



The Institution's Position on Sustainable Energy

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SUMMARY

The twenty-first century will be an era in which sustainability will be a powerful value espoused by the community. The sustainability of energy, in terms of production and consumption, and in relation to the broader impacts of energy on society and the environment, will be a particular focus of the community. Australia, as a nett exporter of energy, and with a high per capita energy consumption, has both an economic and environmental imperative to be a leader in sustainable energy concepts and technologies. Australia therefore needs to position itself strategically, with a policy framework that facilitates the strategic positioning, to use and foster its diverse resources to provide for the social and economic needs of this generation, in a manner that ensures that the energy needs of the future generations can be met. The Institution is developing a sustainable energy statement that sets out the principles and actions through which the country's transition to a sustainable energy future will be managed.

1. INTRODUCTION

Energy is a basic necessity and the major driving force in modern societies and economies. It is largely responsible for the high standard of living and advanced level of industrialisation of much of the world, and our communications, industry and lifestyle have over the years become increasingly dependent on the availability of cheap and reliable energy. Not only is energy a basic necessity of our modern society, it is also a major contributor to the Australian economy both directly and indirectly.

2. THE PAST DEVELOPMENT OF THE STRUCTURE OF THE AUSTRALIAN ENERGY INDUSTRY

The development of energy industries in Australia to the present time can be broadly categorised into four phases:

- i. ***The First Market Objectives Phase:*** a period, broadly from about 1880 until the early years of the 20th century, in which energy was distributed for street lighting and for various buildings, typically as private commercial ventures on a small scale;
- ii. ***The First Social Objectives Phase:*** a period, extending from the turn of the century until about mid-century, in which energy production and distribution was organised on a franchise basis, with the social objective of making energy available to the broader community. Responsibility for supply of

energy in the franchise area (which was often related to shire or municipal boundaries) being either municipal, local government or private companies;

- iii. ***The First Planning Objectives Phase:*** a period, from about mid-century until 1990, in which production, transmission and distribution of energy was consolidated and coordinated on (generally) a Statewide basis, as a fundamental driver of economic development. This period was characterised by central planning of energy development, Government investment in key facilities (particularly interconnecting transmission networks) and central control of commercial outcomes.
- iv. ***The Second Market Objectives Phase:*** the period from 1990 until the present, in which the Commonwealth Government (in effect) intervened to create a national competitive market for energy. The entry of the industry into its fourth (and current) phase marked the resurgence of market objectives as the driver for the industry.

While there are many rationalisations of this change, it derived partly from the ideological inclinations of its owners, partly from the need for governments around the world to find other sources of capital for the industry and of income for budgets, and partly from the fact that the community that the industry serviced had undergone significant cultural change. There was a decreasing inclination to view infrastructure development as an innate good, and the industry was seen by the community as a

business rather than as an agent of Government. There was increasing attention paid to the efficiency and effectiveness of the industry by the community, greater demands for improved performance and service, and less acceptance of the status of the industry as independent from the forces of commerce. Australian society's innate suspicion of perceived large monopolies reinforced theoretical economics tendencies to restructure the industry to encourage intra-sector (as well as inter-sector) competition in the energy market

3. THE FUTURE – AN ERA OF SOCIAL OBJECTIVES

What then are the factors that will determine the future of the energy industry in Australia?

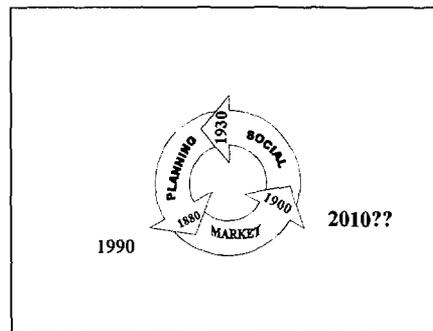
Perhaps the most significant is that Australia is in many aspects a mature country in the critical sense that it has lost its 'frontier' culture. Increasing standards of living, globalisation of attitudes and knowledge, and an increased awareness of community rights and obligations indicate that social and cultural values will play a critical part in the future evolution of the energy industry.

Modern societies are increasingly dependent on secure supplies of energy, both at the level of the individual and at the level of the economy. At the economy level, the correlation between energy intensity of an economy and the wealth of that nation is compelling, while the correlation between economic growth and energy is strong for developing economies, less so for developed economies. At the personal level, our health and welfare depends on secure supplies of energy. These factors will continue the pressure on achieving efficient outcomes from the industry, and will increase the regulatory presence.

At the same time, Australian society generally is now more concerned about the environment and society of the future, and sees the need to start doing now those things which will yield a sustainable future. Thus, there will be increasing demand for the industry to pursue sustainability strategies which will be focussed on the achievement of composite economic, societal and environmental outcomes.

Thus, while the 'market' objectives of the present era will be sustained, the industry will face increasing demands to deliver not only efficient commercial outcomes, but also effective societal outcomes. The early signals are there in the evolving regulatory, environmental and policy frameworks, both Australian and international. The next century will certainly usher in the fifth phase of energy

industry development, the *Second Social Objectives Phase*.



History moves in cycles! The arrival of the 21st century will herald the new millenium version of the changes that occurred at the arrival of the 20th century.

4. THE CHALLENGE OF THE 21ST CENTURY - SUSTAINABILITY

4.1. Sustainability

Sustainability is about ensuring energy for all our present needs, and all our future needs to the ends of time. It is not just about environment, but about sustaining our energy future. It is not about targets, or quotas, but about strategies. It is not just about technologies, but about transitional processes

Australia has adequate energy resources for the foreseeable future for its population, a situation which is quite different from many other countries. Provision of inexpensive electricity based on these reserves has lead to the development of energy-intensive industries in the country, and while Australia is a country with relatively high energy per capita reserves it needs to consider the longer term to ensure a desired energy mix. The exhausting of a particular energy resource does not necessarily mean that this is an unsustainable process, unless it sets in train other irreversible and increasing degradation processes.

The main issue for Australia is sustainability of energy utilisation, rather than simple environmental goals such as greenhouse gas (GHG) abatement. While this latter issue may be important, it is a subset of broader sustainability goals, and while Australia may attain targets for GHG reduction, it will have little effect on global GHG figures and will not of itself lead to sustainable energy frameworks. We need to be pragmatic about the rationale and impact of various options as they impact on the national and global issues. While it is nice to be an exemplar for the world, the realities are that our impact on global issues is small. Thus our "leadership" has to be more than just a moral stance,

it has to be founded on sound business principles as well – for example, deriving technological advantage in export markets to improve our economic position.

The strategies pursued by Australia in achieving sustainability in energy have to be positioned in relation to several “market” arenas: local, regional, national and global. Addressing the issue of sustainability for each of these arenas will yield a suite of strategies that will maximise the impact of the Australian effort. Most evident in this respect is the fundamental need for sustainable energy supplies to raise living standards in developing economies. Australia, as a key energy exporter, has a role and an opportunity to assist those countries meet their aspirations in a sustainable manner, while enhancing its own economic position and society.

Thus sustainability requires us to expand future energy choices (including new conversion and utilisation technologies), rather than narrow them on ideological or ignorant grounds.

4.2. A Sustainable Energy Future in a Sustainable Environment

The objective for a sustainable energy future must be to use and foster Australia’s diverse resources to provide for the social and economic needs of this generation, in a manner that ensures the energy needs of future generations can be met, while preserving and enhancing the condition of the environment that those future generations will inherit.

The evolution of a strategy, and a policy framework, to achieve this needs to be underpinned by a number of principles:

- The transition to a sustainable energy future is not about sustaining the present, but depends on actively creating new energy futures which:
 - draw upon our fossil fuel resource and technology base;
 - prioritise renewable energy sources, energy efficiency and transitional fuels and enabling technologies; and
 - recognise these technologies and areas of expertise as key growth areas to contribute to Australia's long term wellbeing.
- Energy production, delivery and consumption must yield sustainable ecological (environmental, social and economic) outcomes.
- The sustainability of fossil fuels must be enhanced through increased efficiency in supply and end-use, and appropriate resource allocation where resources are identifiably in decline (e.g. valuing oil for future chemical & fertiliser production).

- Continuous improvements must be stimulated in energy related technologies across the spectrum of production, conversion, transmission, storage, distribution, demand management and use.
- Sustainable energy structures require balancing energy production (supply) with the requirements of energy consumption (demand), and demand (need) growth must be substantially reduced via new technologies and cultural change processes.
- The ultimate goal is for all sources of energy to be based on non-depleting and non-polluting sources.
- Continuous improvement of the environmental performance of the total sector must be stimulated; and
- A consistent and committed national and state approach must be taken in terms of market reform, environmental policies and regulation and investment and taxation policy.

5. SIGNIFICANT FACTORS IN A SUSTAINABLE ENERGY STRATEGY

5.1. Sustaining Energy Industry Exports

Australia exports over 60% of its raw energy production as energy products (that is, excluding embedded energy in processed and manufactured goods), constituting about 10 percent of Australia’s total export value. Of these exports, approximately one half is represented by coal exports and one-third by uranium exports. Gas exports, while only a small percentage, represent a probable area of growth as a transitional fuel to a sustainable energy future.

As a major contributor to Australia’s foreign trade income, and as a source of low cost energy in world markets, Australia will be a net energy exporter for a considerable time. The source industries will continue to have significant economic impact, and therefore significant political and social support. To sustain this export industry while contributing to the transition to a sustainable energy future on a global basis, it is important that Australia be at the leading edge of technologies for the conversion, management and utilisation of the energy forms that Australia exports.

This will represent a transition for Australia from a simple exporter of raw energy to an integrated energy industry exporter of resource and technologies. A major inhibitor of this process is that energy export is dominated by focussed resource companies. Therefore, there is a need to provide facilitation mechanisms to extend the activities of these companies into appropriate energy technology

R&D, and production/manufacture of the associated technology outcomes.

A key element in achieving the above is to enhance Australia's position in clean coal technology.

Australia's competitive low cost electricity position is based upon large coal fired power stations. The design life of these generating facilities is in excess of 40 years. New clean coal technologies now being applied at large generating units, are demonstrating 25% reduction in greenhouse gas release, significant reductions in NO_x release, and conversion efficiencies up to 50%. These new technologies can be used to re-power older units, providing an economic option in a competitive energy market that eliminates the possibility of stranded assets, and will extend the life of available coal reserves.

Improved materials now allow new thermal stations to be constructed use supercritical technology, with efficiencies over 40%. Improving technologies are now making feasible gas fired combined cycle and co-generation power stations with conversion efficiencies of up to 60%.

5.2. Technological Impacts

A major factor in future strategies is technology. On the demand (or user) side of the equation advances in technology have produced remarkable improvements in the capacity of energy users to control and minimise the use of energy, which reflects in the lower growth rates in demand for electric energy. Perhaps more importantly, there is an increasing capacity for energy users to provide for their own energy requirements in an economically viable way - for example, gas turbine, co-generation, and alternate energy such as solar.

The potential for advances in these technologies as well as in solar technology and in fuel cells suggests that the era of the major central power station, while not drawing to an end, may well be entering a phase of intense competition from distributed generation sources. The growth in distributed generation or co-generation could defer for some time the need to augment grid facilities, and in fact raises the question whether grid-based supply will not decline as the basic framework for energy supply in the future. A key to a number of these systems approaches is the ability to store energy. Intensive research and development is required for small and large high energy density storage devices.

5.3. Allocative Issues

Allocative strategies – providing efficient economic, ecological and societal signals which direct energy resources to their most appropriate use – are key

elements of a sustainable energy framework, and of the transitions from the present position to a sustainable energy future. Allocative strategies are required in order to direct resources on an efficiency, priority and best-option/resource value-maximisation basis.

5.4. Community Education

With the residential and commerce sectors of the Australian energy market representing less than 15% of the total market, the direct relationship between energy and the individual is limited, as the 'embedded' energy in the goods and services is quite invisible. Any changes in product price, accessibility and convenience as a consequence of changes in energy mix or cost is therefore somewhat disconnected from the objectives and benefits of those changes. The achievement of sustainable energy goals depends heavily on a broad-based community education and commitment program, to change the underlying assumptions and norms of Australian society.

Particularly critical in this is dealing with the perceptual issues relating to various forms of energy, such as the negative perceptions surrounding nuclear and fossil-fuels, and the unrealistic short-term positive expectations of some innovative energy sources.

5.5. Efficiency and Effectiveness Issues

Efficiency in production, transportation and use of energy will be key to achieving the 'quantity' goals of sustainability, while improved effectiveness in the management and development of energy resources will be critical to achieving the 'quality' goals of an essential commodity in modern society.

In respect of efficiency goals, there is a pressing need for the sustainability strategies to provide incentives for research in this area, and to provide tax incentives for companies to convert to lower energy technologies.

While it is fashionable to focus on the activities of the energy producers/converters, there are many issues of community and political action that need to be addressed if sustainability is to be more than an ideological flag. Market structures, regulatory environments, taxation regimes, laws establishing resource access regimes, as just a few examples, all have significant aspects which are inimical to energy sustainability. In developing the sustainability strategy, we need to adopt a systems approach rather than sectional promotion/target approach to ensure that there is a much higher probability of achieving the desired outcomes, and a much lower probability of creating undesired outcomes.

We also need to think laterally. For example, better transport contributes to energy sustainability; improved land planning and denser urban development will make a contribution.

5.6. Technologies for Australian Competitive Advantage

Australia already has a comparative advantage in a number of the energy technologies. This advantage has been gained as a consequence of:

- ongoing R&D activities largely undertaken at public institutions;
- an abundance of natural resources including renewable and non-renewable; and
- the strength and depth of the energy sector in the Australian economy.

The potential areas of comparative advantage include:

- solar – photovoltaics
- energy efficiency technologies
- hybrid solar/fossil fuel systems
- solar thermal
- biomass
- geothermal
- hydro - mini
- storage technologies
- fuel cells
- alternative liquid fuels (such as methanol, ethanol)
- transitional fuels (e.g. gas for liquid fuel substitution)
- transitional fuels (for electricity generation: e.g. gas, briquettes?)
- nuclear
- tidal
- sequestration technologies - capture and reuse
- co-generation

In seeking drivers to advance this position, it is appropriate to look to both long and short term beneficiaries of the changes in the energy industry. These beneficiaries must include the Australian population as a whole represented by government, the energy sector and industry and commerce in general. These stakeholders should be encouraged to be forward looking and to take appropriate action to ensure that Australia does indeed capitalise on its comparative advantage. We need structures and mechanisms that foster and support long term investments to secure a stake for Australia in key emerging technologies and areas of expertise

6. CONCLUSIONS

Energy is the foundation of the modern economy. In today's competitive global environment, a National Sustainable Energy Strategy must build upon Australia's physical and intellectual resource base and its economic and social structures and must support the creation of a sustainable energy culture and a forward looking economy, appropriate to the challenges of the 21st century. Australia's future living standard depends upon our ability to reconcile the demand for energy, our role as an energy exporter, the need to conserve resources and ecosystems for future generations.