

2007 EFNZ WORKSHOP ON NEW ZEALAND ENERGY STRATEGY TO 2050
Wellington 6 December 2007

SUMMARY OF PRESENTATIONS

The keynote address was given by *Stuart Calman (Ministry of Economic Development)*, outlining the government's energy policy direction in relation to the "New Zealand Energy Strategy to 2050 – Powering Our Future" (NZES). He said that a renewable energy future made economic sense for NZ and illustrated this with the chart (NZES Fig. 5.7) comparing costs and potential of various new electricity generation sources. He highlighted from a global greenhouse gas (GHG) abatement cost curve (NZES Box 5.1) that there is great potential from negative marginal cost measures (short payback periods) such as insulation improvements, commercial vehicle fleet fuel efficiencies, lighting systems and water heating. The European focused study then showed a wide range of measures that are cost effective at an emissions price of 40 euros per tonne CO₂ (wind and solar generation, cellulose ethanol, CO₂ capture and storage) together with many more that would be cost effective above this price (notably biodiesel). NZ emission reduction opportunities were summarised as a series of wedges (NZES Fig. 5.6) showing energy sector emissions could be reduced to 1990 levels by 2030, with further substantial reductions by 2050.

Dr Rob Whitney (EFNZ Chairman) summarised a major study undertaken by the World Energy Council: "Deciding the Future: Energy Policy Scenarios to 2050" (available on www.worldenergy.org). The study had a bottom-up rather than the traditional top-down approach: it was carried out in 67 WEC Member Countries by 398 individuals who were typically decision makers that plan and manage regional and local energy systems on a daily basis. The study was qualitative with some quantitative validation.

Four scenarios were evaluated on the basis of positive and negative implications for the achievement of the WEC Millennium Goals: Accessibility (access to affordable modern energy for all people), Availability (reliable and secure energy supply) and Acceptability (protect the local and global environment).

1. The Leopard Scenario (Low Government Engagement with Low Cooperation and Integration) describes countries where domestic economic development is the primary driver, underpinned by domestic energy security - government engagement is constrained and there are few levies or subsidies. For the developing regions, this scenario leads to social and climatic degradation.

2. The Elephant Scenario (High Government – Low Cooperation) represents countries with strong, hierarchical leadership from governments - the first priority is domestic energy security to support structured economic activity and growth with limited use of international bilateral agreements. Government engagement ensures steady improvement in all the measures but low cooperation inhibits progress in developing regions due to technology and resource constraints.
3. The Giraffe Scenario (Low Government – High Cooperation) is for countries whose primary focus is economic growth, freeing up global markets to promote international trade (with limited regulation and few levies and subsidies). Availability improves dramatically as an essential enabler of economic growth but Accessibility and Acceptability are second order priorities in the absence of government engagement.
4. The Lion Scenario (High Government – High Cooperation) describes countries whose national policies provide protection of property and commercial rights promoting international alliances. Governments and businesses actively share their experience and expertise with public/private partnerships ensuring a focus on delivery of policy intent. Accessibility and Acceptability are global concerns and all 3A's make strong progress through powerful international agreements and programmes. This was considered the best scenario for developing regions.

The study concluded with the following key messages:

- To meet the energy needs of all the people in the world, global energy supplies will have to double before 2050;
- The world has sufficient energy resources, knowledge, skills and capital to meet the supply needs; the challenge is to get them from where they are plentiful to where they are needed most;
- We can address the world's accessibility needs in harmony with the effective management of acceptability, thereby mitigating against both social and environmental degradation;
- Higher energy prices will drive efficiency and attract capital investment in developed countries but robust international cooperation and integration is necessary to avoid unintended negative consequences and exacerbating energy poverty in developing countries;
- Private sector engagement is essential – influencing national policy, driving business policy, and ensuring focus on sustained delivery of the policy intent.

Government and business sectors need to work together and invest in new, pragmatic agreements and there are numerous areas for potential cooperation including:

- Increase in Research Development, Demonstration & Deployment;

- Demand side mobilisation;
- Transport transformation with emphasis on acceptability;
- Risk management and fiscal consistency;
- Protection and preservation of property rights (both physical and intellectual);
- Equitable movement of resources (goods, services, know-how, skills, capital).

A session on Strategy on Energy Efficiency & Conservation consisted of four presentations resulting in some lively discussion of the traditional dominance of supply side issues over demand side issues. *Nigel Isaacs (BRANZ)* emphasised his view that facts on energy demand are in short supply and he attempted to dispel a number of myths about household energy – it has taken years to gather data on household energy end use rather than the traditional fuel breakdown. He believed the NZES had a much improved overview of the non-electricity sectors and of end uses, but it needed more demand knowledge to inform effective actions. He considered there was good inclusion of price and non-price actions but questioned whether they would go far enough. He noted that electricity security may not be achieved by focusing on the electricity supply. He believed the impact on affordability and well-being of doing nothing was likely to be far higher than the cost impact of the NZES.

Professor Don Cleland (Massey University Process Engineering) graded the NZES with a C+ or B- mainly because it had no specific targets. He considered frequent repetition of the word “discuss” was necessary to some extent but more incentives were needed to get started on some projects (especially the “no brainer” opportunities) and to “learn by doing”. He has been involved in developing a number of Energy Wise business projects and it takes a while to develop the necessary relationships. A major constraint is the limited number of people with the required experience. A major limitation with the NZES is the lack of focus on demand side measures, especially with regard to the Innovation chapter: there is a great need for research into social barriers to improved energy efficiency and conservation.

Professor Bob Lloyd (Otago University Physics Dept.) agreed the NZES deserved about a B grade, saying the measures discussed should have been in place 20 years ago. His focus was much broader in describing the constraints on the NZES as being the global issues of climate change and ‘peak oil’. Major economic disruption may limit the potential action just when financial capital is needed for the transition. He considered the WEC scenario of doubled energy usage by 2050 as unrealistic and summarised the argument that peak oil production will happen relatively soon. He saw electric vehicles as a realistic solution but questioned the likelihood of the NZES transport goal of halving emissions by 2040.

Robert Tromop (EECA) said the NZ Energy Efficiency and Conservation Strategy is consistent with IEA country strategies, “in the pack” with most European countries although not “ahead of the pack” like the UK and Netherlands. NZEECS is balanced between increasing value from energy services and the sustainability challenge. The first NEECS had a number of positive achievements to March 2005: annual savings of 19PJ from energy efficiency and 13PJ renewable energy. NZEECS programmes have much improved accountabilities and are projected to achieve by 2025 savings of 50PJ from energy efficiency (20PJ of it from transport) and 9.5PJ from direct use of renewable energy. He highlighted the strong potential to commercialise viable, cost effective, sustainable technologies and challenged individuals to develop their own in-house efficiency and renewables strategies e.g. consider buying a car you can afford to run when the [oil price] “crunch” occurs.

Dr Don Elder (Solid Energy) introduced a session on the EnergyScape Study by suggesting that NZ may be trying to provide answers to energy issues before all the questions are known. The EnergyScape consortium is trying to identify the range of supply and demand issues. He commented that for the first time, the IEA has listened to criticism from a range of energy supply companies that an energy supply crisis will dominate future debate as energy demand grows (particularly from China).

Rilke de Vos (NIWA) gave an overview of the EnergyScape project that is currently funded by FRST for a period of 18 months. **Peter Hall (Scion Research)** expanded on a range of bioenergy options that are part of the EnergyScape project, concluding that large scale forest planting is needed to provide future wood supply. **Tony Clemens (CRL Energy)** discussed the ‘roadmap’ (transitional path) if the Hydrogen Economy was to become part of a sustainable energy future in New Zealand.

The EnergyScape project framework is to:

- Develop an inventory of energy assets and their timescales (including peak capacity, costs, GHG, water, land impacts, risks) – seeking approximate rather than detailed results.
- Implement simple analysis tools (a modified national energy summary and LEAP, a comprehensive bottom-up energy use model) - seeking easily maintained collaborative data handling.
- Undertake initial analysis (verify scenarios against objectives), identify knowledge gaps, understand drivers (steady state & dynamic) – seeking an unbiased basis for informing policy and research direction.

Mr de Vos illustrated the range of pathway options for generating and transmitting electricity for a variety of end uses and highlighted the need for the model to be adaptable to capture foreseen and unforeseen issues (while clearly documenting assumptions). He summarised some of the issues needing to be considered: finding sustainable means to obtain services, understanding fuel price impacts on inequality, how to broaden transport alternatives and ways of raising public awareness through visual means of communication. The public interface is operable (www.energyscape.co.nz) but some key questions need to be answered: what are the objectives for such a model (currently ambiguous) and consequently whose responsibility is it to fund the maintenance - Statistics NZ, MfE, MED, or research institutes?

Andrew Campbell (CRL Energy) set the scene for a session on the Strategy on Resilient, Low Carbon Transport by discussing the implications of the NZES transport projections stated that EnergyScape was one way of filling the information gaps for future planning. He concluded that if NZ is serious about climate change, consistent long term policy would be needed and (tongue in cheek) the country may need 10 year election cycles!

Kathy Perreau (Ministry of Transport) discussed the NZES targets of halving domestic transport emissions per capita by 2040 positioning New Zealand to be a world leader in the deployment of new vehicle technologies, including electric vehicles. She noted that road freight and aviation energy use had high growth rates in line with high economic growth.

Ian Twomey (Hale & Twomey Ltd) described the 2040 target as an aggressive one and considered the NZES to be 'very optimistic' on biodiesel. Price based measures alone would not achieve the large shift needed and all policies have major impacts on current fuel suppliers.

Lloyd Robinson (Mitsubishi Motors NZ) said his company is planning to introduce a 100% electric vehicle to the world market around 2010. Manufacturers are seeking guaranteed production sources for lithium ion batteries with 7-10 year lives (or 150,000 km). Motorists on long journeys would be unlikely to accept the need for a 25 minute rapid recharge every 160 km so hybrids are likely to be the dominant technology until around 2030. Fuel cell vehicles are still constrained by a number of factors and no easy solutions are in sight despite \$2 billion research funds in the US to date. 'Flexi-fuels' will be part of the solution for NZ.

In the session on Strategy on Low Emissions Power & Heat, *Mike Suggate (Energy for Industry)* stated in his presentation that over the last 6 years, his company has generally faced reluctance in the NZ business sector to address energy efficiency. Many projects that have not met 2-3 year payback criteria in the past will be enhanced by higher energy costs and longer term strategic views. Because woody biomass is generally in short supply (in the places that low cost fuel is needed) and has an uncertain cost path, he considered it had limited potential.

Catherine Beard (Greenhouse Policy Coalition) highlighted that NZ already has one of the best records in the world in terms of renewable electricity proportion and there would be many barriers to increasing the proportion to 90%. The ETS price impacts would produce large windfall gains for most generators while the 10 year moratorium on new fossil fuel generation could jeopardise energy security.

Stephen Drew (Strata Energy) considered the NZES undervalued the potential of industrial energy efficiency projects. He quoted MED figures to claim that investing in some of these projects would deliver much more cost effective GHG abatement than say a windfarm. He considered the clear priorities for research and expertise development were in the drying and refrigeration sectors.

Andy Matheson (Solid Energy) summarised his company's diversification into wood pellets, biodiesel and solar installations.

In the final session on Strategy on Security of Electricity Supply, *Conrad Edwards (Transpower)* said the 90% renewable electricity target had a 'significant to extensive' range of implications for the transmission grid in its roles of energy transport, security of supply and providing a competition platform. In particular, improved market dispatch systems would be needed to maintain security when the grid has to cope with a large proportion of intermittent wind generation.

Bill Heaps (Strata Energy) said he liked the NZES vision of a low carbon electricity system and leadership in electric vehicles deployment – it fitted well with the reasons he shifted his family to NZ. He described as extremely difficult the challenge of maintaining security and quality while keeping electricity affordable, although the many aspects of security have yet to be well defined. Energy poverty issues are likely to become more pronounced from 2010 when the ETS pricing hits together with \$2-3 billion of transmission upgrades.

Alan Jenkins (Electricity Networks Association) considered how NZ would cope with a dry year electricity crisis in 2008 compared with the one in 1992. There is much less planning in place now for such an event with fewer backup thermal stations, more rigidity in terms of demand and relatively much less hydro storage in a good year let alone a dry year. He has been disappointed in the Electricity Commission's view of pricing: ticking off one issue at a time rather than an integrated approach.

Guy Waipara (Meridian Energy) argued it was time for implementation of the NZES with its 'stretch target' and NZ had a wealth of 'doable' projects. He noted that electricity investment has been energy focused in the past whereas it may need to be driven by peak load in future with a 30-40% increase projected for 2025. Meridian is commissioning research showing that the systems costs of wind in particular are 10 times less than overseas mainly because of factors such as high wind capacity, a high degree of wind persistence and the great flexibility of having a high proportion of hydro generation.

Ralph Matthes (Major Electricity Users Group) argued that the role of the Electricity Commission is not well defined because of the risk of political interference and so it should be independent like the Commerce Commission. In the long term, consumers should be able to trade off their required level of security with price. He (like others) had been disappointed that there was very little mention in the NZES electricity security discussion of the roles of energy efficiency and demand side management. The NZES claimed that the 90% renewables goal should not compromise security yet did not address "at what cost?"

SUMMARY OF PANEL DISCUSSIONS

Don Elder commented on Stuart Calman's presentation by pointing out that NZ is the only country in the world without affordability or competitiveness as an Energy Strategy objective. Mr Calman responded that the role of competitive markets is recognised and affordability is seen as part of the transition to the new energy future. Price elements are in there but the big vision features are sustainability and security. He confirmed that unlike European countries, economic competitiveness is an underlying factor rather than a prime objective.

An audience member commented that the NZES wanted to see CO₂ Capture and Storage as one of the future solutions yet the moratorium on fossil fuel generation will stall this R&D and it typically takes 20 years to implement new technology. Mr Calman responded that many other countries are driving this research and Australia's

experience with brown coal will be particularly relevant for NZ. The government collaborates with various companies in the Australian-led CO₂CRC research. In relation to a question about coal gasification, he conceded he was not up to date with the research but considered it certainly had a future in conjunction with CCS.

Ralph Chapman (Institute of Policy Studies) asked about progress on the National Policy Statement on Renewable Energy. Mr Calman said it was led by Ministry for the Environment and a paper is likely to be presented to Ministers early in 2008 with a draft statement due about June to go to a Board of Inquiry with the opportunity for public consultation.

Energy Efficiency & Conservation Strategy Panel

A question was asked in regard to the marked increase in heat pump imports in recent years. Robert Tromop acknowledged that EECA's role was to define the performance standards for the annual 80,000 imports but it was not providing the funds for this major heating shift. Someone else responded that it has resulted in increased electricity usage for cooling while another noted there would be increased productivity resulting from warmer homes and fewer asthma problems. It was noted that heat pumps are the appliances that receive the most complaints about performance and more consumer warnings are needed. Don Cleland considered that there are some technical difficulties with the performance standards: good water heating efficiency can allow some leeway in the space heating efficiency.

One audience member raised the question of whether it was irresponsible of the government to promote tourism in view of 'green consumerism' concerns – if the boundary is wider than the country then the benefits of tourism may not be worth the costs.

Another said the biggest threat to the NZES is the prospect of cheap oil undermining efficiency and renewables projects (as happened in 1980). There are a number of unusual circumstances in world oil supply contributing to the high oil price and it will probably drop to less than US\$40 per barrel with big impacts on proposed efficiency projects. Bob Lloyd responded by summarising the different estimates of future oil supply and claiming that even the optimistic US Geological Survey estimates would postpone the crisis by only about 10 years. Robert Tromop added that there must be a crisis of capital in the US industry if the major oil refinery knocked out by Hurricane Katrina has still not been rebuilt.

EnergyScape Study Panel

An EECA official had seen criticism that the hydrogen economy will never happen so why should the research funds not be devoted instead to demand side projects. Tony Clemens responded that everyone agrees that many different contributions will be needed for a sustainable energy future and it would be dangerous to pre-judge and throw out any options. Robert Tromop added the criticism that he considered that EnergyScape study had a demand side gap and he would expect to see it given greater prominence in future. The rest of the world sees the urgency that has developed in the last six months yet the hydrogen economy has a 20-50 year horizon. Andrew Campbell responded that there has been a void in terms of long term research such as for buildings. EnergyScape was an open filing cabinet for people to fill and he hoped Mr Tromop would continue to contribute to the study's steering group.

Michael Rynne (Holcim) commented that there is the potential to spend 20 times the available funding on all the different biofuel research possibilities and asked Peter Hall why not just gather all the biomass for power generation rather than reinvent lots of different biofuel conversion technologies. He responded that most of the research was happening overseas and may not be appropriate for NZ. He repeated his main point that there was insufficient biomass resource for the future without major forest plantings.

Transport Strategy Panel

A question was asked about the proportion of biofuel that can be blended because the Christchurch B5 bus (5% biodiesel) continually breaks down due to wax settling at low temperatures. Andy Matheson responded that different biofuels have different temperature resistance and most problems can be sorted out with blending. Biodiesel from soy and canola have good cloud point properties while similar fuels from palm oil and tallow have relatively poor properties. The government was becoming aware of the problems and technical details will be specified to avoid them. Barry Blackett (BP) said tallow biodiesel does have cold use problems in some parts of the country – B10 would be the limit in Auckland. However, he noted these are first generation biofuels and within 15-20 years, performance will have greatly improved.

A Lexus hybrid owner commented that capital costs were significantly less than a petrol V8 car yet performance is better and fuel costs were less than a third. Lloyd Robinson responded that different car manufacturers had different marketing strategies

but they did not necessarily match the manufacturing costs. The significant cost of battery replacements was still a major unknown.

In response to a question about road freight performance, Kathy Perreau admitted there was a single measure of truck fuel use per kilometre and the pros and cons over the whole network had not been evaluated. A similar question about improving the performance of the ageing car fleet had no simple answer because the average engine size had increased from 1500 to 2000 cc. Engine technology has improved but it has been offset in fuel efficiency by the move to bigger and safer cars. People purchase cars for the overall mix of tasks they need to perform, so age is not the only factor.

A comment was made that it would take a brave government to attempt to regulate means of switching freight modes back to rail and sea. Kathy Perreau responded that companies had found various means of avoiding the old 200 km road freight limit in the early 80s. A major difficulty for mode switching is building the capacity of people with infrastructure experience over long periods of mixing road with rail and sea transport. There are easier gains to be made from such creative solutions (together with more monitoring) compared with costly bridge and tunnel improvements. A further comment was made that it is inappropriate to compare NZ with other countries without noting the high proportion in our economy of transport of low value high volume goods.

A question was asked where older vehicles would go if there is a major shift to newer vehicles. Kathy Perreau responded that there is a high natural attrition rate now that the imported used vehicles boom has stabilised. There are also ways of creating a value in scrapping a vehicle (greater than its scrap metal value). She also noted that a quick fuel price rise to say \$2.50 per litre could have a bigger impact (on say public transport) than a slow rise to \$3 per litre. Elasticities are currently being studied in relation to recent behaviour changes.

Barry Blackett summarised the session by saying that the government must be aware of unintended side effects of its policies. EFNZ had always argued for an NZES and while many might describe it as 'too late', the government should also be congratulated for developing a future energy vision.

Heat Strategy Panel

Ralph Samuelson (MED) asked what measures the government could take to encourage industrial energy efficiency. Stephen Drew answered that demonstration rather than research was needed – funding for training engineers on site would be valuable.

Ralph Chapman asked Stephen Drew how he had developed his cost curve for his estimate of 20% potential industrial efficiency savings. Mr Drew referred to an MED paper and said the main barrier was the need to persuade the government of its role to facilitate such measures. He said refrigeration plant energy cost is greater than its capital installation cost so it makes sense to invest in small improvements. Shifting short term to long term thinking must be part of improved sustainability.

Ian Twomey commented that some industry representatives are facing 30% internal investment return criteria. Perhaps energy supply companies had a role in facilitating relatively short payback projects. Mike Suggate responded that Energy for Industry will consider projects with a clear 5-6 year payback period but venture capitalists would not go much better than that.

Bill Armstrong (Todd Energy) noted that Rilke De Vos had commented the government had not considered all aspects of its NZES proposals and asked Catherine Beard about her lack of balance criticism of the NZES. She responded that there was a big risk of grossly sub-optimal outcomes. The GPC survey of a wide range of businesses showed the ETS would have major impacts. The economic analysis required to justify such a strategy is lagging behind and the Climate Change Leadership Forum has identified many aspects of economic work that need to be undertaken. NZ needs to ensure that we have economic growth or we will struggle to stay viable. Many businesses will be setting out their concerns to the Select Committee.

Electricity Strategy Panel

In response to a question about tidal generation in Cook Strait, Bill Heaps responded that if some EU countries (with large much larger tidal ranges in estuaries) have not yet managed to make it work economically, it will take a long time before the technology becomes mainstream. Guy Waipara added that Meridian considers it very expensive (behind solar in priorities).

Ralph Matthes considered the NZES should have looked at all solutions rather than trying to pick a winner. One member of the audience commented that the NZES was

right to highlight the huge potential (triple current levels) of geothermal. In contrast, Meridian's analysis had shown it would require a large capital outlay for an uncertain outcome. Bill Heaps added that there were major consenting constraints including land subsidence and sustainability of individual resources.

Bill Heaps responded to a question about the role of the Whirinaki standby diesel fired plant by saying it had distorted the market by cutting prices. Consequently it had created regulatory uncertainty for generators (going against the factors that make wind generation economic in this country). Ralph Matthes offered a personal view that it costs electricity users about \$30M per year because major users believe the government has missed the opportunity to reduce load much more cheaply when this is needed for supply security. Alan Jenkins added that the government was pushed in that direction by an imperfect market that was not delivering in terms of supply security.

Guy Waipara responded to an Alan Jenkins comment about the expense of wind turbines delivery by saying that shipping is relatively cheap here and the real issue is the global availability of turbines.

Concluding comments

Rob Whitney concluded the day by saying work needed to be started on the next NZES with improved analysis tools (such as EnergyScape) and greater consideration of the cost issues associated with threats to energy security and competitiveness. The long term vision of the hydrogen economy and the shortcomings of biofuels had been addressed. It was clear that major forest plantings would be needed if wood is to be a significant future energy supply option.

He acknowledged the large role for demand side issues and noted that this was the reason for placing this session first. There were some mixed messages with regard to demand: some wanted to see increased research while others believed the knowledge is already there and action is needed. He was disappointed there had not been more discussion of the paradigm shifts that are happening within the demand side and how our way of life is linked to demand decisions (energy creates wealth and we spend it partly on using more energy).