Intensifying French-Australian cooperation over affordable low emission energy and water supplies

Issues Paper

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Introduction

Securing supplies of low emission energy and water represent two major global challenges. Given that supplying water, and potable water in particular, generates greenhouse gas emissions, and low-emission energy technologies often use very large volumes of water, these challenges are linked. There is consequently growing interest from both policy-makers and corporate strategists in this energy-water nexus, and how best to manage it across two, very separate, sectors.[1]

The problems faced are legion, and have recently been exacerbated by the turmoil in global financial markets. Given the reliance on retained profits to fund corporate R&D, a global recession will result in difficulties in funding the private sector energy and water R&D critical to advancing low emission energy and water systems.

As regards energy, the long-term trend has been for OECD governments' spending on research and experimental development (R&D) to decline both in real terms and as a proportion of total government appropriations or outlays for R&D.[2] Given the reliance on government funded R&D for the upstream exploratory work that generates new technological options, this run-down of the pump-priming stages of the energy R&D "pipeline" has been a concern for policy-makers for some time. As the importance of ramping-up energy R&D has grown, particularly with regard to security of supply and emissions reduction, the global government funded R&D effort has declined.

[1] The inherent challenges in the energy-water nexus will also be addressed in a more comprehensive manner in an invitation-only COST-ANU exploratory workshop to be held in Brussels on the 19th to 21st January 2009. For more details contact Dr Karen Hussey, The Australian National University (karen.hussey@anu.edu.au).

[2] On the basis of OECD collated data on government R&D appropriations or outlays – data available from the OECD's R&D statistics database.

In this context, Australia stands out in accounting for an increasing share of wider OECD government spending on energy R&D.[3] Similar challenges are faced in relation to water, although comprehensive data on OECD and the wider global R&D effort are harder to obtain.

Against this R&D context there is an additional problem – that of the *affordability* of low emission energy and water systems. Experience has demonstrated that consumers are price sensitive when it comes to acquiring products and services with a lower environmental footprint. Unless the price of new systems can be significantly reduced (even when carbon imposts that push up the costs of not adopting cleaner technologies are considered) promising lower emission technologies will have a limited uptake.

This means that the fruits from R&D and technology development work on lower emission technologies tend to remain as *options* rather than readily adopted products and services – particularly insofar as households are concerned. Simply funding more and more R&D in such areas on the basis of environmental challenges breeds skepticism amongst policy-makers. Policy makers are well aware that older vintages of already proven technologies are *not* being adopted by households. This failure to adopt is often due to the affordability problem, but also because consumers may have insufficient time and expertise to weigh up the new risks associated with installing different technologies in their homes – technologies that require specialized and harder to obtain trade skills and may not operate as intended if not properly installed.

Indeed, households in industrialised economies, and rapidly industrialising economies like India and China, provide the conduit via which a plethora of manufactured goods are acquired, used and then disposed of. Energy and water flow through this conduit – embodied indirectly in the goods and services consumed by households and of course consumed directly via industrial supply chains. Much of the output of those emission-generating and water-using industries upstream in the industry structure end up passing through our homes on route to the sea and the waste dump. The result is that the world's pressing environmental problems have a lot to do with decisions made in households and over what new or renovated homes will look like. Larger homes, full of electrical and electronic gadgets tend to entail ever more energy and water being used in the economy as a whole.

There is a certain irony therefore in the fact that one root of the global credit crunch, circumstances that may make it harder for the private sector to fill the gap left by the withdrawal of the public sector from energy and water R&D, lies in loans to fund the very house purchases and renovations that have directly and indirectly driven up emissions and water use.

Initiating a French-Australian Bilateral Policy Dialogue

In recognition of the importance of these issues the *Forum for European-Australian Science and Technology cooperation* (FEAST) and the French Embassy in Canberra have organised a small conference to explore how best to achieve affordability in the vitally important areas of low emission energy and water.

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[3] See Energy Research and Development in Australia – 2008. Australian Government Department of Resources, Energy and Tourism. Canberra. 2008.

FEAST is jointly funded by the European Commission and the Australian Government in order to oil the wheels of Australian-European research and innovation collaboration. FEAST is active both in regard to engagement with multilateral pan-European programs, like the Framework Programme and is active in stimulating bilateral cooperation with individual European Member States.

This affordability initiative, which has been launched as part of the French Presidency of the European Union, is intended to explore the ways in which intensified bilateral cooperation between France and Australia can be of mutual assistance in achieving affordable low emission energy and water supplies.

The bilateral relationship between France and Australia is particularly significant. The concept of a specialised unit devoted to facilitating S&T cooperation between Third Countries and Europe was an innovation made in Australia under French EU Presidency in the year 2000. This model, of which FEAST was the first implementation, has now been rolled-out far more widely in 12 other Third Countries and has become an established feature on the international S&T landscape.

A particular emphasis will be placed on scoping out the potential for enhanced cooperation over "low emission water" technologies: obtaining acceptable levels of water quality (e.g. potable re-use and/or desalination in urban environments) *without* pushing up greenhouse gas emissions. It is therefore important to consider ways in which jointly developed technologies, capability and intellectual property and innovation finance choices may be able to contribute to affordable solutions.

The one day conference, to be held on the 12th of November 2008, will provide an opportunity for industrialists, policy-makers and academic researchers to meet to consider options for intensified French-Australian cooperation in affordable low emission water and energy technologies. Following the conference, FEAST and the French Embassy will consult participants and other stakeholders over developing a forward strategy for French-Australian cooperation over affordable low emission water and energy solutions.

Scoping out the affordability dimension

Affordability is a critical factor in determining whether promising science and technology gets translated into products and services that can make a real difference to the environmental sustainability of modern industrial economies. Indeed, policy-makers are all too familiar with the tendency for researchers to stress major environmental challenges when making the case for their own research to be funded – even though older vintages of proven cleaner technologies are not being adopted on a scale that would make a real difference to the environment.

Policy-makers are also aware of the virtuous cycle that can emerge when new technologies are affordable enough to create critical mass in new markets. The so called "learning curve" element to economies of scale in production kicks in – resulting in decreasing price and increased levels of adoption, generating profits that further fuel R&D and improvements in manufacturing productivity. Put briefly, the greater the cumulative production the lower the unit cost and hence the price of that product.

Consequently, achieving these "threshold" levels of affordability is a critical challenge for improving the environmental sustainability of modern industrial economies. Indeed, the ability to exploit manufacturing learning curves has been stressed for decades in relation to the potential for the wide-spread adoption of photovoltaic panels and related systems.

The ways in which R&D can, in effect, push a product down the cost-reducing production learning curve is also well recognised. Indeed, a major element in modern corporate R&D efforts is concerned with using theoretical understanding and simulation modeling to create and refine the design of "virtual" products. The result is that many modern products enter production at a (lower) "de-bugged" cost level than would have been associated with the production of hundreds or even thousands of real units a couple of decades ago. Effective R&D helps businesses to push their products down the manufacturing learning curve *before* the product actually enters production.

This process applies to massive complex systems like powerstations that are not mass produced - for which the "first of a kind" versions built nowadays exhibit the lower technical risk levels associated with the third or fourth version of a design built a couple of decades previously. It also applies to renewable energy systems and to water purification systems.

However, this all-important nexus between R&D and product and production engineering can be problematic. It can fall between the cracks of some nations' research and innovation funding arrangements. Furthermore, this sort of work also requires strong and effective partnerships that link academic research with industrial practice. This too can be a problematic area.

This application-oriented work at the interface between research and business innovation is prioritized by leading "science powers" like the United States and the major European economies Indeed, the European Union focuses on these sorts of academic-industry partnership in its massive €54bn 7-year Framework Programme (FP). The FP has been specifically designed to fund the large-scale demonstrators and production trials that are critical to achieving and *demonstrating* "bankable feasibility" and affordability.

Demonstrating the "bankable feasibility" of a new system, i.e. credible estimates of the investment risks faced, can be critical to releasing private sector investment. The sort of R&D that helps to push a new system down the "virtual" phase of a manufacturing learning curve, in so doing reducing both technical and business risk, plays an important role in demonstrating this all-important bankable feasibility. Potential investors need to be able to scrutinise verified (including peer reviewed) technical data in order to better inform them of the investment risks they face – part of their "due diligence" process. The greater the uncertainty over achievable technical and cost performance - the higher the risk-premium they will apply for a debt financed investment or the less likely an equity-based investment will be. Venture capitalists pay particular attention to the technical risks faced in taking a potential new design out from the lab and scaling it up. They are well aware that this is both a non-trivial challenge and may not be adequately covered by available technical data from lab-scale work.

The current global financial crisis adds further weight to these "innovation finance" issues. Debt finance for innovation is likely to become far more expensive to obtain and hard to secure over the medium to long-term. However, equity investment (including venture capital) is expected to be less affected. Equity investment thrives on uncertainty and volatility. It thrives on investors identifying and then handling project and company specific investment risks better than their competing investors. If there is a compelling "upside" to an investment opportunity there is a greater likelihood that someone will take an investment risk to try to achieve the corresponding and abnormally large profits. In contrast, debt finance is a downside risk-oriented game.

This means that the method of finance for cleaner technologies will become an even more important consideration than in the past. In general terms, only those cleaner technologies that are suitable for equity investment will thrive in this re-balancing in the supply of debt versus equity finance. Large

debt financed projects, particularly those for which increased carbon emission costs constitute a challenge, will become harder to finance. The balance between the potential to achieve “upside” gains from an investment relative to “downside” risks will become even more critical to innovation finance. For example, as a mature technology wind turbine installations currently tend to be debt financed. Arguably, it will be harder to finance new wind power capacity unless carbon impost regimes facilitate a greater role for equity investment. Some new debt financed coal burning power stations in Europe are now likely to be cancelled whereas equity financed projects may still move ahead.

This link between the mode of finance and achieving cleaner innovation must consequently be factored centrally into policy discussions – not as an afterthought – in the same way that it is integral to corporate technology strategy.