victoria licensees that are medium to large energy users are required to:

- > Review energy bills to calculate energy use and associated greenhouse pollution; greenhouse gases produced by an industrial process (such as chemical manufacture or water treatment) are also calculated
- > Conduct an energy audit to Australian Standards
- > Identify best practice options and determine payback periods
- > Prepare an action plan that will implement actions with a simple payback of three years or less
- > Report on implementation and annual emissions as part of annual reporting to EPA Victoria.

Businesses applying for an EPA Victoria works approval or a new EPA Victoria licence are also required to demonstrate that they have identified, and will implement, best practice for their industry in relation to energy use and greenhouse gas emissions with respect to the activities that are subject to their application. Best practice must also be identified and implemented in relation to any non-energy related greenhouse emissions associated with the application.

The program is proving to be very successful, with projected annual greenhouse gas reductions in excess of 1 million tonnes of CO₂-e, and energy cost savings of some \$34 million per annum at a total implementation cost of \$49 million (representing a payback period of 17 months on average).

Appendix B - Greenhouse Emissions by the Victorian Water Industry 2004/05

CO ₂ equivalent emissions 2004/05 (tonnes CO ₂ emitted)						
Water Authority	Water Treatment and Supply	Sewerage Treatment and Management	Transport	Other	Total CO ₂	Calculation method
Barwon Water	7,526	43,741	1,359	3,064	55,690	AGO Guidelines
Central Highlands Water	11,604	38,956	607	1,622	52,789	AGO Guidelines
City West Water	79	3,368	1,480	2,347	7,274	AGO Guidelines
Coliban Water	4,642	9,842	904	639	16,027	AGO Guidelines
East Gippsland Water	4,367	2,616	440	246	7,669	AGO Guidelines
First Mildura Irrigation Trust	10,185	0	0	0	10,185	AGO Guidelines
Gippsland Water	11,301	28,727	1,262	5,306	46,596	AGO Guidelines
Goulburn-Murray Water	9,789	0	5,902	-401	15,290	AGO Guidelines
Goulburn Valley Water	16,031	36,641	987	342	54,001	WSAA Greencount
GWM Water	10,595	3,223	1,544	884	16,246	AGO Guidelines
Lower Murray Water	8,376	7,786	434	269	16,865	WSAA Greencount
Melbourne Water	79,000	273,000	3,350	37,200	392,550	AGO Guidelines
North East Water	9,218	7,193	964	194	17,569	AGO Guidelines
South East Water	7,876	21,462	4,198	3,787	37,323	AGO Guidelines
South Gippsland Water	2,537	1,583	534	142	4,796	AGO Guidelines
Southern Rural Water	1022	0	803	300	2125	Estimate only
Wannon Water	410	285	-	-	695	Estimate only
Western Port Water	1,477	2,852	0	153	4,482	Estimate only
Western Water	11,028	18,192	752	462	30,434	WSAA Greencount
Yarra Valley Water	5,126	16,880	948	-2,274	20,680	AGO Guidelines
TOTAL	212,189	516,347	26,468	54,282	809,286	

Appendix C - Current Strategic Status of Sustainability and Greenhouse Emissions Reduction in the Victorian Water Industry

All of the 20 Water Authorities have undertaken work at various levels to reduce greenhouse emissions by capturing biogas, increasing energy efficiency or by investigating renewable energy potential. The following is a snapshot of their current status as of April 2006.

C.1 Barwon Water

Barwon Water is currently developing a Sustainability Strategy, which will be completed by September 2006. As part of the development of a Sustainability Strategy, Barwon Water's Energy Reduction Strategy will also be finalised by September 2006.

Barwon Water currently considers energy efficiency as part of a triple bottom line assessment for all new projects. For example, as part of investigations into a Northern Water Reclamation Plant, Barwon Water considered numerous treatment technologies, which varied in the amount of energy used during operation. As part of a triple bottom line assessment Barwon Water considered the impacts of energy consumption from an environmental and economic perspective.

Case Study - Barwon Water Mini-hydro Development

Barwon Water is investigating the installation of a 315 kW mini-hydro turbine at the end of a 36 km pipe-line which discharges water into the Montpellier storage basin near Geelong. The energy from this water is currently dissipated by a pressure reducing valve and could instead be used for renewable electricity generation.

The water for this mini-hydro project utilises the existing outflow from the Moorabool Water Treatment Plant which discharges into the Montpellier storage basin. There will be no changes to the operating flow regime.

The mini-hydro turbine is to be installed over an existing concrete discharge pit so that any civil works will be minimised. The distance to the grid connection point is only 150 meters.

The proposed hydro turbine would capture this energy and generate approximately 1600 MWh of renewable electricity each year. The electricity would be sold under contract to an energy retailer and would contribute to Victoria's renewable energy supply. This generation would result in an annual reduction in greenhouse pollution of 2240 tonnes per annum which is equivalent to taking 520 cars off the road each year.

Barwon Water has an Environmental Consultative Committee that includes representatives of local and regional environmental groups. This Committee supports the mini-hydro project.

This project represents renewable energy generation equivalent to approximately 5% of Barwon Water's total energy consumption and therefore could be a key component in Barwon Water's greenhouse reduction strategy.

C.2 Central Highlands Water

Central Highlands Water has an Environmental Management Policy and system certified to ISO14001 that takes into account the issue of environment management for operations and waste management. Central Highlands Water also has established a Board Sustainability Committee in order to focus CHW operations on sustainability principles and track the sustainability performance of CHW.

Central Highlands Water mission states that CHW will provide quality water and wastewater services fairly, efficiently and sustainably to communities in the Central Highlands Region. In addition the CHW Corporate Strategy has an undertaking to set base GHG reduction targets and also has a key priority strategy to develop sustainable communities to service the water and wastewater needs of the community. The objectives of the sustainable communities' priority are to support the economic, social and environmental aspirations of communities serviced by CHW.

In addition the aim of CHW is:

- To manage the regions urban water supply and demand in an environmentally sustainable manner.
- To optimise the use of assets and water resources to minimise community costs.
- To undertake core activities in an environmentally responsible manner.
- To contribute to catchment and river health improvements in their water catchments.
- Minimise greenhouse emissions.

C.3 City West Water

City West Water's vision is to be a truly sustainable water business. Sustainability is defined as balancing social, environmental and economic responsibilities. City West Water's key sustainability responsibilities are to demonstrate leadership in implementing the principles of environmental sustainability. These principles are:

- Resource efficiency;
- Biodiversity protection;
- Minimising ecological impact; and
- Intergenerational equity.
- Ensuring the health and safety of our customers, community, partners and staff;
- Delivering services matched to our customer needs;
- Engaging with our community to build productive relationships;
- Using our influence to support our community; and
- Delivering strong financial returns to our sole shareholder, the State Government of Victoria.

To achieve sustainability these considerations are integrated into all business planning and decision making.

City West Water is currently monitoring the greenhouse gas emissions associated with head office energy consumption, vehicle fleet including maintenance contractor's vehicles, sewage treatment plant and sewage/water supply systems. Through a Waste Wise Agreement with EcoRecycle (now Sustainability Victoria) City West Water has committed to reduce energy consumption at head office by 5% by 30 June 2008 on the 2004/05 baseline.

Energy efficiency is considered in most major purchasing decision i.e. new pumps. City West Water currently purchases 10% green energy, and subscribes to Greenfleet to offset emissions from the vehicle fleet. City West Water has also committed to offsetting emissions for their sewage treatment plant.

C.4 Coliban Water

Coliban Water has an Environmental Policy and quality management system in place that is certified to ISO 14001. The Environmental Policy's key objectives which are based on sustainability principles are:

- Improving our understanding of the carrying capacity of the regional natural environment and the sustainability of our service provision within these limits;
- Maximising the efficient use of resources, minimising waste disposal and as far as possible, preventing pollution;
- Managing facilities and land in a manner which demonstrates good environmental stewardship, considers ecological values and maximises resource recovery;
- Understanding, promoting and upholding within our sphere of influence, respect for the traditional rights of indigenous peoples and valuing cultural heritage;
- Ensuring that employees of Coliban Water have the environmental awareness, skill motivation, resources and support to implement the environmental policy and contribute to the sustainable management of the business;
- Engaging stakeholders in major decision-making; and
- Regularly reviewing our performance and publicly reporting our progress.

Coliban Water identified the need for business greenhouse gas emission reduction in its 2004 – 2009 Corporate Strategic Plan and has a specific objective relating to achieving this over 5 years. A study was undertaken in 2005 to benchmark Coliban Water's operations with other comparable water and wastewater operations, with respect to technologies available for energy efficiency improvement, and level of management systems.

Following this benchmarking exercise, Coliban Water is developing a specific strategy known as 'Coliban Water Energy Management Plan', for Sustainable Energy Management and Greenhouse Gas emission reduction.

As part of the strategy, Coliban Water has an overall greenhouse gas emission reduction target of "20% reduction in GHG emissions by 2015."

The Management Plan also includes a section on capital investment assessment and provides a suggested approach to calculating emissions generated by proposed and existing assets, and where offsets need to be considered. This approach is yet to be fully implemented within the business. New asset/infrastructure projects that will be significant energy users, have the objective of being energy-neutral / GHG emission neutral.

C.5 East Gippsland Water

East Gippsland Water has an environmental policy, which is certified under ISO 14001. The policy includes a commitment to operating the business sustainably, conserve natural resources, promote and encourage environmental awareness among staff and provide training, communication, promote environmental stewardship where possible

The environmental policy also covers greenhouse gas emissions, with the primary aim being to measure them accurately prior to reducing these emissions in the future once a realistic goal has been determined.

East Gippsland Water is also currently investigating a number of energy reduction opportunities including installation of only highly efficient pumps/ motors in the future, and also replacing a number of older motors working well below their best efficiency point. In addition, investigation in to controlling aerators on lagoons with dissolved oxygen meter feed back, and reducing the amount of energy use associated with pumping stormwater by minimising stormwater infiltration into sewers is progressing.

C.6 First Mildura Irrigation Trust

First Mildura Irrigation Trust does not currently have a sustainability or greenhouse pollution reduction policy. However it has been highlighted in the 04/05 Annual Report that these issues will be addressed in the future.

Case Study – First Mildura Irrigation Trust – Kings Billabong Management

The Trust diverts water from the River Murray at Psyche Bend pumping station into Kings Billabong, a recognised wetland providing high levels of biodiversity in addition to a water cleansing function. Water is then re-lifted by the Central pumping station to the Trust's distribution system from the billabong.

An earlier review undertaken in 1997 concluded 'the annual losses due to evaporation and leakage from Kings Billabong were estimated to be approximately 2,850 megalitres and 1,200 megalitres per year respectively for a total loss of 4,050 megalitres per year. This evaporation and leakage loss currently valued at the Trust's delivered water price of \$80.80 per ML results in an annualized cost of \$327,240.

What is not currently included or assessed is the benefit provided by this current management arrangement and the consequences if Kings Billabong relied solely on high river events to cause water to be provided to it as it is an intermittent or ephemeral wetland otherwise. How this service can continue to be provided in the future whilst mitigating greenhouse emissions also needs to be addressed.

C.7 Gippsland Water

Gippsland Water has a statement that sustainability is important. Aims and targets have not been defined except in the case of the Gippsland Water Factory which does have defined sustainability targets in regards to water consumption and greenhouse gas impacts.

Case Study – Gippsland Water - Energy Efficiency at Moe WWTP

The Moe WWTP treats domestic waste by the IDEA cycle. This cycle use air blowers to supply process air and motive energy for mixing. The blowers are the major energy consumer on site. The existing control system does not control the air in an efficient manner with pressure excursions common and the air being supplied at a pressure that is greater than that required for the process. The aim of the project is to install a system that minimises the air pressure while still providing enough volume of air for the process.

The UV sterilisation system is also to be reviewed to determine if advantages can be obtained by controlling the intensity of the lamp discharge.

It is expected that a 10% reduction in energy consumption may be obtainable at this site. (By analysing blower performance curves and determining the inefficiencies that exist.)

C.8 Goulburn-Murray Water

Goulburn-Murray Water's mission is "...is to deliver sustainable water services." Their Environment Policy makes reference to "...enhancing the sustainability of natural systems." The Policy sets out clear actions for Goulburn-Murray Water to implement including a set of Environmental Sustainability Indicators. These provide information to Goulburn-Murray Water's Board and other stakeholders on progress towards achieving the actions.

Goulburn-Murray Water is currently in the process of developing a greenhouse emissions reduction policy.

C.9 Goulburn Valley Water

In December 2002, Goulburn Valley Water (GVW) engaged a consultant to investigate liabilities and opportunities relating to greenhouse gas issues. The resulting report provided a benchmark for greenhouse and energy management within the Authority. From the benchmark study, GVW has since developed its strategic greenhouse reduction objectives. From this strategy GVW identified it could make its most significant greenhouse gas (GHG) reductions in the areas of methane production from wastewater treatment, energy input required for wastewater treatment and energy input required for both pumping potable water and wastewater. Therefore these three areas have been principally targeted both historically and currently to achieve GHG reductions.

The original benchmarked volume was 91,500 tonnes of equivalent CO₂ in 2001/2002. By targeting these three areas GVW has since reduced its GHG emissions to 55,000 tonnes of equivalent CO₂ in 2004/05. It is calculated that by continuing to target these three areas that GHG emissions could be reduced to below 50,000 tonnes of equivalent CO₂ in future. Future projects to reduce the GHG emissions in other areas of the business would be much more expensive than those already undertaken to achieve the same reductions in GHGs.

In order to report on and achieve targeted GHG emissions, GVW has developed in conjunction with and submitted to EPA Victoria, an Energy and Greenhouse Gas Action Plan and has also developed corporate environmental performance indicators which are reported quarterly. To develop this Action Plan and these KPIs, GVW used the benchmark study completed in 2002 and has undertaken Level 1 Energy Audits of its sites as per the SEPP guidelines. To efficiently effect reductions in its GHGs, GVW has targeted sites with Category B emissions (as defined in the SEPP guidelines) as its starting point. Objectives and targets are reviewed annually as part of the Authority's continuous improvement policy and are an input to the Authority's Environmental Management System (EMS).

Case Study - Green Energy from Wastewater Management Facilities

The treatment of sewerage results in biogas being produced, but instead of wasting this resource Goulburn Valley Water is finalising an agreement with Diamond Energy to turn it into green energy.

Goulburn Valley Water's Chief Executive Mr Laurie Gleeson said that the Authority is looking forward to seeing green energy produced from the biogas generated at the Authority's Tatura, Shepparton and Mooroopna wastewater management facilities (WMF).

"These three WMF's operate using high rate anaerobic lagoon (HRAL) technology to treat large industrial wastewater loads from the major food processing plants in the region operated by Tatura Milk Industries, Unilever Australia, SPC-Ardmona and Campbell Soups (Aust.). The covered lagoon technology enables the biogas to be captured and converted to green energy" Mr Gleeson said. "The three WMFs treat a wastewater load equivalent to a residential population of around 2 million people. The significance of the industrial wastewater is highlighted by the fact that the residential population serviced in the three centres is approximately 40,000 people".

Mr Gleeson said that "the most recent HRAL to be completed is at the Shepparton WMF." "This state of the art 200 megalitre HRAL was completed in May 2004 at a cost of around \$17 million," he said. "The lagoon has a polypropylene cover, with a surface area of 5 hectares which is twice the size of the MCG and is the largest facility of its type in Australia."

"The biogas created from the anaerobic treatment is predominately methane gas (about 70%) which is a greenhouse gas contributor and is 21 times more destructive than its carbon dioxide equivalent," said Mr Gleeson. "Currently the gas is captured and destroyed by a flare system at 800oC."

Mr Gleeson said that it has been a long term goal of Goulburn Valley Water to harness this gas resource and turn the gas generated by the wastewater treatment process into green energy. "In December 2004, the Authority's Board approved a proposal from Diamond Energy to purchase the gas and convert it into green electricity."

"This is an excellent project for the region, it has the potential to reduce greenhouse pollution by 20,000 tonnes per year, or the equivalent of taking 4,500 cars off the roads," said Mr Gleeson. "The project has been made viable by a funding grant to Diamond Energy from the Sustainable Energy Authority Victoria under the Victorian Government's Renewable Energy Support Fund."

C.10 GWMWater

GWMWater is currently in the process of developing a sustainability strategy. The strategy is being developed with the aim of embedding sustainability into the culture, strategies and operations of GWMWater. A preliminary sustainability review has recently been completed. This review highlighted energy management and associated greenhouse emissions as a major challenge for the authority.

The Authority has an Energy and Greenhouse Management Plan covering its 22 Waste Water Treatment Plant sites which was prepared to meet the requirements of the SEPP (Air Quality Management). The plan identified greenhouse emissions, current and potential energy management initiatives. The recent preliminary sustainability review recommended the development of comprehensive energy management plan for the business.

Case Study – Development of the Wimmera Mallee Pipeline Project

Energy efficiency has been an important consideration in the design of the first stages of the Wimmera Mallee Pipeline Project. The distribution of water through the trunk system could involve one of two main concepts:

- a) smaller pipes and larger storages - under this arrangement there would be a near constant supply volume throughout the year, relying on storages to get through the summer peak.
- b) larger pipes, smaller storages - under this arrangement there is a defined peak / off peak supply period. The pipes would need to be larger to cope with peak demands.

While a) would lead to lower capital cost, b) provides cheaper energy cost as more efficient and less friction loss with larger pipes.

Other considerations include:

- > pumps will be using low friction coatings
- > design allows for utilisation of gravity in the system wherever possible, because of use of concept b) when demands are small (e.g. winter), Bellfield storage head will enable gravity supply.
- > pipe optimisation - sizing of distribution pipes has been through an optimisation process, energy usage was considered in this

GWMWater is currently working with Sustainability Victoria to explore further opportunities for energy efficiency for the Wimmera Mallee Pipeline Project.

C.11 Lower Murray Water

Lower Murray Water does not currently have a sustainability or greenhouse pollution reduction policy. However for projects such as the Koorlong Waste Water Treatment Plant upgrade a Net Present Value analysis was conducted on energy costs over a 20 year period to assist in the selection of a preferred treatment process. Also when purchasing pumps and motors, high efficiency motors are specified where practicable

C.12 Melbourne Water

Melbourne Water has the following Sustainability Principles. Commitment to sustainability will be demonstrated by:

- Protecting and conserving Melbourne's water resources
- Protecting and improving the environment, including biodiversity
- Our leadership, scientific research, creativity and innovation
- Ensuring responsible risk management
- Sharing information and fostering collaborative working relationships
- Maintaining long-term financial viability
- Contributing to the health of the community
- Demonstrating corporate social responsibility
- Ensuring intergenerational equity by considering short term and long term implications in all decision making
- Providing an environment where employees are encouraged to achieve their full potential.

In addition Melbourne Water is currently preparing a Sustainability Improvement Plan

Melbourne Water has a greenhouse pollution reduction policy/strategy that has the key aims on a 2000/01 baseline to reduce emissions by the following percentages:

2005/06	35% reduction
2006/07	38% reduction
2007/08	40% reduction

In addition greenhouse emissions, pollution reduction, energy efficiency and renewable energy are considered as part of Melbourne Water's Community/Environmental/Public Health Assessment (CEPHA) system. In addition, the CEPHA system considers all aspects of a project's impact to ensure that the community, environmental and public health risks of business activities are identified and managed.

Melbourne Water is also developing Triple Bottom Line assessment methodologies that will be introduced during 2006.

Case Study - Melbourne Water Western Treatment Plant Power from Sewage

Melbourne Water has expanded electricity generation from biogas captured at its Western Treatment Plant. Melbourne Water has worked with AGL for AGL to design, construct, own and operate the 4MW Stage 2 expansion of the electricity generation plant at the treatment plant. The 8MW expanded AGL plant utilises the biogas, a by-product of the sewage treatment process, collected under large lagoon covers installed as part of an upgraded sewage treatment process at the Western Treatment Plant that improves the quality of treated effluent discharged to Port Phillip Bay.

Commissioned in December 2005, the enlarged AGL plant generates more than 52 GWh/yr of electricity, enough to provide more than 70% of the Western Treatment Plant's electricity requirements, significantly reducing the need to use electricity imported from the grid. This results in significant financial savings for Melbourne Water and will reduce greenhouse gas emissions by some 42,000 tonnes CO₂e per year.

Key to the success of the project was the successful partnering relationship established between Melbourne Water and AGL. Clever coordination was needed to allow the construction of the AGL plant while construction work continued in the treatment areas of treatment plant. The project was delivered on time and within budget.



C.13 North East Water

North East Water has an Ecologically Sustainable Development (ESD) Strategy that incorporates an ESD Policy.

Sustainability objectives and targets are also contained within a Strategic Intent 2005/06 – 2007/08. These objectives and targets are:

1. Reduction in per capita water consumption by 20% by 2015
2. Greenhouse Gases – reduced per ML electricity use of 2% over three years
3. Chemical – reduced per ML chemical purchased of 2% over three years
4. Biodiversity – improve net biodiversity across all sites
5. Culture – ESD principles embedded into the organisational culture and business processes

Within the ESD Strategy are a number of sub-ordinate objectives with detailed action plans underpinning it, including:

- Develop and implement a system to monitor and set targets concerning energy usage, so as to provide management with the means to progressively lower overall energy consumption.
- Improve energy efficiency at high power use sites
- Reduce the emission of greenhouse gasses (GHGs) through the use of more sustainable alternative energy sources
- To embed ESD considerations in procurement policies with particular reference to energy and greenhouse gas management
- Reduce the emission of greenhouse gasses (GHG) through the use of cleaner fuels and supporting other GHG offset initiatives
- Implement GHG initiatives as in commitments made to EPA Victoria under requirements of the Victorian Greenhouse Strategy

North East Water are in the process of recruiting a Sustainability Coordinator who will be responsible for developing and implementing a formal process for ensuring that life cycle analysis are incorporated in to all future infrastructure considerations.

C.14 South East Water

South East Water has a Sustainability Policy and a Sustainability Framework and the key objectives are:

- To integrate social, environmental and economic factors into decision-making and seek to maximise net beneficial outcomes.
- To take a long term perspective when considering the implications of decisions and policies.
- To value and protect the environment and biodiversity, recognising that they are part of the irreplaceable life support systems upon which our future depends.
- To increase efficiency when using natural resources, generate less waste and increase use of renewable resources.
- To engage with the community providing involvement for those affected by decisions.

South East Water takes a whole-of-portfolio approach to greenhouse gas emissions as follows:

1. Use a “Shadow Price” to calculate investments based on 100% Green Power when undertaking NPV analyses.
2. Source 10% of South East Water’s electricity from all renewable energy sources, not just Green Power.
3. Target reductions and efficiency improvement in overall greenhouse gas emissions: The focus areas in order of preference are reducing direct emissions, reducing electricity consumption through efficiency and substitution, carbon sequestration and the purchase of carbon credits.
4. South East Water will support a comprehensive emission trading regime in Victoria that recognises the savings achieved in water conservation and gives a clear carbon price signal that has to be included in all investment decisions.

Case Study – South East Water’s In Line Mini Hydros at Hallam & Narre Warren PRVs

In 2005/2006 South East Water applied to Sustainability Victoria for a partnership project in renewable energy. South East Water applied to the Renewable Energy Support Fund to attain a 20% capital funding grant to construct two mini hydro systems. A detailed investigation was then undertaken by consultants engaged by South East Water, which gave a recommendation to construct mini-hydros at Hallam and Narre Warren Pressure Reducing Valves (PRVs). The proposed mini hydro installation is the first-of-its kind in the water industry because the downstream pipe pressure must be maintained for effective supply of potable water to customers in the Hallam and Narre Warren catchments. To date mini hydro systems have been installed in tanks and reservoirs, or balancing tanks where there are no significant downstream pressure constraints.

The mini hydros will effectively harness the pressure differential generated by a PRV which will increase South East Water’s renewable energy production. The average annual energy provided by the Narre Warren PRV is 434MWh/year and the Hallam PRV is 642MWh/year. The pressure reduction would allow a significant power output from both PRV stations which would produce a total of 1076 MWh of renewable energy, generated per annum by the mini hydros. Renewable energy which can be harnessed, is critical to South East Water's greenhouse and energy efficiency strategy to reduce net greenhouse emissions and to improve energy efficiency in existing assets and future assets. It will further contribute to achieving a greenhouse performance target of a 15% reduction in total emissions by 2006/2007

Mini hydro schemes are financially viable at Hallam and Narre Warren based on assessment of the following key factors :

- Sale of renewable energy generated by the mini hydros
- Sale of RECs (Renewable Energy Certificates) generated by mini hydros
- Sustainability Victoria funding of up to 20% of the Capital Cost.

C.15 Southern Rural Water

Southern Rural Water does not currently have a sustainability or greenhouse pollution reduction policy. However greenhouse gas emissions and energy efficiency were considered as part of a strategic planning document for the Macalister Irrigation District 2030 project. The assessment included Southern Rural Water emissions as well as emissions for the district, including farming activities to quantify the future for the irrigation district in Gippsland.

C.16 South Gippsland Water

South Gippsland Water has incorporated sustainability into its Biodiversity Policy and Strategy. The key objectives of the Policy are as follows:

- i. Protect biodiversity assets in operating areas
- ii. Endeavour to comply with legal obligations
- iii. Support local or regional biodiversity related initiatives

South Gippsland Water does not consider that its energy use is excessive, and installation of energy efficient equipment over the course of normal plant replacement is the basis of the organisation’s action plan submitted annually to EPA Victoria. An overall energy audit is planned for 2007/08.

Case Study - South Gippsland Water subscription of 46 Vehicles to Greenfleet

To offset vehicle emissions to the atmosphere South Gippsland Water has rendered their fleet of forty-six vehicles 'Carbon Neutral' through the Greenfleet program. This membership will ensure over seven hundred trees are planted over the next twelve months, which sequesters 199 tonnes of CO₂ from the atmosphere.

South Gippsland Water is also supports the program by setting aside large areas of their Fish Creek property in the Strzelecki Ranges for native plantings by Greenfleet. This revegetation will enhance the natural biodiversity of the area and extend the South Gippsland Lyrebird Corridor.

C.17 Wannon Water

Wannon Water is currently consolidating a sustainability policy/ strategy from the previous three Water Authorities. The following mission, vision and values will be used as a basis for the strategy:

Vision

Wannon Water will be a sustainable business meeting the expectations of its communities through focus on economic, environmental and social responsibility, innovation and best use of water resources.

Mission

Wannon Water provides water and sewerage services that contribute to the sustainable growth, health and well being of the community and environment in the south west of Victoria.

Values

The values that drive the daily business are:-

- Respect - we care for the well being, safety and development of our staff.
- Innovation - we encourage continuous improvement by fostering creativity, experimentation and intellectual openness.
- Integrity - we will be ethical and accountable for our actions.
- Equity - we will be socially responsible in providing access to water services and will have compassion for customers in genuine financial hardship.
- Sustainability - we will strive to deliver long term sustainable outcomes in all business activities.
- Customer satisfaction - we will strive for customer satisfaction and will consult with the community on relevant issues.
- Financial viability - we will be a financially responsible viable business.

While Wannon Water does not have a formal greenhouse pollution reduction policy there are actions from the previous three Authorities currently being carried out. These include a full review of energy use in the organisation and changes to operational procedures to reduce greenhouse gas emissions.

Case Study – District Heating in Portland

The geothermal resources below the town of Portland were used to heat a number of Council and private buildings, swimming pool and hospital from the early 1980's until early 2006. A groundwater bore, 1.4 kilometres deep and owned by Wannon Water produced an artesian flow of around 6 ML/day of hot water at 60°C. Initially this water was used for both the extraction of energy for space heating and potable water supply to the town.

The Glenelg Shire managed the geothermal system that circulated water through a dedicated pipeline to various buildings where heat exchangers extracted energy. The water was then returned to forced draught cooling towers where it was further cooled before being suitable for use in the water supply system.

In recent years, only the heat energy was being used due to concerns about water quality and the returned water was discharged to the environment. The initial design and operation of the system resulted in quite low energy extraction, reducing the water temperature by only 2°C. This meant that Wannon Water used considerable energy to further cool the water before discharge. Although the bore previously supplying the geothermal system has been decommissioned due to poor condition, Wannon Water and Glenelg Shire continue to work together to determine whether a more efficient, mutually beneficial geothermal and water supply system can be re-established in the town.

C.18 Western Port Water

Western Port Water's vision is to work consistently to achieve a sustainable balance between environmental protection and economic development in the interest of present and future generations.

To achieve these commitments, Westernport Water and its staff will:

- Comply with relevant environmental legislation and regulations
- Recognise environmental management as a key business priority
- Establish policies, programs, resources and practices for conducting activities in an environmentally responsible and sustainable manner
- Establish annual objectives and targets within our Corporate Plan to drive continual improvement in environmental performance
- Minimise any adverse environmental impacts due to our operations or work practices
- Maximise the efficiency of use of resources and reduction of waste
- Actively seek innovative solutions to minimise pollution
- Promote the policy and share environmental experience with stakeholders
- Educate and motivate employees and contractors to conduct their activities in an environmentally responsible manner.

Westernport Water has a Close to Zero Energy Policy that aims to reduce the Authority's net energy demand from the electricity grid to close to zero.

The policy will achieve this by utilising the regions abundant natural resources to provide sources of renewable energy.

Case Study – Westernport Water Connection to Melbourne Water System project

Consultants have been engaged by Westernport Water for the detailed design of the “Connection to Melbourne Water System” project. The review of options includes a life cycle analysis which calculates the life cycle CO₂ emissions by estimating the embodied energy in the pipelines and CO₂ emissions for the manufacture of the pipes and compares gravity systems with power consumption of pumped systems.

C.19 Western Water

Western Water has recently amended its Corporate Vision from *“To be a leading service provider as judged by our customers”* to *“A leading service provider working with our community towards a sustainable future”* effective from the 2006/2007 fiscal year.

A Sustainability Policy and Statement was issued in March 2004 and is currently due for review and re-issue. Based on this review a comprehensive strategy will be developed and implemented.

A Greenhouse Gas Emissions Policy and Strategy was released in December 2005 and is about to be implemented through Western Water’s Environment Committee and adopted across the business.

Case Study - Western Water Sewage Treatment Aeration Control

In 2004/2005 Western Water investigated the use of efficiency of Blowers used to perform the aeration at the Sunbury and Melton Waste Water Purification Plants. Each plant had three blowers (two operating continuously with one stand-by unit). Dissolved Oxygen was measured via “spot checks” and not monitored continuously.

The project involved fitting variable speed drives to the blowers, procuring and installing Flow Control Valves and Dissolved Oxygen monitoring probes and transmitters at intervals with the aeration tanks. The blowers now respond directly to the Dissolved Oxygen set-points within the fractions of the process and therefore only operate at the frequency and speed required to maintain the control set-points via a control signals.

Substantial energy reduction has occurred through this process modification for the two sites where mechanical aeration is a fixed segment of the process. Actual quantification of the savings in energy and costs are currently being performed.

C.20 Yarra Valley Water

Yarra Valley Water has the strategic objective ‘to provide water and sewerage services that contribute to the health and well being of our customers and the environment. In this regard we strive to lead the global water industry in serving our customers and environment, supported by our high performing business culture, and continuously improving our efficiency.’

Yarra Valley Water has set their environmental goal to provide water and sewerage services within the ecological carrying capacity of nature as defined by The Natural Step framework.

The Natural Step has helped the organisation to develop a focused culture around what sustainability means and setting the direction of what has to be done to achieve it.

Yarra Valley Water has a Greenhouse Gas Reduction Strategy and a policy to reduce emissions. The Strategy has been developed to provide a framework for the implementation of Yarra Valley Water's commitment in the corporate plan to reduce annual Greenhouse Gas Emissions to 10,500 tonnes CO₂-e by 2007. This target is based on reducing Yarra Valley Water's GHG emissions to 50% of 1990 levels in line with the Intergovernmental Panel on Climate Change (IPCC). To reach this target it is proposed to reduce annual GHG emissions incrementally using steps of 19,500 tonnes CO₂-e in 2005 and 15,000 tonnes CO₂-e in 2006.

The strategy will be implemented in conjunction with Yarra Valley Water's Water Conservation Strategy, Waste Management Strategy and Nutrient Management Strategy which together with the GHG Strategy form Yarra Valley Water's Environmental Management Framework.

Parameter	Target
Greenhouse gas emissions	Below 10,500 tonnes CO ₂ -e by 2008, which is 50% of our 1990 total
Water consumption	Below 306 litres per person per day, which is 80% of our 1990's total
Waste to landfill	Utilise at least 90% of solid waste
Waste from sewage	Quantify our targets for nutrients from our sewage plants by 2006

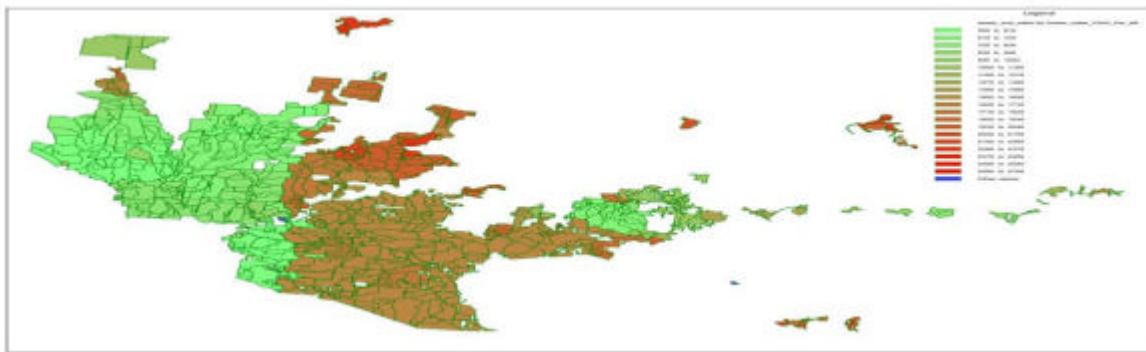
Yarra Valley Water estimates that greenhouse gas emissions contribute approximately 60% of the poor environmental effects of the business. (A number of independent Ecological Footprint calculations from three water companies all show greenhouse gas emissions to be the largest environmental impact.)

Case Study – Yarra Valley Water Greenhouse Gas Reduction Strategy

Approximately 90% of Yarra Valley Water’s greenhouse emissions are produced indirectly through the consumption of electricity. Programs have been put in place to reduce electricity consumption by purchasing 10% of Green Power at Mitcham. However these ongoing programs will not produce the required reduction of 66% of emissions by 2007.

To reduce emissions an innovative strategy has been put in place for purchasing abatement units from local projects such as methane capture at landfill. The Greenhouse Gas Abatement (GHGA) offset required by Yarra Valley Water to meet its GHG reduction objectives of 15,000 tonnes for 2005/06 is forecasted to be 11,000 tonnes. The purpose of this document is gain approval for the purchase of this offset in April 2006.

A modelling framework for mapping energy use in both the water and sewer systems has been developed. These maps show the amount of energy required to supply water and sewer services to Yarra Valley Water’s customers and hence enables the amounts of greenhouse gases produced due to the supply of these services to various regions to be compared.



Appendix D - Sustainable Energy Use - Opportunities for the Water Industry

D.1 Efficient Operation of Existing Assets

Improving energy efficiency of existing and future assets is the most cost effective means of saving energy and reducing greenhouse pollution.

It is estimated that between 50% and 60% of electricity consumed by water authorities is utilised for pumping of water and wastewater with a further up to 40% being utilised for water and wastewater treatment. Therefore ensuring that pumps are running at optimum efficiency and in the most effective operating modes is critical in reducing energy consumption and greenhouse pollution by the Water Industry.

Studies conducted by Melbourne Water have indicated that 61% of electricity utilised by the business is for pumping. Melbourne Water has found that the four largest pumping stations in their network account for 45% of the total pumping electricity consumed with the next five largest accounting for only 5% of the consumption (source: Melbourne Water, 2005). Therefore the most effective outcome has been to focus on the top four energy consumers and to try and make efficiency gains through analysing operation modes and trials with energy efficient pump linings.

Total energy costs in the Victorian Water Industry were estimated at \$38 million per annum in 2000-2001 (source: Energy Use by Victorian Industries, DSE November 2003). If it is assumed that approximately 50% of this energy, \$19 million per annum, is utilised in operating pumps for water and wastewater transfer then increasing efficiency in the operation of pumps by 3% could save up to \$1 million across the sector and reduce greenhouse pollution significantly.

D.2 Transport & Fuel Choice

In 2002, transport was responsible for more than 16% of the greenhouse pollution produced by Victoria. Water authorities have the opportunity to review vehicle choices particularly for fleet vehicles to ensure that efficient fuel consuming and cleaner fuel options are selected. For rural applications, LPG and Hi-tech diesel vehicles could be considered and for city applications, Hybrid electric vehicles, LPG and low capacity petrol vehicles could be considered as alternatives to larger capacity petrol vehicles. An education campaign for all staff could also be provided to encourage using public transport, car pooling and other such measures.

In the future, biodiesel may also be an alternative fuel option. Biodiesel is the name of a variety of oxygenated fuels made from vegetable oils or animal fats. Biodiesel does not contain petroleum but it can be blended at any ratio with petroleum based diesel to create a biodiesel blend and can be used in diesel engines with little or no modifications.

A 1998 biodiesel lifecycle study, jointly sponsored by the US Department of energy and the US Department of Agriculture, found that the use of biodiesel produces

approximately 80% less carbon dioxide emissions, almost 100% less sulphur dioxide and significant reductions in particulates than petroleum diesel fuel.

Biodiesel is growing as an alternative fuel source option in America and Europe with it being used for over 20 years and the market increasing in America 50 fold from 1999. Biodiesel is not yet available for general supply through Australia however there are a small number of outlets providing biodiesel for commercial customers such as centrally fuelled urban bus fleets.

D.3 Commercial Building Design

Commercial buildings account for 4.3% of Australia's total energy use (source: Sustainable Energy Authority, 2005).

Sustainability Victoria is working with the Property Council of Australia and willing partners to create commercial building stock that is more sustainable, cost-effective to build, cheaper to operate and more comfortable to occupy.

Energy audits of existing commercial offices can identify energy saving measures which can be implemented within a rapid payback period. As an outcome of the energy audit, a list of recommendations are provided which outline expected energy savings, cost savings, greenhouse emissions savings, cost to implement and payback period.

D.4 Biogas - Wastewater Treatment

Energy generation from biogas is created by the capture of methane gas that is formed as part of the anaerobic wastewater treatment process. The gas generated by the anaerobic digestion process also includes hydrogen sulphide gas which causes odour issues for water authorities. Methane is also a key greenhouse gas contributor with a carbon dioxide equivalent factor of 21.

Odour management issues are a key concern for a number of water authorities particularly with urban encroachment, heightened expectations of the community and EPA Victoria licences requiring odour reduction. Changing wastewater treatment processes can be expensive so gas capture and flaring can be an attractive option. Biogas can be captured and burned to heat sludge digesters directly, thus substituting this renewable source for a non-renewable energy source.

Another option is to add biogas fuelled generators for power generation. This may not be a large step however water authorities do not usually have the in-house skills for these types of ventures.

Only Melbourne Water operates such facilities with 4 MW generating capacity at the Western Treatment Plant. This capacity was more than doubled in 2006 when the Western Treatment Plant was upgraded to 8 MW and will increase again in 2007 when the Eastern Treatment Plant is augmented to provide a further generating capacity of

9 MW. Melbourne Water does not operate the cogeneration facilities at the Western Treatment Plant and has contract agreements with a third party to operate them.

Goulburn Valley Water is also currently facilitating development with a private partner of three facilities at Mooroopna, Shepparton and Tatura wastewater treatment plants with a total potential generating capacity of 3.4 MW to be installed by 2007.

The generation of electricity from biogas has additional financial incentive in that it has allowed water authorities to be eligible for Renewable Energy Certificates (RECs) and other green products in addition to offsetting local electricity costs. The potential for the future value of carbon should be considered in longer term projects.

Biogas generation is a significant opportunity for the Water Industry as it potentially assists in management of odour and methane generation issues at wastewater treatment plants however it has not been taken up due to the size and technology of current wastewater treatment plants. In the future, as international pressure to reduce greenhouse pollution increases, management of emissions from key greenhouse gas emitters such as wastewater treatment plants will increase the drive for biogas generation technology. Biogas generation is the key renewable energy opportunity for the Water Industry.

D.5 Hydro

Up until now, hydro opportunities have been implemented by managers of large water storages such as the Thomson Dam and Lake Eildon. A number of large scale hydros are operated by the private industry and hosted on sites managed by Gippsland Water, Goulburn-Murray Water, Central Highlands Water, Melbourne Water and Southern Rural Water which generate approximately 1,130 GWh per annum.

As the technology matures, a number of water authorities are investigating or plan to install smaller scale hydro projects (mini-hydros) including Barwon Water, Gippsland Water, Melbourne Water, Coliban Water and Wimmera Mallee Water. Some water authorities are also investigating the installation of small (micro-hydro) turbines within water reticulation systems however due to the untried nature of the technology, the difficulties of keeping the downstream lines pressurised and the need to ensure security of supply for water reticulation, these studies are still at the feasibility stage.

Water authorities have traditionally found hydro technology installations to be a difficult area to manage due to low financial returns to the water authority from contractual arrangements with private operators. When surveyed by VicWater and the Sustainable Energy Authority in 2003, water authorities indicated that low returns attributed to these projects were due to water authorities only receiving small royalty payments (~0.5% to 4% of energy revenue) from private operators whilst bearing risk to old or critical infrastructure.

To increase financial return and decrease operational risk, water authorities such as Barwon Water and Melbourne Water now plan to build, own and operate their own mini-hydro projects.

In 2004 Hydro Tasmania undertook a study for the Sustainable Energy Authority that estimated that there exists approximately 30 MW of potential generating capacity on existing water supply infrastructure which could be developed. In addition, it is estimated that there is a further up to 250 MW of potential generating capacity on green field sites based on flow and head drops in natural rivers and streams. These estimates indicate that there is still significant untapped hydro generating capacity that requires further investigation.

D.6 Biosolids - Fuel Source

Biosolids treatment and disposal is an emerging issue for the Water Industry with the Victorian Government White Paper *Securing Our Water Future Together* requiring all water authorities to develop Biosolids Management Plans including site specific recycling targets.

Contamination characteristics of some biosolid stockpiles particularly from wastewater treatment plants with a significant industrial component have reduced opportunities for agricultural applications for recycling. To meet recycling targets, some water authorities are investigating other opportunities such as biosolids being utilised as a potential fuel source. Utilising biosolids for a fuel source is complex with heavy metal contamination such as mercury, as it can cause other contamination issues such as air quality when incinerated. In addition, the biosolids may not be of a high enough calorific value to be considered an effective fuel source or may have other issues such as high moisture content. Community attitudes to the use of biosolids in areas that may be close to urban development are also likely to be negative due to potential contamination issues. This increases the complexity in the use of biosolids in this area.

As such there are currently no schemes in place in Victoria that utilise biosolids as a fuel source. The main application for biosolids in Victoria has been in the agricultural sector although the use of biosolids as fuel source could be considered by each water authority as part of the Biosolids Management Plans required for each wastewater treatment plant as some niche market opportunities may exist.

D.7 Other Renewable Energy Options

When water authorities were surveyed in 2003 on planned, operational or rejected renewable energy projects that had been investigated it was found that hydro projects were by far the most common accounting for 70% of projects investigated, refer to Figure D.7.1.

The major growth in renewable energy generation in Victoria is predicted to come from wind technology with a significant increase in market capacity from 0% in 1995

to 17% in 2005, refer to Figure D.7.2 and D.7.3. Wind is also the fastest growing energy technology worldwide.

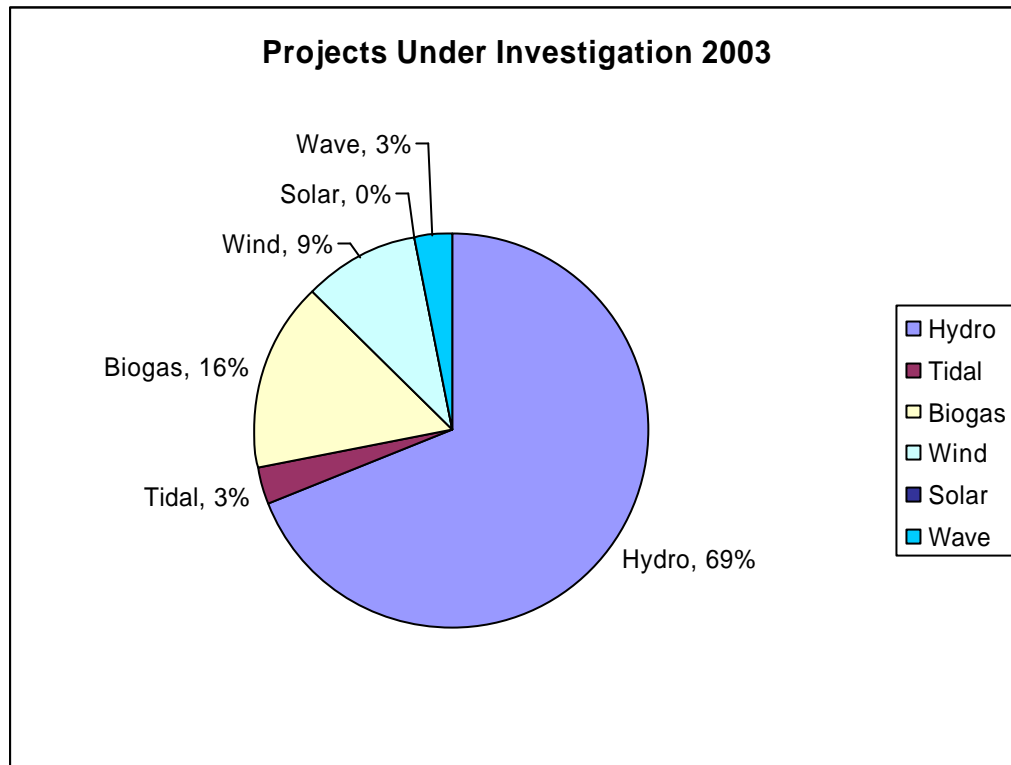


Figure D.7.1: Renewable Energy projects investigated by Victorian Water Authorities 2003 (Source: Sustainable Energy Authority/VicWater survey 2003)

There may be limited niche market opportunities for water authorities located in compatible areas to investigate renewable energy options such as wind, wave, solar and process heat. However all of these technologies are at early stages of development in Australia and would require individual assessment of each site to ensure that local requirements such as Ramsar, community perceptions and proximity of electricity networks are addressed.

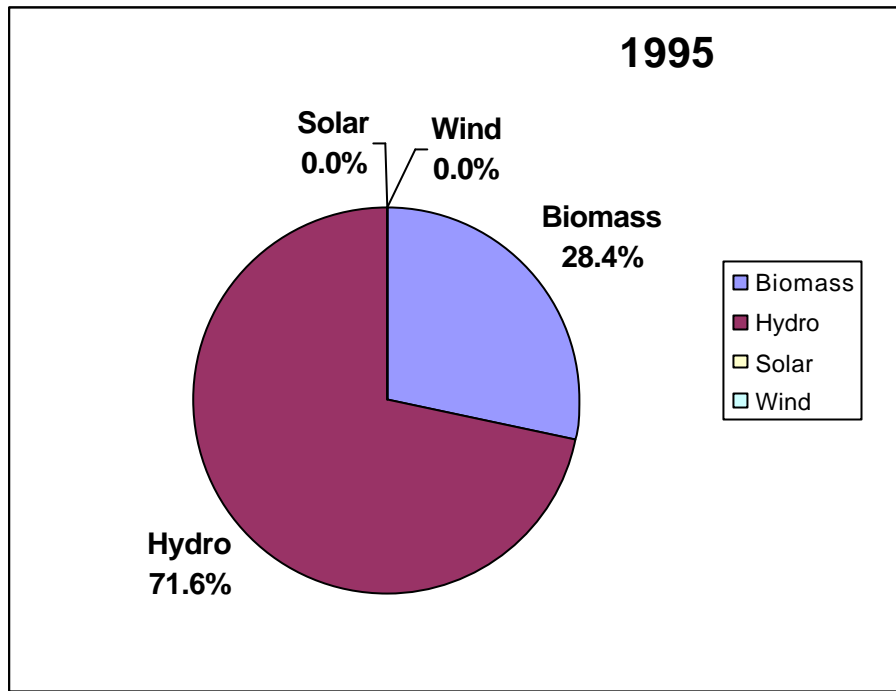


Figure D.7.2: Renewable Energy Generation in Victoria by technology in 1995

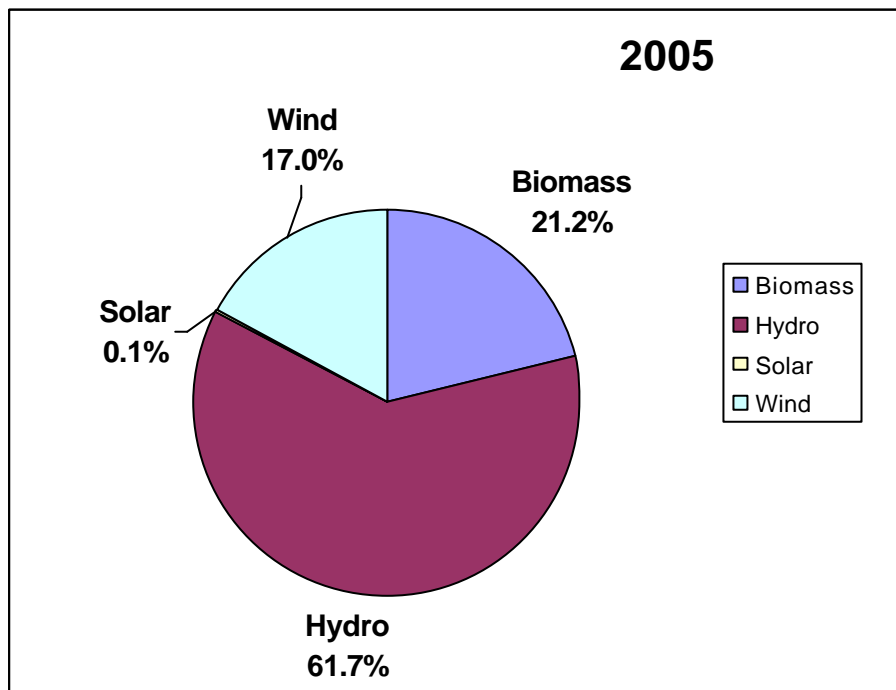


Figure D.7.3: Renewable Energy Generation in Victoria by technology in 2005
(Source: Sustainable Energy Authority, April 2005)

D.8 Green Power

Green Power is government accredited clean, renewable electricity sourced from the sun, the wind, water and waste. Accredited Green Power is purchased by the electricity company from renewable energy sources and is fed into the National Grid Network.

Green Power is independently audited and verified by a National Green Power Accreditation Program. The National Green Power Accreditation Program ensures that Green Power is from accredited renewable energy generators that meet strict criteria.

The Victorian State Government has set a target to purchase 10% of its electricity in the form of Green Power. For water authorities that don't have access to renewable energy options, Green Power is a viable option for increased access to renewable energy. The Victorian State Government target could be adopted by the Victorian Water Industry when other renewable energy options are unavailable.

D.9 Agriculture and Forestry

A number of water authorities manage large water and wastewater treatment sites in rural locations which have a livestock or forestry aspect to their operation to facilitate onsite water recycling and land management issues.

Livestock, particularly ruminants such as cattle, contribute to the emission of greenhouse gases however tree plantations may have the opportunity to provide greenhouse mitigation if they are utilised as short-term carbon sinks. It should be noted that the utilisation of tree plantations as carbon sinks can be considered as a less robust greenhouse reduction measure. Due to the uncertainty of the life of tree plantations, over time the trees may be harvested and break down to release carbon to the atmosphere.

There is potential for water authorities who manage large areas of land to increase tree plantations as an offset measure for greenhouse pollution. There is also the potential for water authorities to partner with Catchment Management Authorities (CMAs) to create win-win partnerships by assisting rehabilitation works for identified degraded areas.

D.10 Greenfleet

Based in South Gippsland, Greenfleet has a national focus and provides a program that reduces the impact of cars on the environment. Greenfleet is a not for profit organisation that plants native trees on behalf of individuals and organisations. As the trees grow they absorb the greenhouse gasses that cars produce per year (based on 4.3 tonnes of CO₂e for the average car).

Since 1997, Greenfleet has planted more than 2 million trees on behalf of Australia motorists and fleets. These forests will not be harvested and will be an investment in rural Australia for generations.

Councils, water authorities, universities, power companies, corporate organisations and government departments are some of over 50 organisations that already subscribe to Greenfleet.

Greenfleet is not currently recognised or accepted by the Australian Greenhouse Office as a formal offset for greenhouse emissions.

Appendix E - Renewable Energy Capacity in the Victorian Water Industry

The Victorian Water Industry currently manages infrastructure that hosts up to 615 MW of renewable energy capacity by 2009. Based on electricity displacement alone, this is the equivalent to a reduction in greenhouse emissions of 1.7 million tonnes of carbon dioxide per annum and is approximately equivalent to generating 10% of the electricity required for residential consumption. These numbers are conservative estimates as methane abatement from capture in biogas facilities has not been included.

Currently 583 MW of capacity is available from hydro, biogas and wind projects hosted on Water Authority infrastructure across the state. See **Table E.1** for an outline of the existing renewable energy sites (source: Sustainable Energy Authority, April 2005).

Table E.1: Summary of Operational Renewable Energy Sites

<i>Region</i>	<i>Type</i>	<i>Plant Type</i>	<i>Location</i>	<i>Capacity (MW)</i>	<i>Commis Date</i>
Barwon Water	Wind	Turbine	Breamlea	0.06	1987
Goulburn-Murray Water	Hydro	Turbine	Cairn Curran	2	1960
	Hydro	Turbine	Dartmouth	150	1981
	Hydro	Variable Pitch Kaplan	Eildon	4.5	1994
	Hydro	Turbine	Eildon I & II	135	1957 & 2001
	Hydro	Horizontal Francis turbine	Lake William Hovell	1.5	1994
	Hydro	2 x Kaplan turbines	Yarrowonga	9.5	1994
Southern Hydro*	Hydro	Turbine	Kiewa - Clover	29	1930 & 1961
	Hydro	Turbine	Kiewa - West Kiewa	62	1956
	Hydro	Turbine	Kiewa - McKay Creek I & II	150	1960 & 2004
	Hydro	Turbine	Rubicon Scheme	13	1928
Melbourne Water	Biogas	7 RCP Gensets	Western Treatment Plant	8	1998 to 2006
	Hydro	In-line turbine	Cardinia Res	3	1993
	Hydro	In-line turbine	Thomson Dam	7.5	1989
Southern Rural Water	Hydro	Francis turbine	Blue Rock Dam	3.6	1993
	Hydro	2 x Francis turbine	Glenmaggie Southern Channel	3.8	1994
Total Renewable Energy Capacity				582.5	MW

* Privately owned company hosted on existing water authority infrastructure

A further 32 MW is planned to be installed on Water Industry infrastructure by 2009 and consists mainly of hydro projects with one biogas project at Melbourne Water's Eastern Treatment Plant.

See **Table E.2** for an outline of planned renewable energy project installations (source: Sustainable Energy Authority, April 2005).

Table E.2: Summary of Planned Renewable Energy Installations

<i>Region</i>	<i>Type</i>	<i>Plant Type</i>	<i>Location</i>	<i>Capacity (MW)</i>	<i>Commis Date</i>
Barwon Water	Hydro*	In-line turbine	Montpellier Basin	0.3	2007
Melbourne Water	Biogas	RCP Genset (7 x 1.3 MW)	Eastern Treatment Plant	9.1	2007
	Hydro	In-line turbine	Silvan Dam	2.1	2008
	Hydro	In-line turbine	Notting Hill	0.55	2008
	Hydro	In-line turbine	Mt View	0.55	2007
	Hydro	In-line turbine	Olinda	1.0	2008
	Hydro	In-line turbine	Preston	2.0	2007
	Hydro	In-line turbine	Upper Yarra	0.9	2008
Goulburn-Murray Water	Hydro	Turbine	Bunimboola (Mitta Mitta River)	12.2	2006
Goulburn Valley Water	Biogas*	Cogeneration	Tatura, Shepparton	3.4	2006 - 2008
Total Renewable Energy Capacity				32.1	MW

* Partnered with Sustainable Energy Authority for this initiative

A further potential 16 MW are currently under investigation by water authorities and the private industry.

See **Table E.3** for indicative projects currently under investigation (source: Sustainable Energy Authority, April 2005).

In the majority of cases, the energy generation infrastructure is operated by the private industry with the water business being responsible for maintaining the water supply infrastructure. Significantly, the Water Industry hosts approximately 70% of Victoria's installed renewable energy generating capacity and therefore has a large role to play both in influencing further development of renewable energy projects and leading by example for existing projects.

Table E.3: Summary of Renewable Energy Project Investigations

Region	Type	Plant Type	Location	Capacity (MW)**	Commis Date
Gippsland Water	Biogas*	Cogeneration	Gippsland Water Factory	1	2008
	Hydro	In line turbine	Traralgon WTP	0.15	2011
	Hydro*	In-line turbine	Gippsland Water Factory	0.3	2008
Goulburn-Murray Water	Hydro	Mini-hydro	Torrumbarry Weir	2.5	Unknown
	Hydro	Mini-hydro	Laanecoorie Reservoir	0.4	Unknown
	Hydro	Mini-hydro	Lake Nagambie	0.5	Unknown
	Hydro	Mini-hydro	Lake Buffalo	1.3	Unknown
North East Water	Bioenergy*	Cogeneration	Wodonga	5	Unknown
South East Water	Hydro	In-line mini-hydro turbine at PRV	Hallam & Narre Warren	0.2	Unknown
Southern Rural Water	Hydro	Mini-hydro	Cowwarr Weir	5	Unknown
Yarra Valley Water Limited	Hydro*	In-line mini-hydro turbine at PRV	Various	0.09	Unknown
Potential Renewable Energy Capacity				16.4	MW

* Partnered with Sustainability Victoria for this initiative

** Numbers provided are estimates only subject to investigation outcomes