

# **LOW EMISSIONS ENERGY TECHNOLOGIES: RESEARCH AND DEVELOPMENT**

## **OVERVIEW**

This paper answers the following three questions from Garnaut Climate Change Review Paper 4 entitled, 'Research and Development: Low Emissions Energy Technologies'.

1. What is the role of an emissions trading scheme in driving innovation?
2. How large are the market failures in innovation?
3. Are there alternative frameworks that may be useful in the process of policy analysis and development in regard to innovation?

All related responses to earlier Garnaut papers and submissions to the Commonwealth Department of Climate Change and the Productivity Commission Inquiry into a National Consumer Framework are available on request. In answering Garnaut's current questions I arrive at the general position outlined in the overview below:

Innovation should first be identified and undertaken on regional industry and community bases more openly, critically, scientifically, and competitively, in the light of the general framework of key international and national agreements, standards and regional planning processes which have been designed to promote sustainable development in Australia and beyond. The innovation requirements of industry, communities and their related environments must primarily be identified, prioritized, and funded in this context. To bring this about, the Department of Climate Change Regulations Policy Paper entitled 'National Greenhouse and Energy Reporting System' (Feb. 2008) should first be adopted as an industry code of practice and an audit of the greenhouse gas emissions of large polluters should be undertaken to consider the adequacy of the current directions of the National Greenhouse and Energy Reporting System Discussion Paper entitled 'Technical Guidelines for the Estimation of Greenhouse Emissions and Energy at Facility Level (Energy, Industrial Process and Waste Sectors in Australia) (Dec. 2007).

A more informed, freer, and more competitive market can then be ushered in by big polluters with government and related community help. Ideally, the government will provide the big polluters with an appropriate number of carbon permits, which have a scientifically identified monetary value. The design of the permit issue is ideally aimed at promoting the control of inflation and more open, scientific, stable, and competitive operation of all markets, through leading activity in relation to the control of greenhouse gases. The big polluters can then choose either to reduce their greenhouse gas emissions at the business source, or invest in the control of emissions identified in other communities.

### **What is the role of an emissions trading scheme in driving innovation?**

It is impossible to know the role of an emissions trading scheme in driving future innovation because there are too many uncertainties about how the market will treat any

carbon price and how innovation will relate to this. For example, an article from The Economist, entitled 'Coal power a burning issue' in the Australian Financial Review states:

In theory, the carbon price (in Europe) and the threat of one (in the US) should dent enthusiasm for coal. But in practice many utilities are betting that the disparity in fuel prices will outweigh the cost of extra permits to pollute. At the moment permits cost pennies in Europe because governments handed out too many of them...Although there should be more of a shortage starting next year, the futures price would have to rise from the current 22 per tonne of carbon to over 30 per tonne to prompt a significant switch away from coal over the next two years, according to Henrik Hasselknappe of Point Carbon consultancy.' (AFR 19.11.07, p. 60)

Enron first made its name as a clean energy producer but its managers found they could make more money for themselves in highly speculative deals of many kinds, rather than producing or innovating effectively in the energy market. (McLean and Elkind, 2004). Was Enron a rare bad apple or the logical expression of a prescientific, anti-competitive, market designed primarily to serve its controlling sectional interests? I think the latter. This problem is endemic and Australia should design a more open, scientific and therefore more competitive and freer market. This process will challenge older regulatory views.

In the published papers of an annual bank conference on development economics, Stiglitz and Muet (2001, p xix) argued that economic crises have shown the need for greater world governance, especially to manage 'public goods' such as financial stability and environmental protection. They stated many economists now look beyond 'the Washington consensus', which they define as unconditional liberalization of markets, lack of attention to institutions, and macroeconomic policies geared towards lowering inflation rather than development and employment. They claimed development success requires high savings, rapid capital accumulation, high levels of training, strong capacity to acquire new knowledge and rapid insertion into international trade. Weak institutions, on the other hand, lead to economic instability and financial crises. They also argued that effective world governance must closely involve employers, trade unions and non-government organizations. However, the Australian Government is strongly committed to controlling inflation first. Inflation benefits the comparatively wealthy investor through providing higher interest rates on their lending. The comparatively wealthy are also more likely to borrow large amounts of money than the poor, so may be content if inflation reduces the value of their debts. On the other hand, inflation may drive the small but struggling business to desperation if the repayments on much more modest debts cannot be met.

In the Australian national context it seems strange there has been little or no public discussion of how carbon permit pricing options would affect inflation, let alone innovation. For example, if government gave big polluters free permits as an incentive to control the effects of their own or others' noxious emissions, instead of tax cuts for research and development, which is the more common national practice, how would this affect inflation or innovation? I have no idea about the possible effect on inflation but think that free permits for big polluters could encourage innovation in the industry and community development context I have discussed in many previous submissions, as well

as this one. From producer and consumer perspectives, as distinct from financial service and related speculative approaches, industry superannuation funds appear potentially low risk, stable, low cost investors in emissions control and other sustainable development strategies. However, this depends on the fund investors having sufficiently reliable market knowledge in order to invest wisely in more practical, obvious, emissions reducing businesses, as distinct from pure research, leading to patents and the speculative market.

In arguing that Australian communities, governments and industries require more broadly designed, open, scientific, democratic, freer and more competitive approaches to attainment of sustainable development, I follow in the administration, social insurance and related competitive approaches of Weber, Keynes, Beveridge, Galbraith, Wilenski and Hilmer. I am naturally also guided by key aims in UN Conventions and agreements in regard to sustainable development and related matters. In this context, Australian approaches to the general duties of care outlined in occupational health and safety, rehabilitation and workers compensation legislation are ideally also applied in producer duties of care to consumers, communities and their environments. Australian approaches to designing national health promotion, services and industry superannuation schemes also point the way forward to more democratic, competitive and stable market design. Risk management and related innovation, which centrally involve open information provision, education, its practical application in production and assessment of comparative outcomes, are ideally treated historically, scientifically and competitively in their related global, national and regional community and industry contexts. (Think globally, act locally.)

Garnaut's paper does not define innovation, in comparison with continuing and improving development of production methods on one hand, or pure research conducted in an academic environment, on the other. I tend to support the former approach in preference to the latter, because it seems more likely to be designed to solve a particular practical problem of production or service. This innovation process is ideally also used to create a general learning culture in the primary organization and in others to which it may be related. Comparatively few Australian employers appear to be in a position to undertake or support scientific and technological research and development on their own behalf. However, across the board industry benefits might be derived if industry leaders, their organizations and members are willing to participate in broader regional community planning approaches which also address effective communication, skills development, education, and research to achieve national objectives related to control of greenhouse gas emissions and broader sustainable development. Industry, government and community relationships with higher education and other research, education or development partners are ideally forged in this practical context. The aim is to broaden sustainable development and grow all businesses, by utilizing economies of scale and competition more effectively.

In contrast to the above, an academic discipline based approach to conducting research may be too theoretically and narrowly constructed to be useful outside the university career path. The research interests which dominate and fund academics may also be driven by disciplinary paradigms which are challenged by the new, internationally developed goals and requirements of sustainable development. Law, economics and accounting provide obvious examples of this problem which also obstructs program

budgeting and triple bottom line accounting – economic, social and environmental. However, there may be some support in universities for the industry based innovation direction I recommended earlier. The Group of 8 Universities Response to the Expert Advisory Group's Preferred Model paper for the Research Quality Framework ( RQF 2005) identified the need for a clear statement of research purpose for application of the RQF. The first two points of the Group of 8 proposed purposes for the RQF were:

1. To provide governments and business with the additional information they need to assess the value of their investments in research
2. To provide researchers and institutions with the additional information they need to plan future research strategies.

In 2002, at a medical research conference that I attended, the Sydney University Business Liaison Office's Kevin Croft offered the following definition of commercialisation:

‘Maximising the process of transferring outcomes to the community in a manner which optimises the chances of their successful implementation, encourages their use, accelerates their introduction and shares the benefits among the contributing parties’

This commercial approach seems useful for many joint venture contracts between government, industry and other industry or community development organizations seeking more sustainable development. I proposed that this direction should be adopted to make key undergraduate curriculum content openly and freely available to all, so that research training for postgraduate students could be built more transparently and effectively on this clear basis of promotional and certifiable knowledge. This would benefit Australians and any other people who might model curriculum on similar approaches to governance for sustainable development upon it. It seemed to me that an open curriculum approach to education would also be the most obvious and effective way of developing skills quickly and flexibly and that it is also vital for fighting inflation and for business and community innovation and cost cutting. The closed, computer-based, distance education initiatives which Australian universities have funded in the past decade are comparatively little utilized (Gallagher 2000; Nelson 2002), their production costs are more expensive than classroom teaching and they have not made money (Marginson 2004). These education products are not open to scrutiny so one cannot judge quality. Openness will improve it.

In my experience, on the other hand, most academics who write about innovation are thinking about patents and my guess is that Garnaut and Grubb, (the former quotes the latter), are no exception. The number of patents registered plays a role in determining the supposed quality and prestige of universities, so they are locked into promoting this process. As a former academic I have often watched with wonder at the promotional activities of the Sydney University Business Liaison Office, which is dedicated to assisting academics develop patents. Doing so looks to me like a very poor way of encouraging innovation because it is extremely secretive, bureaucratic, expensive, slow, highly uncertain and driven by the interests of the investors in making financial returns, rather than applying the original research which was funded. How comparatively productive is it

in practice? I have no idea. However, I often wondered what sort of academics would willingly put themselves through such a highly speculative and stressful ordeal and whether many were able to speak about and practice innovative methods more openly.

### **How large are the market failures in innovation?**

Businesses, lawyers and courts normally rely upon protecting legal privileges, which demand secrecy and may encourage misinformation in the legal and client interest. This is the opposite of an open market ideal, in which perfect information leads to perfect competition. More open and data driven management is necessary to achieve sustainable development and better policy formulation on a continuing basis. Systematic feudal frustration of the free market ideal also provides many reasons why markets do not clear. The rich may live off and encourage market peaks and troughs through their secretive market dealings driven by opaque financial interests. If one regards every loss of biodiversity and every endemic disease throughout the world as a sign of market failure to achieve the key UN goals of sustainable development for all, the market failures in innovation appear to be very large indeed. Without government backing there is usually no money to be made in identifying and addressing the problems of the poor and their environment. The wealth created through innovation may trickle down, but taxpayer support on a larger scale may often be required to support services to poorer populations. However, governments must also attack the feudal practices of the rich, which inhibit all more informed, scientific, competitive, freer and stable markets. Governments providing service support while tolerating service secrecy are most likely to be providing a rod for their own back. Clear and open communication is vital in the recommended paradigm.

Market failure in innovation may often be better conceptualised as a failure of political will, rather than a failure of innovation or research, and tackled accordingly, in my view. Having been a public servant who became an academic, I hated seeing so much money wasted on doing research I regarded as largely pointless, in comparison with addressing political systems which are obviously broken, but which no one dares to face or fix. For example, it seems to me that the entire budget of the Australian Housing and Urban Research Institute might mainly be seen as another way of masking a continuing, long term political reality about how development has always been driven by financial links between developers and political power in New South Wales and other states. From this perspective, doing research is something which legitimates ignoring people who actually know what is going on – in this case builders and developers – to focus in a comparatively dumb and discipline driven fashion on essentially peripheral issues, rather than the cruder nuts and bolts of industry and related community practice. I am often astonished by the tenacity with which researchers may cling to academic perspectives, rather than ask what may appear to simple minded others to be more obvious questions about how consumer choices are structured by specific industry development and related political interests. In the choice between more open, practical, political and technical investigation of problems and more discipline based research, I usually prefer the former on the grounds that it is more likely to gain broader public attention and so be more productive and educational.

Do Grubb's diagrams (p. 3, p.7) assume all innovation occurs by patents? To what extent is this true? I have no idea. I generally assume innovation primarily depends upon the development of a learning culture, and that secrecy inhibits this. In practice, academics who get research grants from the Australian Research Council or related bodies of their academic fellows are invited to publish or perish in academic journals which normally have a comparatively narrow professional readership. However, if academics get their grants from private industry or government they are usually expected to keep all their dealings secret, unless otherwise authorised. Their work may never see daylight if it is seen as inconvenient for the funding authorities, which may be almost as often as the reverse. From my perspective, the maintenance of any institutional privacy (secrecy) is synonymous with the inevitability of ignorance for all others. The ideal of secrecy leads to perfect ignorance, rather than the reverse. Ignorance is the opposite of insider trading?

I object to Sydney University's newly stressed, apparently automatic, confidentiality requirements contained in all their Australian Workplace Agreements (AWAs), which mandate secrecy for all 'trade secrets, institutional knowhow, plans, strategies and initiatives' of the university. This conflicts with both freedom of information and freedom of speech, which I think should normally be conceptualized as related to a general duty to pursue the truth scientifically, as distinct from doing whatever it takes to pursue professional and personal advantage in the university or market. Australian universities often appear to have fallen between many dysfunctional stools in rejecting a few of their weaker, traditionally feudal collegiate relations, to take up with some more narrowly primitive bureaucratic and commercial fellows instead. Information technology usage in academia often reflects this problem. Are Australian academics expected to whisper their sustainable development goals, strategies and initiatives to their intimates around the world, until all have been implemented and evaluated? I guess so. (Dumb men are best?)

In his submission to a recent higher education review, Bruce Chapman (2001) calculated that it takes the average male thirty-one years to pay off an Australian higher education debt of \$100,000 and that after 38 years the average female has paid off a higher education debt of only \$60,000. The current closed shop approach to higher education is a narrowly elitist and socially dysfunctional approach to education and research. At worst, one may be educating the 'thick rich', lawyers or their related ideologues, to take up controlling roles in industries and government which they know little about in practice. The current university education may also take a lot of money from young people who have little hope of getting jobs to match what they have paid for their student experience. Broader, cheaper and more flexible approaches to education and skills development could improve innovation across many industries and communities, but organizational secrecy prevents this. This market culture is not free but historically designed more narrowly and feudally, rather than for creating a world where science and democracy are more effectively related and market driven in the interests of future generations. We face prescientific, lawyer driven markets, without stable, reliable bases for innovation. (Move on, for Christ's sake!)

**Are there alternative frameworks that may be useful in the process of policy analysis and development in regard to innovation?**

Yes. The first principle of the UN Declaration on Environment, signed in 1992, is that humans are at the centre of concern for sustainable development and entitled to a healthy and productive life in harmony with nature. At the 1994 Asia Pacific Economic Cooperation (APEC) summit, national leaders agreed to an Asia-Pacific free trade zone by 2020, and to protect health and the natural environment. A recent Australian report stated that coordinated governance structures are essential which can translate the vision of health and sustainability into targets, and to plan, implement and review the programs that will achieve those targets (Standing Committee on Environment and Heritage, 2005). The sustainable development of all services to achieve the general international or regional sustainable development goals is ideally considered in community and related industry contexts. From this perspective, the governance emphasis should be on the clear separation of policy and administration, with the former driving competitive, transparent, service provision (Rich, 1989; Hilmer, 1993) so all may identify comparative outcomes.

Peter Wilenski (1986), the Australian and UN public service reformer, described the early Chinese Communist approach to development as seeking the integration of health education and health work into the overall political and economic development climate of the nation. He admired the mobilisation of a large labour force to carry out the slogan 'Put prevention first' in regard to environmental health tasks. He noted the break-up of the medical monopoly over health tasks, and the creation of new health service delivery models specifically designed to meet the needs of the people. A renewal of this once familiar Chinese approach within more recently developed market economies might now be productively undertaken to achieve the global control of greenhouse gases, piloted by the worst polluters, with government assistance. This is logically assisted by supporting the use of key information technology developments which have occurred since the 1980s and the open curriculum approach to education that I suggested earlier. The aim would be to identify and prioritize treatment of a wide range of industry and community sustainable development problems, on an open project and contract basis, joined openly with others.

In his recent US discussion of the links between research, creativity and economic performance, Florida (2003) followed Drucker (1993) and Bell (1973) in suggesting that productivity increasingly depends on rapid and continuing skills development and knowledge dissemination, rather than on traditional approaches which guard intellectual property but do not exploit it effectively in the organizational interest. He argues that all traditional cultures over protect intellectual property. The Boyer approach to scholarship (1990) has support in Australia (Senate Employment, Workplace Relations, Small Business and Education References Committee, 2001, p.211). The Boyer model seeks to integrate teaching and research activities and distinguishes between four forms of scholarship. Discovery creates new knowledge. Integration puts it in an intellectual context. Application applies it in useful ways for individuals, industry and institutions. Teaching facilitates student learning and developing scholars in these areas. The Health and Medical Research Strategic Review (1997) stated Australia should develop a focus on the prioritised creation and assessments of interventions and policy. Adopting definitions from the World Health Organisation (WHO) it stated the national research effort should take three forms. Fundamental research should generate knowledge about problems of scientific significance. Strategic research should generate knowledge about specific health

needs and problems. Research for development and evaluation should create and assess products, interventions and instruments of policy that seek to improve on existing options.

Sustainable development and the control of environmental problems can be most easily conceptualised in related regional industry and community contexts. The control of greenhouse gases may be lead by major polluters in regional industry, government and community partnerships which also follow the market for alternative offset investments aimed at sustainable development. The Senate inquiry into the National Greenhouse and Reporting Bill (2007) notes that there are fifteen commonwealth, state and territory programs with greenhouse and energy reporting requirements. This provides an opportunity for an investigative baseline audit of major polluters in order to establish the foundations for a related carbon pricing and permit trading scheme and for better related innovation and development in the future. I recently put this audit proposal in response to the Department of Climate Change Regulations Policy Paper entitled 'National Greenhouse and Energy Reporting System' (Feb. 2008). My response also considered the National Greenhouse and Energy Reporting System Discussion Paper entitled 'Technical Guidelines for the Estimation of Greenhouse Emissions and Energy at Facility Level (Energy, Industrial Process and Waste Sectors in Australia) (Dec. 2007).

I greatly admired the thoughtfully defined clarity of the Department of Climate Change Regulations Policy Paper. However, I thought the draft 'Technical Guidelines for the Estimation of Greenhouse Emissions and Energy at the Facility Level' are inadequate to implement scientific requirements. I guess the Technical Guidelines have largely been produced by gathering together existing technical measurement expectations outlined in existing regulations and putting them together as if this could also provide the last word in scientific implementation of the National Greenhouse and Energy Reporting System. The technical guidelines are not yet clear, lack key definitions and are flawed scientifically. Measurement of 'indirect' emissions poses many related problems.

I think that further industry consultation on many of the matters the Technical Guidelines deal with must be pursued to align the polluting organization's expected technical input more clearly with the scientific objectives of measuring greenhouse gas emissions. This will assist government evaluation of the appropriate value and number of permits provided to major polluters, prior to establishment of the carbon permit trading scheme. This will also assist major polluters to invest as productively as possible in reduction of greenhouse gases at the business source, or to undertake investment in offsetting greenhouse gas reduction programs in other communities. The preliminary investigations and related consultations on all the above matters could be done during an immediate, experimental, audit process based on the Regulation Policy Paper and Technical Guidelines, to test both approaches practically, with industry, as soon as possible.

I therefore recommended that the Department of Climate Change Regulation Policy Paper ought immediately to be turned into a National Industry Code of Practice, to be implemented immediately by industry as a research project. I am fearful that if lawyers and less knowledgeable politicians get their hands on such an excellent Regulation Policy Paper, they will want to destroy it with a thousand cuts, if they think it does not conform

to their less practical, old fashioned, black letter, prescriptive, views on legislation. Turning the Regulation Policy Paper immediately into a National Industry Code of Practice and implementing it as an industry research project would also allow the technical side of the Energy Reporting System to be more consultatively and openly worked upon through testing and report. This ideally occurs through a baseline experimental audit of greenhouse gas emissions. The Regulation Policy Paper states that an external audit will be undertaken by an external auditor who may use an audit team. However, nobody who represents the registered corporation can be a member of the audit team. I think this is wrong and recommended that a member of a registered corporation should be present on the external audit team to inform it about any source of confusion. I think this promotes mutual learning and less vague, more informed reports by external auditors, who also cannot escape their responsibility for producing the final report.

The suggested Department of Climate Change process, on the other hand, is more likely to lead to lawyers, rather than to mutual education, if the auditors make an unavoidably ignorant mistake in relation to an organization's operations and the latter then takes understandable umbrage and calls in lawyers. Then both sides may go into their secretive bunkers, until all come to court. Everyone can learn and fix mistakes quicker and cheaper without lawyers if everyone shares a more communicative, investigative approach which aims to reduce greenhouse gas emissions through scientific and competitive approaches to activity and investments with greenhouse gas reduction and all related sustainable development goals in view. This chance for investigation and consultation also assists a new, more stable, market foundation on which further industry and community research and investment can be more logically and productively built.

I have previously rejected the Australian Greenhouse Office (2007) approach to risk management which expects that individual businesses will first estimate the potential effects of various climate change scenarios on their business units. This is extremely difficult to do technically and also appears to be very far removed from the central task of business improvement. I follow instead the risk management perspectives of state occupational health and safety acts, the national perspective on health promotion, and the concept of action research, which all require that administration is conducted consultatively and as experiment. Large polluters should first identify and measure their own greenhouse gas emissions, in order to develop strategies for reducing them, and also consider less direct ways of reducing greenhouse gases through greenhouse offset programs conducted with other communities, like those working in farming, agriculture, local government or housing (See attached related discussion on the Illawarra region).

Similar risk management processes may be conducted in any industrial or regional community. In the former case one first describes the operation and its broader context. One then identifies and prioritizes the major risks to air, water, land and related biodiversity which arise as a result of the organization's production. Risks are ideally prioritized for future treatment according to their severity and frequency. Programs to control risks to the environment created by the organization are then set up. Alternatively, the organization may invest in the control of climate change risks which are identified in

surrounded communities. The requirements for identification of 'indirect emissions' and risk management must be agreed upon before this can occur in a logically related fashion. I support the directions begun in the 1980s in relation to community health and safety. Bring on the superannuation; get down to educating the market. (That is where I come in.)