

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a suite of applications for resource consent by the Ashburton Community Water Trust

FOR resource consents to construct, operate and maintain an intake, settling pond, fish bypass, canals, tailraces and associated infrastructure to enable the take, divert, use and discharge of up to 42 cubic metres of water per second from the Rakaia River via the Ashburton Community Water Trust intake at Happy Valley, and to use it for hydro-electricity generation and associated purposes.

Resource Consent Application No's:
Ashburton District Council: - LUC07/0030

Environment Canterbury: - CRC072637,
CRC072636, CRC073863, CRC072638,
CRC072639, CRC072640, CRC072641,
CRC072642, CRC073862, CRC073864,
CRC072643, CRC072644, CRC072645,
CRC072646, CRC072647, CRC072648,
CRC072649

BRIEF OF EVIDENCE OF JOHN PHILIP SMALL

Dated: 8 September 2008

1 Introduction

1.1 My name is John Philip Small. I am a consulting economist based in Auckland and employed by Covec Ltd. I have worked as a consulting economist for more than 15 years. Most of my work concerns the design or implementation of public policies that affect business activity. I frequently assist official clients in the design and assessment of policy options. I also advise private firms that are affected by public policy.

1.2 I hold a PhD in economics from the University of Canterbury, and was previously employed as an academic economist at the University of Auckland, including serving as Head of Economics during 2003-04. My academic research has been published in several highly ranked international journals.

1.3 Over the last 14 years I have undertaken many contract assignments related to the electricity industry and to energy issues more generally. This has included work on electricity transmission pricing in New Zealand and Australia, and on the modelling of efficient transmission investment in California and New Zealand. I have contributed to several energy modelling projects Covec has undertaken for the Ministry of Economic Development and the Energy Efficiency and Conservation Authority, and advised the Electricity Commission on hedge markets, and on demand side issues including policy interventions related to electric motors. Following the appointment of David Parker as Minister of Energy I was also engaged by the Ministry of Economic Development to assist with analysis of various aspects of the markets for electricity in New Zealand.

2 Scope of Evidence

2.1 The purpose of this evidence is to provide an overview from an economists' perspective of the role of renewable energy generation in New Zealand's energy sector, with a focus on hydroelectricity and the Rakaia River Project. I have organised my evidence under the following headings:

2.1.1 The importance of electricity;

2.1.2 The role and benefits of renewable electricity sources generally, and hydro-generation specifically;

2.1.3 Government policies promoting renewables;

2.1.4 The need for new generation;

2.1.5 The desirability of regional electricity generation schemes.

3 The Importance of Electricity

3.1 Electricity is used prolifically throughout our society. Its basic characteristics of reliable central generation, safety (e.g., compared with formerly popular energy sources such as kerosene) and a multitude of beneficial end-uses have made electricity a necessity as well as a convenience for the populations of developed countries.

3.2 Today, electricity is an essential input to commerce and industry in New Zealand as well as to the personal lives of New Zealanders. There are limited alternatives for many of electricity's uses, so shortages require us to stop or change many of our activities, which imposes significant costs. This is particularly true in the short-run, because our homes and workplaces are geared towards using electricity as an energy source. The available evidence suggests that interruptions to electricity supply cost around 60 times the normal retail price of electricity.¹

3.3 In addition to its widespread existing uses, there is potential for electricity to start replacing oil-based transport fuels within New Zealand's vehicle fleet. The transport sector is New Zealand's largest consumer of non-renewable energy sources. Along with biofuels, the use of electricity (eg in hybrid plug-in and electric vehicles) as a transport fuel is seen as a good way to reduce New Zealand's greenhouse gas emissions and increase the security of our energy supplies.

3.4 The potential for renewable energy sources such as electricity to provide an alternative fuel source for vehicles has been noted by the Government in a number of policy documents, including the New Zealand Energy Strategy, which states:

Switching to electricity as a fuel for our vehicles would make the most of New Zealand's abundant renewable electricity supplies, particularly if transport was not competing for supply at times of peak demand.

¹ http://www.med.govt.nz/templates/MultipageDocumentPage_____20054.aspx

4 The Role and Benefits of Renewables Generally, and Hydro-Generation Specifically

4.1 It is widely agreed that the following are the key characteristics of any sustainable energy system:

- security of supply;
- environmental impacts; and
- pricing.

4.2 These three elements feature in virtually all serious analyses of energy policy. Similarly, most individuals want good security of energy supplies, low environmental impacts and cheap prices. I comment on each of these characteristics below, paying particular attention to the role of renewable energy sources such as hydro-electricity in meeting New Zealand's energy objectives.

Security of supply

4.3 Long term security and reliability are important features of a well-functioning energy system. Currently, our economy and society are heavily reliant on the continued availability of non-renewable energy sources in New Zealand and overseas. As an importer of fossil fuels, New Zealand is exposed to supply uncertainties and price fluctuations in the international markets for oil products in particular. In 2005, Covec was contracted by the Ministry of Economic Development to investigate oil security issues in New Zealand. Our report summarised the position as follows.²

New Zealand has an unusual combination of supply vulnerabilities. It faces the same broad range of possible external supply disruptions as do all IEA members but these are exacerbated by such things as its current level of import dependency, remote geographical location at the furthest extent of the international supply chain and relative isolation from other countries from whom relief could be expected in some situations.

² Oil Security, page 10, available at <http://www.med.govt.nz/upload/25065/adjusted-final.pdf>

- 4.4 Greater use of renewable energy sources can help to alleviate these risks. Compared with other countries, New Zealand has significant renewable energy resources. Our climate, geology and low population density make energy sources such as hydro, geothermal, wind, solar and wave power relatively accessible to us. Hydro, wind and geothermal generation have already reached commercial maturity in New Zealand, with hydro-generation having been an important domestic energy source for a number of years, particularly in the South Island.
- 4.5 The development of a hydroelectricity generation plant on the Rakaia River would add a valuable additional resource to New Zealand's renewable energy basket, helping to reduce our reliance on imported fuels and the risk of energy shortages.

Environmental impacts

- 4.6 Because they do not burn fossil fuels, renewable generation technologies have none of the greenhouse gas emissions that are a by-product of thermally generated electricity. Moreover, adding a hydroelectricity plant to New Zealand's generation portfolio reduces the need for further thermal plant. As a result, the accrual of some greenhouse gas emissions would be avoided, thereby helping New Zealand meet its commitments under the Kyoto Protocol.
- 4.7 It is acknowledged that poorly planned and designed hydroelectric projects do have the potential to disrupt surrounding ecosystems as a result of changes in the river environment brought about by generation activities. The extent of these ecological impacts should be considered alongside the benefits of reduced greenhouse gas emissions to form a complete view of the environmental implications of the proposal.

Price

- 4.8 The cost of energy is important because it is a component of the prices we pay for all goods and services, virtually all of which require some energy inputs. Because of these far-reaching impacts, energy costs are a significant factor influencing New Zealand's economic growth and development. They are also a major issue for many families who struggle to afford adequate heating. Accordingly, it is important to consider the relative costs of various alternative energy projects when deciding which option(s) to pursue.

4.9 Although hydro projects can be relatively expensive to build (including long lead-times for site studies, hydrological studies, and environmental impact assessments), once constructed their variable costs of generation are extremely low. Like wind, the fuel source for hydro plants (water) is free. This provides hydro-generation with a significant advantage over fossil fuel sources, which face the cost of procuring fuel inputs in addition to other costs of generation.

4.10 It should be noted that electricity pricing in New Zealand is market-based. Prices depend on the variable cost of the most expensive plants needed to meet demand. Adding a new plant with a low variable cost (such as the one at issue in these proceedings) will unambiguously reduce the need to run more costly plants, although the size of its impact on national retail prices will probably be quite small. The exception to this would be if it is integrated or developed within the current Ashburton transmission network in which case District benefits and a reduction in retail prices could be more direct.

5 Government Policies Promoting Renewables

5.1 In recognition of the benefits discussed above, there have been multiple government initiatives in recent years promoting the development of renewable energy sources in New Zealand. Some of these policy initiatives are described briefly below.

5.2 The Sustainable Development for New Zealand Program of Action, released in January 2003, identifies four key issues affecting New Zealand's long term sustainable development, of which energy is one. The document states:

We must find ways of growing as a nation that manage the demand for energy and limit the damage to our environment.

5.3 The Program of Action includes the following list of 'Desired Outcomes,' which expressly includes the development and maximisation of renewable energy sources:

- *Energy use in New Zealand becomes progressively more efficient and less wasteful*
- *Our renewable sources of energy are developed and maximized*
- *New Zealand consumers have a secure supply of electricity.*

5.4 The New Zealand Energy Strategy to 2050 (NZES) describes the Government's "energy vision for New Zealand" as follows:

A reliable and resilient system delivering New Zealand sustainable, low emissions energy services, through:

- *Providing clear direction on the future of New Zealand's energy system*
- *Utilising markets and focused regulation to securely deliver energy services at competitive prices*
- *Reducing greenhouse gas emissions, including through an emissions trading scheme*
- *Maximising the contribution of cost-effective energy efficiency and conservation of energy*
- *Maximising the contribution of cost-effective renewable energy resources while safeguarding our environment*
- *Promoting early adoption of environmentally sustainable energy technologies*
- *Supporting consumers through the transition.*

5.5 The NZES sets out the Government's target of 90 per cent of electricity being generated from renewable sources by 2025. In support of this objective, the NZES states:

It is in New Zealand's longer-term economic and environmental interests to meet increases in demand through an economic mix of renewable energy sources that will meet our security objectives. It is easier for New Zealand to commit to a low emissions electricity system than almost any other country.

5.6 The New Zealand Energy Efficiency and Conservation Strategy (2007) (NZECS) is a companion document to the NZES. The NZECS sets out a series of detailed plans "to respond to long term challenges of energy security and climate change." Its two main policies are:

(1) continuing improvement in energy efficiency; and

(2) progressive transition to renewable sources of energy.

5.7 The Government's Policy Statement on Electricity Governance was released in May 2008. It sets out the objectives and outcomes that the government directs the Electricity Commission to implement in order to give effect to the strategies contained in the NZES and NZEECS.

5.8 The Policy Statement adopts the NZES target of generating 90 per cent of electricity from renewable sources by 2025 and emphasises the role of renewable energy sources in the Government's long term energy strategy:

Encouraging the development of renewable energy resources is a key part of the Government's NZES for managing climate change and long term energy security.

5.9 The Government's specific objectives in relation to renewable electrical energy are stated as follows:

- *undue barriers to investment in renewables should be reduced or removed*
- *the efficient uptake of renewable generation should be promoted*
- *the national transmission grid should be planned and made available so as to facilitate the potential contribution of renewables to the electricity system*
- *the specification of the grid planning processes and approval criteria should allow grid upgrade plans to facilitate the efficient and timely development of renewable generation resources, taking into account any difference in lead times for transmission and generation investment.*

5.10 The government has also recently proposed a National Policy Statement for Renewable Electricity Generation. It would establish, as a matter of national significance under the terms of the Resource Management Act, "the need to develop, upgrade, maintain and operate renewable electricity generation activities throughout New Zealand". The proposed objective of this statement is:

To recognise the national significance of renewable electricity generation by promoting the development, upgrading, maintenance and operation of new and existing renewable electricity generation activities, such that 90 per cent of New Zealand's electricity will be generated from renewable sources by 2025 (based on delivered electricity in an average hydrological year).

- 5.11 Under the terms of this proposal, local authorities would be obliged, by 13 March 2012, to “notify, in accordance with Schedule 1 of the Act, a plan change, proposed plan or variation to introduce objectives, policies and, where appropriate, methods, into policy statements and plans to enable activities associated with
- 5.11.1 the identification and assessment by generators of potential sites and energy sources for renewable electricity generation;
 - 5.11.2 research-scale investigation into emerging renewable electricity generation technologies and methods; and
 - 5.11.3 the development and operation of small and community-scale distributed renewable electricity generation.
- 5.12 As a further part of its overall strategy to reduce greenhouse gas emissions and increase investment in renewables, the government recently introduced a 10-year Moratorium on New Thermal Generation. The ban applies to the building of new baseload fossil fuelled power plants (smaller peakload thermal power stations may still be viable). The restriction is stated to apply except to the extent required to ensure the security of New Zealand's electricity supply.
- 5.13 Looking forward at a possible policy framework post election, the National Party recently issued its Energy Policy, in which it indicated that it would lift the moratorium but it would support the Government's target for 90% of electricity generation from renewable sources by 2025, would introduce an emissions trading scheme, and expects that scheme to effectively prevent the construction of new coal-fired electricity generation.
- 5.14 Finally, the New Zealand Emissions Trading Scheme (NZETS) is a far-reaching program that is likely to have major impacts on energy-related investment decisions. The Kyoto Protocol, which New Zealand ratified in 2002, commits New Zealand to reducing its net greenhouse gas emissions

over the period 2008-2012 to its Kyoto Protocol target (which is based on 1990 emissions) or “take responsibility” for the excess.

- 5.15 The NZETS, announced late last year, is the primary mechanism for facilitating New Zealand’s compliance with its Kyoto targets. Participants in the scheme are required to surrender tradable emissions units to cover their greenhouse gas emissions. The NZETS is linked to the international Kyoto trading system and is intended to cover all sectors of the New Zealand economy over time.

6 The Need for New Electricity Generation

- 6.1 There is ongoing pressure for new generation to meet the needs of New Zealand’s growing population and increases in the ways in which electricity can and is being used in our society. In New Zealand, this need is particularly great because of the insufficiency of our existing electricity sources to satisfy demand on a consistent basis.

- 6.2 While New Zealand has adequate generating capacity to meet demand under normal conditions, we tend to run short of electricity during dry winters. This is the reason for the public campaigns calling for electricity demand reductions during the winters of 1992, 2001, 2003 and 2008. These shortages are caused by low rainfall, combined with the relatively modest levels of water storage in New Zealand’s hydro-electric system. Most of New Zealand’s hydroelectricity is generated in the South Island. When low rainfall reduces the output of South Island hydro power stations, the South Island needs to rely more heavily on electricity generated in the North Island in thermal power stations.

- 6.3 The risks associated with dry years are increasing in light of the tightening of New Zealand’s once plentiful gas supplies with the expected depletion of the Maui Gas Field. At the same time, national imperatives relating to climate change policies, whether these are reflected via the current moratorium on thermal plant or more directly via the pricing of emissions, are reducing the potential for non-renewable energy sources to fuel electricity generators.

- 6.4 In order to minimise the risk of supply outages and blackouts, the Government has purchased a 155 MW diesel-fired reserve energy plant which is located at Whirinaki near Napier. The Whirinaki plant is expressly tagged as a dry year reserve plant which is only available to the wholesale electricity market when prices exceed a pre-set elevated threshold level.

- 6.4.1 While there is some debate about the likely magnitude of future growth in demand for electricity, it is certainly agreed that demand will continue to grow. It follows that more generation is required, even if New Zealanders are willing to continue living with shortages in dry winters, and even if we do not move towards greater electrification of the vehicle fleet.
- 6.4.2 In light of considerations relating to environmental impacts and cost, it is preferable that new generation projects target renewable energy sources where it is feasible to do so. The Rakaia hydroelectricity project would provide needed additional generation capacity using a zero-carbon emitting renewable resource.

7 The Desirability of Regional Electricity Generation Schemes

- 7.1 The proposed project is particularly desirable for Canterbury, for two reasons. One is that Canterbury is experiencing some forms of demand growth that are absent from other regions. The farming industry has been and still is growing strongly in Canterbury. This industry uses electricity for irrigation, for food processing and milking shed operations, and to process milk in factories.
- 7.2 The second reason is that it is costly to transmit electricity into and around the region. There are two types of transmission cost savings enjoyed by generation plants that are located close to demand. First, the level of capital expenditure required on transmission infrastructure (e.g. upgrades to the national grid) can be lower than that associated with more widely distributed sources. Second, electricity is lost as it is shifted through power lines and these losses are minimised by locating generation close to demand. The contribution of the Rakaia plant to avoided transmission losses depends on many factors. However it has been estimated that on average 3.8% of electricity is lost in transmission across New Zealand's national grid, with an additional 6.3% being lost over local distribution networks.
- 7.3 I note that the proposed site is close to an existing transmission line that connects the Coleridge power station to Hororata, from where it travels to Christchurch via Islington. It is also positioned well in terms of being able to be integrated into the Ashburton District transmission network. I expect that this location will allow the ACWT scheme to contribute in a cost-effective way to the electricity needs of households and businesses in Ashburton and the wider Canterbury region.

John Philip Small
25 August 2008