Australia – United States Climate, Energy and Water Nexus

Overview of Policy Forums

December 2010

Introduction

The Dow Sustainability Program’s Australia – United States Climate, Energy and Water (AUSCEW) project was launched on December 2nd in Canberra at the first of three policy forums.

The AUSCEW policy forums examined the interdependencies between three of the greatest dilemmas facing modern societies, namely how to respond quickly to climate change, to supply the energy people require and sustain freshwater resources. Many of the low-carbon energy technologies favoured by climate change policies require either consistent water supplies (for instance, nuclear power and hydropower) or greatly increased water consumption (biofuel production). Similarly, carbon sequestration technologies can be thirsty, for instance, with tree planting and also carbon capture and sequestration from fossil fuel power stations vastly increasing water consumption.

In many regions of Australia and the United States water supplies are already fully or over-exploited. Ironically, technologies for supplementing supplies in water scarce regions are very energy intensive, for instance, desalinating sea water. These linkages create a vicious circle where climate change and mitigation responses add to water scarcity, requiring more energy to meet water demands, in turn increasing greenhouse gas emissions. The AUSCEW project seeks to prevent perverse outcomes such as these emerging from policy and technology measures taken in the climate, energy and water sectors by identifying and promoting integrated solutions to these resource challenges.

Over the course of the three policy forums, presentations on managing emerging technologies, carbon sequestration in the landscape, and energy use in water supply helped to identify many insights and lessons. These were then further developed through discussion of integrative governance mechanisms that have the potential to generate integrated solutions. A number of solutions were identified in the form of better designed markets, legal mandates, vertical and horizontal integration institutions, and accountability measures. The climate, energy and water relationship is a classic example of a sustainable development challenge. At a broadscale these solutions are common to sustainable development, yet at a finer scale tools specific to the climate, energy and water nexus were identified. The AUSCEW program will now document the case studies and develop guidance on the identified broad and fine scale solution for academics and practitioners.

Attendance at the forums

The policy forums were launched by Prof. Andrew MacIntyre, Dean of the College of Asia and the Pacific at ANU (and a member of the USSC Advisory Board), Prof. Geoffrey Garrett, Chief Executive of the USSC, and The Hon. Dr Mike Kelly AM MP, Parliamentary Secretary for Agriculture, Fisheries and Forestry. Dr Kelly emphasised the Australian Government’s commitment to supporting emerging technologies that offer practical solutions. Adj. Prof. Robert Hill then joined Dr Kelly
to launch the Australia – United States Climate, Energy and Water project. A keynote presentation by Dr Karen Hussey of the ANU Fenner School of Environment and Society outlined the lessons from a three year energy – water nexus collaboration between ANU and the European Council on Science and Technology, involving Australian, US and EU researchers. This project has resulted in a special edition of the journal *Ecology and Society*, which was launched at the forum by Prof. Will Steffen, a journal editor and Director of the ANU Climate Change Institute.

The full-to-capacity Canberra forum, which was co-hosted with the National Water Commission, engaged a broad range of federal, NSW and ACT government agencies as well as two major service companies, consultants and researchers. The forum in Melbourne was co-hosted by the University of Melbourne’s Energy Institute and Sustainable Society Institute, and had extensive participation from Victorian Government agencies and water services companies. The Sydney forum was co-hosted by the University of Technology Sydney and Australian Water Association and had a particular focus on the energy-water nexus in urban areas. In the course of the three forums, 150 participants registered, including 38 presenters and chairs.

**Emerging technologies**

A primary focus of the policy forums was the management of emerging technologies to maximise benefits and avoid perverse impacts from the interdependencies between the carbon, energy and water sectors. Mr John Seebach from American Rivers outlined how periodic relicensing of hydropower dams enabled the United States to upgrade hydropower equipment and retrofit old dams to reduce their environmental and social impacts. Mr Koen Zuurbier from the Dutch KWR Watercycle Research Institute provided the example of underground thermal energy systems, which pump fluids to heat or cool buildings. Application of this technology has expanded exponentially in western Europe in the past decade, outstripping the ability of regulators to manage the potentially severe impacts on groundwater quality, and raising the broader question of how new technologies favoured by climate change technologies can be fostered while avoiding negative consequences. Discussion at later forums raised the key role of government assessment agencies in Europe in advising governments on how to maximise benefits and minimise the impacts of emerging technologies.

Prof. Robert Glennon from the University of Arizona then reported on his research on water consumption and community resistance to deployment of solar power stations in the deserts of south-west United States. His presentation raised the need to explicitly link energy and water in approvals of major new projects (eg. requiring air cooling of new thermal power stations in water scarce regions). Glennon also raised the need for strategic assessment to facilitate the deployment of new technologies, such as solar power stations, in the most appropriate locations so as to avoid site by site objections and accelerate regulatory approvals. In the Melbourne Forum, Dr Roger Dargaville of the University of Melbourne presented modelling on the ideal placement of intermittent renewable energy generation facilities so as to maximise power production as the weather changed. This work highlighted the challenges in rebuilding the electricity transmission system to access new generation facilities and also the coincidence of many ideal locations for wind and other renewable energy generators with high elevation and coastal areas in conservation reserves.
Carbon sequestration in the landscape

Increasing demand for carbon sequestration in the landscape was a second major focus of the policy forums. Prof. Peter Holm from the University of Copenhagen outlined the tremendous potential to increase carbon sequestration in soils through better agricultural practices, but the analysis showed that the key European Union legislation for climate, agriculture and water largely conflicted and failed to provide support for such sequestration measures. Dr Anna Della Marta from the University of Florence presented a detailed analysis of the land, energy and water balances for production of biofuel crops in Tuscany. The assessment concludes that there is insufficient unused land to produce enough biofuels to meet EU targets in the region, that cropping the available land would double water consumption, and that the energy balance for biofuels was neutral or negative, largely due to the embedded energy in nitrogen fertiliser inputs.

Ms Naomi Pena from Joanneum Research in Austria critiqued current methods for carbon accounting for biofuels by detailing how the current focus on overall land cover change hides a number of emissions and creates perverse incentives. Instead she recommends accounting based on point of combustion which would require more accurate considerations of energy and carbon inputs and outputs. Dr Albert van Dijk of CSIRO detailed the inherent trade offs between afforestation in Australia and reduced river inflows due to increased evapotranspiration. He called for guidance to inform governments and land managers on how the trade offs could be better managed, for example, by sequestering carbon in areas of lower importance for runoff. Dr Andrew Campbell of Triple Helix Consulting detailed opportunities for better management of carbon, energy, vegetation and water in rural Australia. He presented examples of how rural institutions can be enabled to more actively manage these resources with a good strategy, careful selection of indicators, real time performance data and incentives.

These presentations highlight the extent to which any assessment of the carbon, energy and water costs and benefits for carbon sequestration in the landscape are contested and depend on the accounting methods adopted. The potential for substantial perverse impacts, for example in terms of biofuels with little or no energy gain and greatly increased water consumption, illustrates the need for more integrated policies. On a positive note, the examples from rural Australia showed how energy and water could be actively managed for mutual benefit.

Energy in water supply

Energy use in supplying water was briefly addressed by a few presentations and will be a larger theme in subsequent AUSCEW work. Prof. Graeme Dandy of the University of Adelaide detailed the trade offs between increasing water supply efficiency through reticulation and transfer versus the extra energy required. In Sydney, Ms Monique Retamal of the University of Technology Sydney detailed a method for assessing new water supply options, which identify desalination and rainwater tanks as the most the energy intensive technologies. She showed how integrated resource planning could prioritise the water supply options to identify an investment sequence for more cost effective measures. Also in Sydney, Mr Andrew Speers of the Australian Water Association outlined how that organisation’s members, particularly large water supply agencies, were managing energy use in water supply
and identifying ways to reduce demand and increase power generation in the water supply system. Retamal and Speers both highlighted the opportunity to greatly reduce energy use in water supply by targeting water heating in the home. These presentations highlighted a negative feedback loop where new, energy intensive water supply measures can increase greenhouse gas emissions, in turn leading to greater climate change and increasing water scarcity. Breaking this vicious circle is a key challenge and demand management measures were identified as one important response.

**Integrative mechanisms**

Solutions were the focus of the final session, with presenters discussing examples of how society can better manage the relationships between climate, energy and water. Mr James Bennett from Entura (Hydro Tasmania) outlined how their modelling had forecast ongoing regional changes in runoff over Tasmania, and how their system of hydropower stations was down rated in terms of production capacity, and options for re-engineering are being considered to adapt to climate change. Ms Ashlynn Stillwell from the University of Texas at Austin detailed the similarities between energy and water management between Texas and Australia, and discussed the measures being applied in Texas to meet increasing demand. She highlighted the need for accurate water and energy accounts to inform management decisions. Detailed modelling by researchers at the University of Texas is providing decision makers with tools to assess the increased water requirements of additional energy supply options. Legislative reform is proposed to link approvals for new power supplies to requisite water entitlements.

Mr Alan Smart from ACIL Tasman reported on his research for the National Water Commission on water use in energy generation in Australia. He outlined how changes in the Australian energy market could influence future demand for water and the need for reform of the incomplete water markets, so that energy generators paid a fair price for water and could trade more water into their operations as required. In Melbourne, Prof. Lee Godden and Assoc. Prof Jacqueline Peel outlined the options for strategic environmental impact assessments under Australian law to manage the impacts of new water and energy supply measures at larger scale and earlier in time to better optimize the economic, social and environmental outcomes. Dr Barry Newell of the Australian National University and Prof Deepak Sharma and Dr Deborah Marsh at the University of Technology Sydney detailed how systems thinking and stock and flows models can be used to more effectively target the points in our energy and water management systems that are most amenable to change. Mr Jamie Pittock reported on his assessment of integrative governance mechanisms in the climate, energy and water policies of eight nations and the European Union. Many examples of beneficial mechanisms that facilitate legal mandates, vertical and horizontal integration, and also independent accountability were identified but no jurisdiction had applied them all, which indicates the considerable potential for more effective governance.

**Summary**

Prof. Steve Dovers from the Australian National University challenged the Canberra forum with his summary by noting that the climate, energy and water relationship is but one example of the integration challenges society faces, and he called for identification of the most crucial links, trade-offs, synergies and knowledge needs.
Dovers urged participants to draw in knowledge from other fields that involve integrative structures and processes and have multiple instrument policy regimes. He cautioned against techno-fixes and institutional fads and encouraged attention on no-regrets adaptation options such as energy and water demand management.

Considering the focus of AUSCEW on collaboration between the United States and Australia, Dovers urged comparative policy analysis that examines policy styles and policy elements but avoids mimicry of programs and avoids preference for singular policy instruments. Noting the human tendency to form ‘in-groups’, he urged that work on the climate, energy and water nexus recognize the links with other fields (such as food and health) in a sustainable development framework. Dovers noted that this field involves inherent uncertainty and value judgements where data availability and standards of proof in deciding on trade-offs require careful attention. He concluded that this nexus is a good site for technical and policy research, and as a typical sustainable development problem, can benefit from past research and policies in identifying solutions.

Next steps

The three forums were instrumental in bringing together key researchers, practitioners in industry and government policy makers to work through the relationships between climate, energy and water. In particular, it has linked the separate initiatives being undertaken in Australia by the Prime Minister’s Science, Engineering and Innovation Council, the Australian Academy for Technological Sciences and Engineering, the Electricity Supply Association of Australia and AUSCEW, and developed collaborative links with similar work being conducted in the US and Europe.

An initial product from the forums will be a policy brief for decision makers, which will be published in early 2011. A reciprocal visit to the United States in May 2011 by AUSCEW staff will seek to build on the comparative knowledge in the US for integrated water and energy supply planning, and in Australia with carbon sequestration in the landscape and also integrated policy. The exchange of knowledge with the US will be enhanced by the visit to Australia of Assoc. Prof. Michael Webber from the University of Texas at Austin in June 2011 to brief decision makers on integrated management measures for energy and water.

During 2011 a major program output will be an academic book and matching policy briefs that detail the climate, energy and water issues for particular technologies, including how these technologies could be more systematically managed, and tools for integrated management that maximise benefits and minimize perverse outcomes for society. AUSCEW will be engaging with industry and government institutions in 2011-12 to communicate the lessons learnt and solutions identified.

More information:

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