

Sustainable Energy: – Are we tilting at windmills?

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Introduction

I am glad the Engineers for Social Responsibility are taking an interest in this topic. In my view it is a key professional issue and also a key economic, social and environmental issue -my ordering is deliberate. Perhaps you expected me to put environment first. But the political reality is that no action will be taken simply because it is environmentally rational; the factors that force practically all significant decisions are first economic, second financial and - a poor third - social. Despite the green flummery, environment as a political motivator is not even in the race.

For this audience, therefore, I have decided to begin and end my analysis with social responsibility. In the middle, I will be taking you through the evidence which suggests that delivery of energy services in the next century will differ fundamentally from the pattern which has become dominant over the last hundred years or so. Some of the reasons for this will be technical and institutional, but the driving force will be the rapidly declining costs of energy from "alternative" sources. When this is plotted against the increasing trend of forecast prices for "traditional" sources in the case of electricity, we see a significant crossover point, probably within the next decade. On the morning after the crossover, everyone will ask why did we not prepare more systematically for the phase of cheaper renewables. This is my central challenge to the decision-makers.

So a transition lies ahead - some would argue that it is long overdue. Its main feature will be to shift us towards energy systems which are increasingly decentralized and more closely tailored to specific tasks or, in the case of electricity, load patterns. There will be greater incentives for energy efficiency under these new systems, while the imperfections of the market in transmitting the relevant signals to the consumer will become apparent. At that point governments, after they have reinvented energy policy - perhaps even energy plans? - will want to establish a closer link between economic and social objectives in a sector which is of strategic importance to New Zealand society.

Because the words we use - "sustainable", "sustainability" and "sustainable development" - are all somewhat flabby and in semantic terms downright inefficient, I will need to spend a little time on definitions. I then want to present some of the facts and figures that will affect decision-making in the decades ahead. My purpose is to demonstrate that the shift to a sustainable energy mode is an economic as well as an environmental imperative.

Because economic interests will run towards sustainability rather than away from it, I will touch on the way this could be accelerated by using environmental economics - a discipline still largely ignored in this country. I want then to discuss market theory and the public interest, which will lead finally into a consideration of the role of future governments and the agenda for political debate. The new negotiating element here obviously is the style of dialogue which is forced on the parties as they prepare to operate in MMP mode.

All of this will, I hope, leave you with a clear prospectus for the work of the "Sustainable Energy Forum" - a grouping which has emerged in recent months to tackle some parts of this agenda. A meeting in mid-April will take the formal steps, and will decide just how much of the agenda the Forum should cover. Should it deal, for example, with the application of the Treaty of Waitangi to the use of renewable energy resources, an issue of social responsibility, perhaps? What effort does

it need to give to energy efficiency, given the accelerating efforts of EECA and the theoretical excellence of the market in forcing this outcome? Should it find out whether the accounting methods of energy companies operate against sustainable options and, if so, work with their professional advisers to win acceptance of change? Does the advent of MMP create an added duty to get information to a larger cast of political actors? And what about the effect of rising energy costs on smaller exporters -assuming that the larger corporations are able to get cheaper long-term supply contracts?

In its early years, the Forum may indeed spend more time sorting out these and other questions than in delivering the answers. But sometimes this is a legitimate role. It will add issues to the policy agenda that might otherwise be obscured by the current focus on market reform, which is only one part of a longer story.

Definitions, facts and figures - in that order...

I approach the definition of "sustainable" by sifting through the eight meanings of the verb "to sustain" given in Webster's Dictionary (Ninth New Collegiate edition). For the purposes of discussing economic development or energy options, only three of those meanings are likely to be relevant;

2. to supply with sustenance, NOURISH
3. KEEP UP, PROLONG, and
- 7a. to support as true, legal or just

I have argued, at the World Bank and elsewhere, that the environmental case rests on a combination within the term "sustainable" of all three facets of meaning. The first derives from ecological and biological truth - i.e. all systems are interdependent, the second is important because it assumes the goal of avoiding ecological (and therefore economic) collapse, while the third takes us into the ethical component.

In the current political and economic discourse about "sustainable development" the problem is that some people expect the term to convey more messages than will actually be received by the majority of listeners/readers. This is best illustrated by the problem for the economist with a classical background, who will see the term as congruent in meaning with "sustained economic growth" - which it clearly is not. The environmental economist, on the other hand, will join the ecologist in seeing the first and second of the three meanings as the most important. He or she will argue that the professional problem for economics is to a) measure accurately what level and type of economic activity can be "nourished" by the biosphere, and b) assess whether this can be "prolonged" in perpetuity - thus achieving maximum efficiency in the use of scarce capital.

I am getting closer to windmills and sustainable energy. Let me first point out however that the semantic problems inherent in the use of a term like "sustainable development" mean that it is not in itself an adequate vector for policy. I suspect that it will also be in trouble whenever it comes to be tested in the courts. No doubt that is the reason that the drafters of the Resource Management Act stated that the purpose of the legislation is "to promote the sustainable management of natural and physical resources" - this term is then carefully defined in the following sub-section.¹

When we use the term "sustainable energy" in the New Zealand context, I conclude therefore that we mean more precisely the sustainable management of those renewable energy resources which are available to us i.e. direct solar², hydro, wind, geothermal, biomass, tidal and wave power. But we also imply the achievement of maximum efficiency, which is one reason the term "sustainable energy" means more than simply all renewable (non-fossil) sources.

There are two elements of the global picture which have a bearing on New Zealand's need to develop policies on sustainable energy. The first is the accumulation of CO₂ in the earth's atmosphere (a fact) and the possible effect of this on climate patterns, e.g. by creating global warming (a hypothesis). The scientific sceptics, backed by the not inadequate finances of the carboniferous lobby, may argue that the hypothesis needs to be proven before action can be justified, but they miss the point. The international community has not forgotten the mistake of delaying action on forcing the replacement of CFCs by substitutes (some of which turned out to be both energy- and cost-effective). On climate change, it decided not to wait for scientific certainty but to adopt instead for a "no regrets" approach.³

This was the purpose of the Framework Convention on Climate Change, which was signed at the Earth Summit in Rio in 1992. Governments are committed, under a rather loose formula, to do something to stabilize the release of CO₂ to the atmosphere, either by reducing the use of fossil fuels, or by increasing the volume of atmospheric carbon which is captured by new forest plantings. The New Zealand Government will this year come forward with proposals on how it might meet the commitment to stabilize CO₂ emissions by the year 2000.

The second global influence, which may have far more influence on decision-making in New Zealand than any convention, is the rapid increase in the use of "alternative" technologies. This is particularly true for niche markets in developing countries, such as village electricity supplies, food drying or other light industrial loads. The investment flows will increase steeply because many such countries, in particular the rapidly-growing economies of East and South-East Asia, face enormous problems of urban pollution and need to move away from traditional forms of electricity generation (as well as polluting forms of transport).

But the developed countries will also be increasing their investment in renewables. Australia is doing this, not because it wants to stop using its cheap coal and gas for bulk supplies, but because it has a 500MW niche market of (mostly) diesel-fired outback supply. It is now economic to replace this with renewables. California is doing it because it has to deal with the air pollution problems of Greater Los Angeles; as in the case of electric cars; Californian decisions will affect the other highly urbanized States. Overall, donor countries will want to show developing countries that they are being offered a superior technology, rather than a cast-off.

As a broad rule of thumb, we can conclude that if annual global investment in solar, wind and other technologies increases tenfold by the year 2000, this will lead to a reduction of around 50% in the unit cost of power generated by these technologies. A tenfold increase is not improbable, given that we start from a very low base and given the exponential increase in demand for electricity in countries with growth rates of 8%, 10% or more. So when ECNZ argued that the present installed wind capacity worldwide would only be enough for a city the size of Hamilton, they were unconsciously demonstrating that the relative cost of wind power will decline very fast -- some countries are actually planning to meet 10% of their power requirements from wind by the turn of the century. New Zealand can be a beneficiary of cost trends which other countries are generating - and that is a smart way to go.

The evidence on likely cost trends for the renewables is worth close attention. In most cases there are mutually reinforcing effects from technological innovation and increasing commercial use. Colleagues at the World Bank have produced some very interesting conclusions by amalgamating the results of a wide range of studies carried out worldwide on alternatives such as solar PV, solar-thermal and biomass.⁴ The pattern that emerges is consistent for practically all renewable technologies - a very steep decline in costs during the 1980s and 1990s, and a more gradual decline in the first decade of the next century, levelling out around 2015-2025.

Let us look at some examples;

Fig 1 - Cost of Ethanol Production from Different Raw Materials⁵

Fig 2 - Projected decrease in the cost of energy from wind turbines⁶

Fig 3 - Cost of Electricity from Photovoltaics⁷

And in order to illustrate the trends in market size, let us look at the trend for solar PV since 1976;

Fig 4 - Global Photovoltaic Market 1976-1992⁸

One does not have to be an investment analyst to see that the optimal return from the world market will accrue to those who get in just before the bottom of the curve, buy the knowhow and the cost-effective technology, then derive the commercial advantages of multinational operations. There are opportunities as well as challenges in this for people all around New Zealand. In Auckland, it would be appropriate to point out that the knowhow from yacht design and construction is immediately relevant to modern wind power technology. They know that in Perth, so pass the message on. In Wellington, the obvious factor is the opportunity to work with some of the most productive wind sites in the world, and solve the engineering and design problems. In Christchurch, the most notable factor is the amount of brainpower already focussed on the issues. And in Dunedin, they tell me, you will find that other essential factor for good investment decisions - faith!

Just to close off the discussion of investment arithmetic, I want to contrast the above trends with what is going to happen for coal-fired power, electricity from gas - if in the post-Maui situation we are ever deluded into thinking that this is a good use of any new gas fields, and large hydro. It has proved hard to come by good estimates, but the general conclusion that has emerged from my enquiries is that the profile is exactly the opposite - we have gradual increases in cost through the 1980s and 1990s, followed by steeper increases in the early decades of the next century. The following graph is based on what information I could get last month from ESA, Coalcorp and other sources in Wellington.

Fig 5 Cost trends for Electricity from Traditional Sources in New Zealand.⁹

The conclusions to be drawn from the above data, and from the proven cost-effectiveness of investments in energy efficiency, are broadly as follows;

- the hydro base will remain the core of NZ's generating capacity for many years to come, but the risks inherent in the system will be reduced and it will be rendered more efficient by the use of other grid-connected technologies, some of which are natural complements to a hydro system (especially wind and solar);
- the competitiveness of export industries will rely in part on reducing the cost of energy inputs, since energy prices overall will rise faster than the rate of inflation -part of this can be achieved by investing in energy efficiency;
- switching to indigenous renewables, especially for transport fuels, will also provide insurance against the inevitable fluctuations in international oil prices which will become a regular feature of the 21st Century;
- coal and other fossil fuels will still have a role in the new diversified energy markets, but the main growth area will be in reciprocal uses where they back up some of the cheaper renewables;

- at the household and community level, great interest will be shown in the opportunity to make socially productive energy investments which increase both employment and welfare (see examples quoted later in this paper);

Let us therefore look at the way in which a free market, in the case of electricity, might either encourage or discourage new initiatives. Let us also ask how matters of public and national interest, together with questions of equity, will be dealt with in the emerging scenario.

Market Failure and the Public Interest

Despite the idiomatic comfort of the term "level playing field", everyone knows that it is an illusion. Seasoned advocates of market policies at the World Bank know full well that distortions of one sort or another are part and parcel of the political economy. To reduce them is fine, and does indeed contribute to optimal welfare, but as we increase our dependence on the market mechanism we would do well to understand a bit more about market failure.

The area which most directly affects the prospects for new renewable technology is that of environmental (and social) externalities. These are costs which are not taken into account - sometimes because they are genuinely hard to calculate, but more often because the deregulated market rewards those who do not fully internalize the true costs of production (i.e. there is an incentive to let sleeping externalities lie). Environmental assessment and analysis is often directed at "mitigation", which usually means asking the polluter to pay for any remedial action which becomes necessary. But unless such findings can be enforced through some formal or informal mechanism, the pressure to perform in the market will mean that the costs are not internalized. This is one example of market failure.¹⁰

At the global level, one externality which is receiving a great deal of attention is the net emission of CO₂. The proposal for a carbon tax is based on the notion that if all fossil fuels and biomass are taxed on the basis of carbon content, non-carbon alternatives will be in a better competitive situation and risks of climate change may be reduced. In this sense, market failure would be avoided, but there are three important reservations. The first relates to the costing of uncertainty and thus the price of insurance. No one can quantify the future costs to the world community of each additional tonne of CO₂ released today.¹¹ Setting the level of a carbon tax has therefore become a pragmatic exercise for those countries which have gone down this track - although a bracket ranging from US\$50-\$200 per tonne¹² seems to have become the norm.

The second reservation is that CO₂ is not the only greenhouse gas, neither is it the most intensive in its effect per unit of volume. It is easily captured by a carbon tax, whereas nobody has to my knowledge worked up a proposal for a methane tax which would be designed to take account of emanations from rice paddies and from flatulent herbivores! While accepting the plea from the Energy Foundation on this particular issue, I would argue that the answer lies in placing social and financial responsibility on the fossil fuel corporates to achieve zero net CO₂ emissions. Many experts have pointed out how well placed New Zealand is to invest in offset forest plantings, with the social and environmental benefits that they will produce downstream. But the heart of the matter is that they are good financial investments, as Shell, BP and others have already seen.

The third reservation is that it is no solution to shift the problem from a global uncertainty to a regional or local inevitability. If you tax carbon and not sulphur, you slew the market so that it will still fail to cover regional externalities, such as acid rain. And if these in turn are somehow internalized, what of the strictly local effects of particulates and toxic emissions? In other words,

the true capture of all environmental externalities under a market regime is unlikely to be achieved by any country, let alone a group of countries; some forms of intervention (including regulation) will always be needed to offset long-run environmental costs.

Market theory is equally defective in terms of covering long-run social costs. A market-driven tertiary education system in New Zealand, for example, will increasingly tend to give priority to providing cost-plus education for wealthy Asian students, so that institutional and research budgets can be maintained. The social investment in our own population will be progressively downgraded in the absence of political intervention. And that intervention will not be forthcoming if neither the Business Round Table or the informed public realize that investment in education today will be the key single factor which determines economic performance in the next century.¹³

As we move on to identify areas in which sustainable energy policy can produce social as well as environmental benefits, we need therefore to be clear that these benefits will not be captured by a deregulated energy market. The carbon tax debate is thus just a beginning of the process through which we can decide how to design an energy policy which upholds the public interest, and does not undermine legitimate environmental and other goals.

I would like to dwell for a moment on this term "public interest" because the taxpayer's money has traditionally been paid over in the expectation that organizations funded by the state (as well as local and regional bodies) will focus on this as their first objective. It is surprising therefore to find that the term is currently going through a phase of temporary suspension in the Wellington lexicon. I consider it to be a concept of real importance to any democracy and would expect it to stage a comeback in the political vocabulary of the MMP era.

In the meantime, let it be clear that it is not possible to delete it from the discussion of future energy options, particularly if the focus is on transition to sustainable use. To do so would imply that massive market interventions, to meet the needs of Comalco and other private sector actors, are OK, whereas interventions to produce the best results in terms of the public interest are not OK. This is the Alice in Wonderland dimension of the current policy debate, and one which needs to be tested against the concept of social responsibility.

Social Responsibility --the Political and Institutional Response

In addressing the Engineers for Social Responsibility, I do not consider it necessary to define the term itself. There does however need to be some discussion of the obligations which it imposes on decision-makers, in both our public and private sector institutions.

I find it intriguing that the legislation establishing the State Owned Enterprises¹⁴ classifies "social responsibility" as one of the prerequisites for successful business. After returning here from the litigious traditions of a city like Washington DC, I am also amazed that we do not use the opportunity to test in the courts the degree to which the SOEs, and in particular ECNZ, are observing the requirements of the statute. I would not argue that it is socially irresponsible to support the sport of rowing or fund scholarships for bright secondary students - far from it. But it completely avoids the issue of social responsibility in the generation and distribution of electricity.

The injunction that SOEs should exhibit a sense of social responsibility "when able to do so", clearly means whenever they can, rather than only when their executive management feels they can. One task for any group promoting sustainable energy will be to link the renewable options with the opportunities they can create to achieve maximum social benefits. Issues of equity in pricing and the identification of investment opportunities for community groups and Maori tribal authorities

will all be part of this wider debate.

The lynchpin of my argument is that the economics of renewable technologies will in fact do the job that could be done by seeking legal clarification of what duties are imposed on SOEs by the statute, and therefore save a lot of expense by potential litigators. It is however also central to my thesis that without wide debate on the options that could produce economic benefits as well as optimal social welfare, the tendency will be for new investments to keep us in a Jurassic Park of large power stations, and correspondingly high risks, together with surges from undersupply to oversupply.

In other words, social responsibility in this day and age is not exercised when engineers become mesmerized by challenging hydro schemes with scales of tectonic and other risk factors that should put them right out of court on any normal investment criteria. If there were ever any doubt that technology would bring us to the end of monumental power schemes, it could be dispelled by waiting above the Clyde Dam when the road is again closed because of slips, and then reflecting on the real costs of the power to be generated at that site. This can be done using the ECNZ range of 12-14 cents per Kwh and adding in all the externalities you can think of. You might end up closer to 20 cents than the anti-Clyde protesters ever dreamed possible! In fact, the last twenty years have seen consistent cost overruns on all hydro projects in New Zealand, so that any future supply below 10 cents per unit is in my view very unlikely.

(Let me here confess that I would like to collect public subscriptions for a sculpture at the lookout point above the Clyde Dam. It would depict, in the modern idiom, the back of an envelope - because that was how the site was selected - and a translation into English and Maori of the classic dictum of Ozymandias "Si monumentum requieris, circumspice"!)

I can only be encouraged that the recent annual conference of IPENZ agreed to move ahead with the incorporation of the concept of sustainable management into the Institution's mission statement.¹⁵ This clearly brings the profession right into line with the philosophy of the Resource Management Act. It is also harmonic with notions of social responsibility. It would be timely for IPENZ to set up a group to identify renewable energy projects which could give effect to this new slant on professional duty. I know that the Forum would want to work with such a group and give it every support.

Indeed, I see the proposed Sustainable Energy Forum as a facilitator in a much wider process of sorting out new investment possibilities for New Zealand in the next decade. I am encouraged by the support our initiative has already had from IPENZ and from your colleagues throughout New Zealand. I would like now to take the argument on social responsibility a stage further and bring out the differences that can be made if we think through our technical and economic options from the standpoint of social responsibility, rather than treating the welfare of the community as a residual which will somehow fall into place if we get everything else sorted out first. Nowhere can this be more clearly illustrated than in the partnership context of the Treaty of Waitangi, and the meaning which that contract might assume for Maori and non-Maori in a phase of renewable energy investments.

Resources, taonga and market theory (advanced)

It is in my view impossible to achieve social equity in this country by assuming that the rights and obligations entered into under the original Treaty in 1840 were a one-off settlement. In fact, what has happened in recent decades - in the courts, in the political arena and in terms of increased self-identity for both Maori and Pakeha - all of this should convince us that our founding document is

not simply an archive. It is in fact a live document, containing commitments which will need to be reinterpreted and renegotiated through many phases of the future partnership.

Of course, the document (and the commitment which it contains) can be rejected at any time by either "the Crown" or the "assembled chiefs". Let me set aside from this analysis the nuance which separates the persona of the Crown from the persona of the New Zealand Government. We should simply focus on the current and future relationship between those who identify as Maori and those who identify as Pakeha. The thing that binds both groups to each other and to what would otherwise be a scrappy documentary relic of the colonial era is the fact that neither of us has anything else to fall back on. As a founding document, it has become more important, not less. By the year of the bicentenary, 2040, I would expect it to be almost equally important to both groups.

Why do I think this? The question is often put to me by South Islanders, where the Treaty carries different overtones (and undertones). My answer is that the 1840 contract was a major intervention in a functioning market¹⁶, and was entered into because it suited the signatories to modify the existing market (particularly for land) in a particular way. The way in which this was done was to specify the rights of the Maori in respect of non-tradeable items, because that is the economic meaning of the word taonga.

The environmental argument, which I sustained in my time as Commissioner for the Environment, is that all New Zealanders have taonga - items which are of great value but which are literally "priceless", that is to say they are not for trade. The ecological argument says the Treaty only covered items which had value for people, and that there is a higher category of habitat and ecological integrity which has been neglected by giving too much weight to anthropocentric notions of value, inside or outside the market.¹⁷

The energy resources argument, which I want to focus on here, is that while energy in the form of electricity or fuel can be traded, many of the resources from which the energy is derived are taonga. And the transition to a sustainable energy future will mean increased reliance on resources which cannot be traded, such as sunlight and wind. The Maori criterion, as stated by Morrie Love at our 1993 Seminar, is that the use of such resources should leave the integrity of the resource intact, it should retain its mauri.

With the exception of hydro projects and geothermal energy, I do not see the renewable resources of the future facing that threat. Human use will not have any effect on the natural forces of wind and solar radiation in New Zealand. So both Treaty partners can be relaxed about taking energy in this form. All that is needed is to haggle over the rent for the use of a particular site for a windfarm or photovoltaic array.

There are however some residual issues. One feature of most renewable technologies is the high capital cost (relative to low operating costs and negligible fuel costs). The current distribution of capital resources in New Zealand, combined with the possible involvement of overseas capital, means that the new energy systems will tend not to improve the economic status of Maori. Since the resources being used are taonga in common ownership, it would be ironic if present inequities could not at least be offset in some degree. I see here a set of issues to be thought about in advance of the transition to renewable energy, rather than be left to fester and join the land right detritus for future generations to grapple with.

There is also the human resource dimension of the new technologies. Which group in the population will have the skills and win the contracts to construct and operate the new equipment? How will the advantages of the technologies be communicated to Maori communities in the Far North, on the East Coast, and other remote locations? How will advice be given on investment to

improve the efficiency of energy use in low-income urban housing? There is a series of questions here which I would like to see treated as opportunities. It is to be hoped that a sustainable Energy Forum will be the place for some of these topics to be looked at in depth, and for lines of activity to be identified.

None of this adds up to a case for massive intervention in the market. What it does suggest however is that one of the normal preconditions for an efficient market, namely access to information, needs to be put in place at an early stage of the transition. It also suggests that some of the normal mechanisms for enhancing new market opportunities, e.g. setting up training facilities, should be funded through special investments this decade. I look forward to the debate on how this might be achieved and whether it is appropriate and sensible to approach the task inside a Treaty framework.

After all, Maui did catch the sun, didn't he? And even if he didn't complete the engineering work, the symbolism which that myth will carry for the culturally-assertive generation of young Maori could still impose a social cost if the benefits of the new technologies are not seen to be shared. I think this has immediate relevance for communities in semi-remote areas such as the Hokianga, where transmission costs could create the incentive for local investments in renewables. Perhaps the lesson of history since 1840, and more particularly since 1940, is that this cost could be avoided by creative policy initiatives. One of the Anglicisms yet to become part of the Maori vocabulary is "winiwini" (opportunities). These should be the focus of the Forum's work in this important area.

Energy Policy and the Agenda for Social Responsibility

It is clear to me that a profound transition in energy management lies ahead. This goes way beyond the re-jigging of market mechanisms and has the potential to contribute to wider societal goals - social, economic and environmental. At this point, therefore, let me summarize the thread of the arguments presented so far.

Domestic decisions about energy in New Zealand over the next decade will be heavily influenced by a number of key developments in the international arena. Some of these we know about - for example the need to contain CO₂ emissions under the Climate Convention. Some of these are less well known, but can be derived from published material - I have projected for example the cost trends which will make certain renewable technologies highly competitive in the context of a deregulated energy supply market in New Zealand. Even without any loading for environmental or social externalities, some of the traditional sources of electricity generation will be off the investment charts early in the next century.

Then there are the unpredictables, particularly in the oil market and in the accumulation of evidence about climate change. At different times, these factors may be dynamic in support of renewable options (such as biomass) or create a lull, during which there is a return to the delusion that business-as-usual is the best approach. "No need to change." "Don't rock the boat." "You environmental people don't understand the real world." And so on.

As we begin during the next decade to dismantle the relics of Think Big, we should ponder on the last time that script was trotted out, and where it left us. The logical conclusion is clear; if we are dealing with a transition, and I hope you are convinced by the evidence of the crossover in relative costs, the best policy is risk minimization. This means diversified investment strategies and a corresponding increase in the spread of technologies, including those which conserve and those which are tailor-made to a particular site and/or a particular demand pattern. I hope I have also established that the direction of the transition is known - it is towards sustainable management of all

forms of energy, thus creating a bias in favour of those renewables where New Zealand has an exceptional resource endowment.

It will not be a case of windmills from North Cape to the Bluff, but that will be the first of the proven new technologies to come on stream with sizeable grid-connected capacity. And we will experiment with wind hybrids, so that the overs and unders of Tawhirimatea are smoothed by use of, for example, small hydro and small fossil-fuel burning plants - these are options already under serious investigation.

The rapid expansion of the world market for renewable technologies, plus the fact that some of those technologies (for example, solar thermal) probably still have some innovative barriers to break through, will make the sharp investor and the sharp energy company much more aware of the advantages to be won through a strategy of diversification of this type. The deregulated market should help, but let us suspend judgement until we see the detail of the WEMDG proposals. If however it is a truly competitive market, so that some of the areas of market failure are eliminated, I believe that the shifts in patterns of investment will be even more dramatic.

Then we come to areas of political choice. A key decision is whether governments should have any strategic approach to the transition to sustainability. In other words, does it require any specific actions which take the doctrine beyond the level of rhetoric, and create a sense of practical commitment? Although such actions have tended to be ruled out under the New Right dogma of non-intervention, my thesis is that a more mature understanding of the role of democratic governments in free-market economies is beginning to emerge. I saw this happening in Washington DC during the last Presidential election campaign; the usual eighteen-month lag seems to be generating a similar inclination in Wellington to reinvent the wheel of government.¹⁸ Any grouping which wants to act as a "Sustainable Energy Forum" must of course assume that there is a political will to do something. Indeed, it can find the evidence in the activities which are being undertaken by the Energy Efficiency and Conservation Authority (EECA), which has rightly judged that the two objectives in its title cannot be divorced from careful assessment of the opportunities now open in the renewables.

The Forum can also assume that all political parties will be interested in an approach to sustainable energy which links the technological and economic opportunities with considerations of social equity and real welfare. The integrationist approach to economic and social policy has not made much headway in New Zealand in the last two decades¹⁹ - it was scuppered first by the forward rush of "Think Big", and more recently by the slightly more elegant back play of "free-market rules OK".

It will return. From the international evidence, I have absolutely no doubt about that. Liberalized economies which give attention to equity issues early in the process of market reform perform better than those which rely on the discredited theory that benefits will "trickle down" and that governments can therefore go out to lunch, leaving it all to the forces of a truly competitive market.²⁰ The Treasury and others will study this evidence; they will see that New Zealand's current economic recovery will only be a blip on the graph of national decline unless there is a move to grapple with issues of social investment and with the integration of these with macroeconomic and fiscal policies.

It will return for other reasons. The principal of these is the change in the political process flowing from last November's democratic option in favour of MMP. Some shifts are already apparent to the public eye, within the parties and in overtures towards dialogue among the parties. In the submerged seven eighths of the political iceberg you can be sure that a lot more is going on behind closed doors. The sudden plurality of the political scene is another straw in the wind.

The Forum will therefore have an opportunity, if it wishes to influence political decisions, to enter into a dialogue with the main parties and to test its own ideas about sustainable energy policy. We have a discussion draft which will be considered at the inaugural meeting of the Forum in Hamilton in mid-April, and this could become the basis for a set of consultations. I predict that some politicians will quickly identify those win-win opportunities in sustainable energy which can be turned into win-win political opportunities. Such a dialogue will be infinitely more rewarding than the "us and them" mode of Government and opposition parties under the duality of the old system.

If this is what the Forum decides, we will also have the opportunity to bring social responsibility back onto the political agenda, and link it directly with what happens in one important area of the economy. There is no question that pressures on the New Zealand environment in the 21st century could be significantly reduced if this dialogue is fruitful in terms of policy outcomes. The public interest would be served.

NOTES

1. Section 5(2) of the Resource Management Act (1991) reads as follows;

"In this Act, "sustainable management" means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while -

 - (a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonable foreseeable needs of future generations; and
 - (b) Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
 - (c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment."
2. A strict definition would include wind and biomass as solar generated energy sources, but since both are likely to be very significant in New Zealand's energy future, they are treated here as separate resources.
3. The term "no regrets" conveys the idea of policies which do not incur additional costs - although they may distribute costs differently, e.g. through a carbon tax - but which reduce the likelihood of unfavourable outcomes. The analogy would be the concept of an international insurance policy, but with the burden of adjustment falling clearly on those countries whose patterns of energy consumption create the greatest risks for populations elsewhere.
4. A World Bank Technical Paper (Number 240) has recently been published under the title "Renewable Energy Technologies - a Review of the Status and Costs of Selected Technologies", by Kulsum Ahmed.
5. World Bank (1994) op cit, p.17
6. From "Renewable Energy" by Johansson, Kelly, Reddy and Williams (Island Press 1993, p.1S3)
7. World Bank (1994) op cit, p.77
8. World Bank (1994) op cit, p.48
9. This is a provisional graph, derived from the comprehensive, but not easily understood, diagram on p.23 of the Annual Report of the Electricity Supply Association of New Zealand (1992). It will

needs revision when other cost projections are obtained, but even if the line were flat the intersection with the trends for renewables would still take place early next century, which is the central point of this paper.

10. Examples of market failure are extensively discussed in the economic literature. See, for example, Chapter 7 in "World without End" (1993), by Pearce and Warford - specially the section of pricing in the energy sector pp 179 et seq.

11. I am indebted to Arthur Williamson for pointing out that one can however derive a figure by using the cost of chemical "fixing" for CO₂. Using the cost of planting trees is another legitimate technique.

12. There is a lucid discussion of the policy options facing New Zealand in the recent study prepared for the Ministry for the Environment by Simon Terry Associates and BERL - "Energy and Carbon Taxes".

13. This point was made forcibly by "The Economist" in its survey of the reasons for the success of the fast-growing economies of East Asia (November 1993) and is supported elsewhere in the literature. See, for example, the 1991 World Development Report quoted below in endnote 20.

14. State-Owned Enterprises Act (1986), Section 4 (1), which reads;

"Principal objective to be successful business - (1) The principal objective of every State enterprise shall be to operate as a successful business and, to this end, to be

(a) as profitable and efficient as comparable businesses that are not owned by the Crown; and
(b) a good employer; and

(c) an organization that exhibits a sense of social responsibility by having regard to the interests of the community in which it operates and by endeavouring to accommodate or encourage these when able to do so."

15. The words to be added to the IPENZ mission statement are; "To advance the profession of engineering with its vital contribution to the economic and social wealth of the nation and to the sustainable management of the planet."

16. In preparing this paper, I encountered the following gems from R H Tawney's Preface to "Primitive Economics of the New Zealand Maori", by Raymond Firth (1928);

"Like other sciences, economic science tends normally to take for granted the assumptions from which it starts, for, unless it did so, it would find it difficult to start at all. These assumptions, however, have not always been submitted to a very rigorous criticism...

"Thus there develops a kind of economic Fundamentalism, which, like religious Fundamentalism, preserves itself from mental disturbance by wearing blinkers, and is sometimes indignant at the discoveries reported and scepticisms hinted by those who allow their eyes to roam over a wider field." (pp xiv-xv)

17. I find the debate on the Queen's chain and the coastal heritage as one area in which the (human) environmental and (pure) ecological views could come to resolution, although this is primarily dependent on the degree to which resources are available to set up comprehensive marine reserves and protected coastal areas.

18. As an example of the new manifesto for governments, take the final paragraph from "The Work of Nations", by Robert Reich (currently Secretary of Labour in the Clinton Administration);

"We are presented with a rare historical moment in which the threat of worldwide conflict seems

remote and the transformations of economies and technologies are blurring the lines between nations. The modern nation-state, some two hundred years old, is no longer what it once was: Vanishing is a nationalism founded upon the practical necessities of economic interdependence within borders and against foreigners outside. There is thus an opportunity for us, as for every society, to redefine who we are, why we have joined together, and what we owe each other and the other inhabitants of the world. The choice is ours to make. We are no more slaves to present trends than to vestiges of the past. We can, if we choose, assert that our mutual obligations as citizens extend beyond our economic usefulness to one another, and act accordingly."

19. In the 1960s and 1970s, for example, the notion that economic policy and planning needed to be more consciously linked to an understanding of social trends and new directions for what was still called "the welfare state" made considerable headway. This was reflected (belatedly) in the structure of the National Development Council and in the philosophy of the New Zealand Planning Council. See "New Zealand at the Turning Point" (1976). The termination of the Planning Council in 1992 dramatized the fact that by the early 1990s such integration was not seen as adding value to the (residual) policy process.

20. See "The Challenge of Development", the 1991 World Development Report by the World Bank. Referring to developing countries, the authors conclude;

"Governments need to do more in those areas where markets cannot be relied upon. Above all, this means investing in education, health, nutrition, family planning and poverty alleviation..."