Funding for Renewable Energy R&D

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Summary

Renewable energy is a fully sustainable energy source, with a resource base that is a thousand times larger than energy consumption. Australia can play a major role in the renewable energy innovation process. In particular, Australia is a world leader in photovoltaics.

Substantial investment in renewable energy R&D is essential in order for renewable energy to contribute effectively to major reductions in greenhouse gas emissions. Investment only in market support is insufficient, inefficient and ineffectual in the medium to long run.

There is a hole in Australia's renewable energy support portfolio: lack of substantial long term R&D support of a kind that can be used to invent and commercialise the renewable energy technologies that could make major contributions to powering the world from 2012 and beyond.

The relative scarcity of R&D funding for renewable energy in Australia is creating major difficulties for universities and other research organisations engaged in renewable energy R&D. It has led to major reductions in renewable energy research group size and numbers, difficulties in translating research into commercial outcomes and movement of innovative technology offshore.

Proposition: that funding of $400 million over 5 years be made available for renewable energy R&D in Australia. A tax of $0.20 per tonne of CO_2 from fossil fuels could provide this funding, and would add about 0.1% to the retail price of electricity.

Details

Australia can make much greater use of renewable energy. However, if renewable energy R&D is not supported in Australia then renewable energy technology will largely be imported, with negative consequences for Australian jobs, Australian investment and Australia's balance of payments. It will be harder to argue against the proposition that responding to climate change by using renewable energy will cost jobs.

Funding renewable energy R&D and education feeds forward into renewable energy commercialisation within Australia.

Dedicated funding for renewable energy R&D has been largely absent until recently. The Energy R&D Corporation and the Australian CRC for Renewable Energy have closed. The Australian Greenhouse Office never funded renewable energy R&D. The various state government funding schemes, including those of the public electricity utilities, also closed down. The Renewable Energy Development Initiative is not available to Universities. LETDF, RRPGP, PVRP, Solar Cities and other programs do not support R&D. AP6 funding is welcome, but will expire during 2007.

The focus of Australian Government investment in renewable energy is preferably the generation of intellectual property that can be exported by way of licenses and high value manufactured goods. This strategy will generate high value manufacturing and employment in Australia that takes advantage of the nation's investment in skills and innovation.

Innovation support

- Provide greatly increased support for research, development and demonstration.
- Establish world class renewable energy innovation funding of $80m per year
- Innovation funding: A tax of $0.2/tonne of CO_2 on fossil fuels will raise $80m/year. It would add about 0.1% to retail electricity, gas and petrol prices.

Comparisons

a. Australian Nuclear Science and Technology Organisation (ANSTO): $127m/y
b. Proposed Renewable Energy R&D: $80m/y
c. National Information Communication Technology Australia (NICTA): $60m/y
d. Fraunhofer Institute for Solar Energy Systems (a German research group): $47m/y
e. Australian Institute of Marine Science (AIMS): $27m/y

Funding for energy innovation

Federal Government support for energy R&D comes from the following sources, among others. As of 2008 there will be no dedicated renewable energy R&D agency to which Universities can apply.

Renewables

1. Australian Research Council http://www.arc.gov.au/default.htm - generic R&D. See note below
2. AP6 http://www.ap6.gov.au/ ($40m for renewables; will be exhausted in 2007)
3. Renewable Energy Development Initiative ($100m over 7 yrs). Universities, which have been powerhouses for renewable energy innovation, cannot apply to REDI. There have been relatively few applications for REDI funding because the long term lack of R&D funding has led to a lack of new commercially viable IP.

Nuclear

1. Australian Research Council http://www.arc.gov.au/default.htm - generic R&D
2. Australian Nuclear Science and Technology Organisation (ANSTO): $127m per year (mostly not for nuclear energy)

Fossil Fuels (among others)

1. Australian Research Council http://www.arc.gov.au/default.htm - generic R&D
2. AP6 http://www.ap6.gov.au/ ($60m for fossil fuels; will be exhausted in 2007)
3. CRC for Greenhouse Gas Technologies www.co2crc.com.au (2003-2009)
4. CRC for Mining http://www.crcmining.com.au/int.html (2003-2010)
5. CRC for Coal in Sustainable Development http://www.ccsd.biz/ (2001-2008)
6. Rio Tinto Foundation ($35m no-interest loan from the Federal Government)
7. CSIRO Energy Transformed Flagship works mostly on fossil fuels, with a small renewables component http://www.csiro.au/index.asp?type=blank&id=EnergyTransformed
8. CSIRO Energy Technology http://www.det.csiro.au/
9. CSIRO Exploration & Mining http://www.em.csiro.au/
10. CSIRO Minerals http://www.minerals.csiro.au/
11. CSIRO Petroleum resources http://www.dpr.csiro.au/
12. Geoscience Australia http://www.ga.gov.au
13. NCRIS will deliver ~$50m in infrastructure to fossil fuels.

Note on ARC support for renewables

It has been suggested that the ARC is providing substantial support for renewable energy R&D. However, simple keyword searches of ARC grants can give an overstated view of the level of support. For example, a project that refers to anything connected with renewables could be wholly allocated to the renewable energy category, even though that might be a small part of the proposed work. Fuel cells are often lumped into the renewables category, despite the fact that fuel cells will be powered by hydrogen obtained from natural gas for the foreseeable future.

The industry

Climate change is a major issue. Energy efficiency, renewable energy, carbon capture & storage ("clean coal"), afforestation and other measures all need to be harnessed to solve the problem. None of these options will prosper without a price on carbon pollution.

Renewable energy comprises many energy forms, including photovoltaics, solar thermal electricity, solar heat, wind, geothermal, bioenergy, small hydro, ocean energy, solar buildings and clean transport systems. Taken together, renewable energy and energy efficiency can provide most of Australia's energy needs by 2050. Renewable energy and energy efficiency are much more job-intensive than coal fired power stations.

Solar energy, with a resource 1,000 larger than current energy consumption, is the most important of the renewable energy technologies in the long-term.

It is important for Australia to have a balanced portfolio. Increased support is needed for renewable energy and energy efficiency R&D, demonstration, commercialisation and market incentives. The latter could include an extension to the Government's mandatory renewable energy target, carbon pricing and individual technology incentives.

Baseload power can be met by wide geographical dispersion of collectors, technical diversity (using many different forms of renewable energy), storage (e.g. pumped hydro - pumping water uphill during the day and releasing it through turbines at night) and shifting loads to daytime.

The worldwide solar energy industry is doubling in size every 20 months, and will reach $100 billion by about 2011. Wind energy is enjoying similar growth. Australia has real innovative strength in some sectors, notably photovoltaics. Australia can play an important environmental, employment and economic role in this industry.

Australian solar innovation

Universities have been powerhouses for renewable energy innovation in Australia. Australian university renewable energy technology is highly valued in international technology markets. In particular, photovoltaics is an area of real Australian research and commercialisation strength.

UNSW

- Buried contact solar cells (gone to Spain)
- Crystalline Silicon on Glass (gone to Germany)

ANU

- Sliver solar cells (likely to go overseas)
- Solar concentrators

Sydney University

- Trough concentrators (gone to California)
- Evacuated tube collectors (gone to China)

A funding gap in the renewable energy sector

The quantum of funding for renewable energy innovation needs to be vastly increased to be commensurate with the scale of the economic opportunity and the problem of climate change.

A vibrant industry requires a partnership between companies, research organizations and universities. Universities not only provide research, but also provide high quality training of industry engineers and scientists. Research and training go hand in hand, and an industry without both is an industry in trouble.

A gap has developed between the early stage research support provided by the Australian Research Council and commercialisation support. It is difficult for a University to bridge the gap between

early stage R&D funded by the ARC and the point where a company is willing to invest millions of dollars.

Development Phase funding, as illustrated in the figure below, should fill the gap between ARC funding (small scale, low probability of grant success) and market support measures. This funding should be large-scale and should reward research groups that have a good commercialisation track record.

It is important to recognise that there is a right time and a wrong time for control of an idea to pass from scientists to company executives. Just as scientists often are poor managers of a commercialisation program, company executives are often poor managers of R&D. The hit and miss nature of R&D, and the sometimes mysterious ways in which very good ideas appear, is usually poorly understood by those not engaged in science. The conditions required to nurture those people capable of conceiving very good ideas are not to be found in most companies.

Funding programs such as the Renewable Energy Development Initiative, whereby companies can subcontract Universities to undertake R&D, have an important role. However, if this is the only R&D funding available then there is a grave danger that control of an idea passes to company executives at a premature stage in the R&D continuum, resulting in the removal of the conditions that are optimum for completion of the R&D process.

A further danger is that the company is in a position to drive a tough bargain with the researchers, who are often desperate for money to keep research teams together. This can cause overly restrictive confidentiality restrictions to be placed upon the researchers, and can downgrade financial incentives to succeed. The company executive simply doesn't have the experience to recognise that their short term gain (in terms of control and low royalty returns to the inventors and their institution) is at the expense of their own (and Australia's) medium to long term best interests.

The solution to this dilemma is to have a portfolio of support mechanisms for renewable energy R&D. At one end are ARC grants for blue-sky research. At the other are the market support mechanisms. In between is an organisation such as REDI to support early stage commercialisation, plus organisations that support the research, development and demonstration of new ideas, with the funding remaining under the control of the researchers until the right time has come to pass control to company executives. In addition, of course, these organisations can support the researchers to establish their own companies in order to commercialise their own work – which is often the best outcome.