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ENERGY INNOVATION POLICY AND THE NEED FOR A PORTFOLIO APPROACH

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Key Points:

- Innovation is critical to a low-carbon energy future but it is not adequately valued or incentivised in Australia;
- There is a need to pursue a portfolio approach to energy innovation;
- Collaboration, including international collaboration, is also essential; and
- Public and stakeholder engagement is necessary to build confidence.

Innovation is critical to our energy future

Policies to force the transition to a low carbon energy sector cannot be sustained without affordable, technologically reliable solutions. Technological innovation is necessary but is universally characterised by patient, high-risk, high-reward investment.[1] This is particularly the case in the clean energy sector where good ideas abound but true innovation through to widespread commercial deployment is rare (e.g. renewable energy with storage and carbon capture and storage). As a result, global achievements in decarbonising the energy sector continue to lag global ambitions.[2]

Sound innovation policy is a critical component of energy policy but Australia does not value innovation highly enough.[3]

There is a global and systemic funding gap in the availability of capital for immature ventures where research points to the potential but commercial application remains uncertain .[4] Uncertainties around the carbon price outlook, future costs of different low-emissions technologies and the level of energy demand are dampening private sector investment in research, development and demonstration of low emissions. In Australia, there have been cuts to industry and government R&D budgets[5] and there is evidence[6] that collaboration between business and universities is declining.

The need to pursue a portfolio approach

The relative merits of alternative low-emissions energy technologies cannot be reliably predicted without a significant number of demonstration projects for each technology. Successful innovative organisations deal with this problem by preserving optionality and supporting a portfolio of options. Improving the prospects of low carbon energy technologies should therefore involve innovation and technology enhancements that reduce investment risk and project costs across an appropriate suite of potential low-carbon energy technologies.

Individual project failures are inevitable and it is therefore imperative that innovation policy results in a portfolio investment approach. Attempting to pick individual technology winners exposes governments to the risk of a specific failure becoming a political issue and being used to reduce or shut down support for a particular technology, or even the broader clean energy programs.

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[1]AEIC. (2013). Unleashing Private-Sector Energy R&D. USA: American Energy Innovation Council.
[2]International Energy Agency. World Energy Outlook 2012. Paris, France
[3]Cutler, S. (2008). Innovation is for the bold. Fast Thinking's Innovation 2008.
[4]MIT Taskforce 2013. A Preview of the MIT Taskforce on Innovation and Production Reports. In: Wellhausen, R. M. L. A. R. (ed.).
[5]Australian Government. (2012). Mid-Year Economic and Fiscal Outlook 2012-2013. Canberra, Australia: Australian Government.
[6]DIISRTE. (2012). Australian Innovation System Report 2012. Canberra, Australia: Department of Industry, Innovation, Science, Research and Tertiary Education.

A well-constructed (efficient frontier) portfolio encompassing some fundamental, and significantly more applied research, as well as development and demonstration funding for renewable energy systems, low emissions fossil energy and nuclear energy is required. In addition, research needs to be multidisciplinary to reflect the critical techno-economic, social, regulatory and business challenges that affect the energy sector.

The need for a robust governance framework - portfolio management

Given limits on funding and all inherent risks and uncertainties, a robust governance framework is required to manage an innovation investment portfolio. This framework should encompass the authorities, roles and responsibilities for the determination of the portfolio make-up, the assessment of technologies, the selection of projects, monitoring of progress and assurance of dissemination of outcomes.

The governance process should also employ a stage-gated approach so that projects which are failing may be reframed or terminated. This allows valuable funding to be redirected to support more promising options.

The high levels of uncertainty for new energy technologies means that misinformation about performance, cost and scalability is common among project proponents, funders and policy makers. Project proponents often tend to adopt subjective performance and cost assessment procedures, often relying on individual judgements.

Government-supported independent reviews are critical to inform decision-making around the appropriateness of proceeding to the next stage of development of projects in the context of the broader portfolio of options being pursued. Obtaining an 'external view' helps to avoid honest delusion and, in exceptional cases, deliberate deception[7], which may be encountered where project proponents are competing for investment dollars and financial incentives from government, and where the ambition to "be first", leads them to underestimate risks, uncertainties and costs.

Investment in R&D

In the absence of stable policy settings and a strong signal on the future price of carbon, the energy industry has little incentive to invest in clean energy R&D. It is appropriate in these circumstances for Governments, both Commonwealth and State, to intervene to stimulate RD&D.

A mix of stimulus offerings to support early mover clean energy technologies is likely to be beneficial, including:

- direct grant funding;
- R&D tax concessions;
- accelerated depreciation of investments in exploration, plant and infrastructure; and
- loan guarantees on demonstration projects.

For large-scale demonstration projects (e.g. solar flagships, CCS flagships and the like), in order to ensure that the activity remains demand driven and outcome focussed, costs should be shared with and led by private industry. The timeframes for R&D need to be aligned with realistic and risk optimised schedules for demonstration projects.

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[7]Flyvbjerg, B., Garbuio, M., and Lavallo, D. (2009). Delusion and Deception in Large Infrastructure Projects: Two Models for Explaining and Preventing Executive Disaster. California Management Review, 51 (2), pp 170-193.

Mobilising private sector investment is critical. Innovation is required in energy financing as well as energy technologies so that potential financiers (e.g. superannuation funds) have vehicles to deliver the investment[8]. An important enabler to bridge this gap between investment need and funding availability will be corporate reporting reform. Current reporting structures are not conducive to funding energy innovation. Financial reporting has a tendency to expense energy innovation / R&D investments, implying that they are a 'negative', rather than a 'positive' which will create value if successful.

Attracting R&D Talent

Successful innovation flows from the creation of novel concepts. This requires individuals who are capable of adapting to technological and organisational change whilst generating and implementing new ideas.[9] The attraction of an educated and skilled workforce is critical but, in Australia, investment in education is below the OECD average[10], and both business and government support for R&D and science investment has declined.[11]

Australia represents only a 2% share of the global market, including knowledge production and R&D. Leveraging this small share and identifying ways to access and deploy the knowledge and innovation generated globally is necessary to attract R&D talent.

A national energy innovation policy must result in improved education and training to maintain a competitive advantage as well as to pursue internationalisation through mobility. This should focus on attracting R&D talent to Australia and fostering a culture of globally connected researchers to encourage inward streams of investment, information and skills.

Enabling the transition from R&D to deployment

Energy innovation policy must address points of failure along the innovation chain i.e. the three distinct phases encompassing early research, demonstration and commercialisation, and market update[12] if widespread, commercial deployment of low emission technologies is to be achieved. Barriers to deployment include unstable policy environments and regulatory delays, insufficient direct government funding, international trade barriers and tariffs and licensing intellectual property (IP) produced through industry-university funded research or partnerships.[13,14]

On a global scale, the removal or liberalisation of international trade barriers[15] and negotiations for a Trans-Pacific Partnership Agreement can facilitate opportunities for trade, technologies and emissions reductions to accelerate the global deployment of low carbon technologies. On a smaller scale, policy needs to consider the role of unrestricted or easily accessible commercial licenses for the use of IP for all parties involved in industry-university collaborations.

Collaboration and clustering

Collaboration is essential to dealing with grand challenges such as the energy /climate dilemma.

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[8]Cutler, supra note 3.
[9]DIISRTE, supra note 6.
[10]OECD. (2011). Education at a Glance - What Proportion of National Wealth Is Spent on Education. Retrieved November 1, 2013, from http://www.oecd.org/edu/skills-beyond-school/48630884.pdf
[11]DIISRTE. supra note 6.
[12]Garnaut, R. (2008). The Garnaut Climate Change Review. Melbourne, Australia: Cambridge University Press.
[13]AEIC, supra note 1.
[14]Pritchard, R. (2010). A Technology-Driven Framework for Energy and Climate Policies. Energy Alliance of Australia, Energy Trade and Investment Taskforce, 22 November, 2010.
[15]e.g. the Environmental Goods and Services tariff

A coordinated approach across governments, private sector energy asset owners, private sector energy technology providers and OEMs, and universities must be encouraged. In particular, the proportion of innovation-active businesses collaborating with universities or other research institutions should be expanded. Private sector-university partnerships provide the opportunity to leverage expertise, funding and equipment whilst ensuring efforts are directed to priority areas for deployment.

National clustering initiatives can facilitate the assembly of skilled personnel to work more quickly towards agreed objectives.

International bilateral and multilateral collaborations, built on stable, shared commitments and objectives with ongoing business support, are also central to maximising the effectiveness of Australian innovation.

Public and stakeholder engagement

Raising public awareness of the role of all energy technologies in reducing CO_2 emissions is necessary. Public mistrust of technologies and policies stems from inadequate consultative processes.[16] To overcome this and embark on the long process of restoring confidence and trust, genuine opportunities for public participation must be made available.

An independent institution with a governing board comprising industry and public representation could conduct independent reviews and make recommendations to governments on appropriate policy responses for efficient, safe, secure and competitive supply of energy to the Australian public and the economy.[16] In addition to demonstrating transparency and 'social license', this would assist in addressing concerns relating to climate change and how the transition to a low carbon world is to be achieved.

Conclusion

Sound innovation policy is an essential component of a sound energy policy for Australia. The key elements of such a policy are a portfolio approach to investment in a range of technology options and facilitation of domestic and international collaboration.

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[16]Pritchard, R. (2013). Trust and Energy Governance in Australia. Energy Policy Institute of Australia, Public Policy Paper #1, May 2013.

About the author...

Chris Greig is Professor of Energy Strategy at University of Queensland and Director of the UQ Energy Initiative. This is a university wide initiative providing strategic leadership for energy research across all of the faculties and institutes within the university. The initiative covers energy production and utilisation, electricity generation and distribution and transportation fuels for both fossil fuels and renewable resources. The scope of research activities ranges from engineering, material sciences and mining research, to social policy, economics and environment, reflecting the specific challenges facing Australia with its abundant and cost competitive coal and gas resources and an economy that is heavily reliant on fossil fuels.

Prior to joining the University, Chris had 25 years of project and executive experience in the industrial, mining and energy sectors, both within Australia and abroad. Most recently he was Project Director for ZeroGen Pty Ltd which undertook a comprehensive study of the feasibility a large scale IGCC plant integrated with CCS in Queensland. That project also completed one of the largest onshore CO_2 storage exploration and appraisal programs undertaken globally.

Chris has a Bachelor of Chemical Engineering, Master of Engineering Science and PhD, all from the University of Queensland.