Factsheet - Carbon abatement, identifying the best opportunities

Introduction
A key challenge facing the urban water industry is managing and adapting not only to supply variability, but also to the potential impacts of climate change, which are likely to include the inundation of coastal infrastructure, flash flooding in urban areas, severe storms and more frequent bushfires (Hennessey et al. 2007). The Water Services Association of Australian (WSAA) considers climate change risk as a priority area for its members.

The associated impacts of climate change have compelled WSAA members to adopt greenhouse gas mitigation strategies, and to assess the risks climate change impacts pose to their business, and plan to adapt.

As regulated authorities, water utilities must select climate change responses that are cost effective, defensible and representative of sound investment.

The Cost of Carbon Abatement Tool

Why was this tool developed?
The CCA Tool was developed as a dynamic decision support tool to standardise and simplify the assessment of carbon abatement opportunities. It includes a standard data input template to simplify the investigation of carbon reduction opportunities, the ability to vary inputs based on scenarios and a CCA Curve, that can be presented in a number of ways, according to user needs. The CCA curve plots the cost per tonne of emissions reduced and the total emission reduction potential for each carbon reduction opportunity.

The CCA Tool can assist water utilities who are developing or implementing a carbon abatement strategy. However, prior to the implementation of the tool, opportunities for carbon abatement need to be identified and scoped.

The output of the tool is reflected in Graph 1 on the final page of this document.

In developing the CCA Tool, Sydney Water took a concept from the national level (as developed by McKinseys in their Marginal Cost of Carbon Abatement Curve) and applied it to a single organisation. The CCA Tool has the potential to provide a nationally consistent approach to evaluating opportunities to reduce carbon emissions in the water sector.

Description of the tool and its capabilities
The CCA Tool is an Excel-based tool that enables a company to assess its opportunities to reduce greenhouse gas (greenhouse gas) emissions in terms of potential volume reduction, associated financial costs and benefits, and risk.

The CCA Tool provides a common calculation platform and flexible interface that allows for detailed scenario modelling and outputs. Users can quickly compare changing forecasts of energy prices, regulatory and voluntary carbon costs and external funding for different abatement opportunities.
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The Tool has four main sections (1):

The CCA Tool allows comparison of the economic return for each opportunity by calculating the levelised cost per tonne of emissions reduced over a given period (e.g. 30 years). The tool then allows the information to be presented in the form of a cost of abatement curve, or graph. Scenarios can then be run on future energy and carbon prices and the extent of voluntary reduction commitments that a utility may have committed to, all of which impact the economic viability and timing of opportunities.

The CCA Tool has the following features (Sydney Water, 2011):

> Quantifies the potential greenhouse gas emissions reductions from each abatement opportunity.

> Calculates cost per tonne of emissions reduced.

> Provides a template to consistently capture cost, greenhouse gas savings and other data specific to each abatement opportunity.

> Collates the full range of abatement opportunities within one spreadsheet.

> Creates a CCA cost curve and project data table ranking all opportunities based on cost per tonne of emissions reduced.

> Enables the user to run scenarios on factors such as electricity prices, discount factors and the presence of legislated or voluntary carbon prices.

> Gives the user the flexibility to choose and change criteria and display options for the CCA cost curve.

Provides the user with the opportunity to add features to the cost curves to highlight negative abatement cost opportunities and the ‘break even’ abatement cost opportunities.

Case studies – key learnings from applying the tool

Case studies on the implementation of the CCA Tool by three water utilities, Sydney Water, Hunter Water and ACTEW Water, provide practical examples of the value of the CCA Tool and the wider decision making process which incorporates the tool.

Whilst the three utilities differ there were some common key learnings from the implementation of the tool:

> The tool was easy to use

> Can be tailored to individual organisations needs

> Analysis took under 12 months from inception to development of cost curves

> Output has been extremely useful to the decision making processes

> Use of output charts are powerful in communicating greenhouse gas abatement opportunities to staff

> Could be adapted for other decision making uses i.e. identifying cost effective and reliable water efficiency projects

Key investment opportunities to abate carbon

Carbon abatement measures identified, assessed and prioritised through the implementation of a process which incorporates the CCA Tool, have the opportunity to make significant reductions in both greenhouse gas emissions and operational costs to the business (in the case of Sydney Water these reductions are up to 20%).

The types of opportunities identified by WSAA members include:

> energy efficiency

> demand management

> waste heat capture

> energy capture

> greenhouse gas capture / destruction

> alternative low- / zero-emission energy sources

As expected with three utilities with differing spatial locations, customer bases and size of operations, there are differences in the specific
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Scope of the measures available and the extent of particular project types. However, in all three case studies energy efficiency opportunities are ranked as the most cost effective measures, and predominate the list of negative cost of abatement measures.

Examples of opportunity types which were identified as having a negative levelised cost for at least one case study utility are provided in Table 1.

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Annualised average GHG (t CO2e)</th>
<th>Levelised Cost ($/tCO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet efficiency</td>
<td>181 to 408</td>
<td>-1,232 to -400</td>
</tr>
<tr>
<td>Aeration control</td>
<td>290 to 4,031</td>
<td>-250 to -172</td>
</tr>
<tr>
<td>Lighting efficiency</td>
<td>148 to 416</td>
<td>-220 to -83</td>
</tr>
<tr>
<td>Mini hydro</td>
<td>436 to 2,261</td>
<td>-157 to 351</td>
</tr>
<tr>
<td>On-site wind (single turbine)</td>
<td>207 to 4,875</td>
<td>-91 to 112</td>
</tr>
<tr>
<td>Biochar</td>
<td>130 to 5,499</td>
<td>-28 to 114</td>
</tr>
</tbody>
</table>

Table 1: Negative levelised cost opportunities for greenhouse gas abatement (case study data)

Notes: This data considers only the data made available from three case studies (Sydney Water Corporation, Hunter Water Corporation and ACTEW Corporation. This table provides examples of opportunities for greenhouse gas abatement and does not include all opportunities available to reduce greenhouse gas emissions.

Investment Opportunities

WSAA acknowledges that technological maturity is a barrier to the cost effectiveness of some carbon abatement opportunities, and as such supports ongoing investment in research and development of abatement opportunities, including:

- Cogeneration
- Large scale wind energy generation
- Large scale solar energy generation
- Codigestion
- Biosequestration as an opportunity for greenhouse gas emission capture.
- Algal biofuels

Conclusion

As energy efficiency measures commonly lead to a reduction in energy costs which outweigh the capital cost of the measure over the analysis period, WSAA expects that other water utilities will find energy efficiency measures will generally be highly ranked by the CCA Tool. However, energy efficiency opportunities in isolation yield typically small to moderate abatement potential compared to the other project types since they are making incremental savings over existing areas.

Climate change mitigation is now a legitimate area of policy development for governments. WSAA advocates for government policy settings which are flexible, efficient, transparent and favour a wide array of renewable energy options. This will allow water utilities to deliver innovative, sustainable and cost effective water services to customers and the community. It is important for water utilities to continue to be engaged by governments and regulators on climate change mitigation policy.

Further Information

For a full copy of the report please visit the WSAA website https://www.wsaa.asn.au.

If you require further information please contact

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Graph 1: Cost of Carbon Abatement Curve by project type

Annualised average GHG savings, t CO\textsubscript{2}e

Levelised cost, $/t CO\textsubscript{2}e

Project Type
- Energy Efficiency
- Renewable Energy Generation
- GHG Capture / Destruction
- Energy Capture
- Demand Management