# STATEMENT OF RICHARD MICHAEL HAWKE

## Statement of qualifications and experience

1. My full name is Richard Michael Hawke. I am the manager of the Energy and Environment Group in the Ministry of Economic Development.

2. I am representing the Ministry, the Energy Efficiency and Conservation Authority (EECA) and the Electricity Commission. These answers were prepared by the three agencies. With me are Kent Hammond and Mark Walkington from MED's Energy Information and Modelling Team, John Gleadow from the Electricity Commission, and Nathan Ross and Steve Torrens from EECA.

## Scope of statement

3. The Board of Inquiry for the proposed NPS has asked the Ministry, the Electricity Commission and EECA the following questions:

Renewable target and modelling

1. What is the timetable for completion of the review of the NZ Energy Strategy?

2. What effect will proportions of renewables above 90% have on the cost of delivered electricity per megawatt hour?

3. What effect will proportions of renewables above 90% have on the cost of transmission?

4. What is the expected capacity growth in electricity generated from the wind between 2007 and 2025?

5. What are the expected effects of the emission trading scheme or system on the price of and demand for electricity looking forward to 2025?

6. Was there any work done to estimate the impact on electricity supply of the decision to repeal the Renewables Preference Act?

7 Has the modelling of the electricity generation system been updated to take into account the needs of increased security of supply?

Electricity Commission work

8. What are the expected outputs of the Electricity Commission's Transmission To Enable Renewables report, has the report identified any possible refinements to the regulatory framework and, if so, what refinements have been identified?

9. How could Part F of the Electricity Governance Rules be utilised to support the integration of renewable electricity generation into the New Zealand electricity system? In particular, should these rules be considered an alternative to a NPS or as an enhancement to an NPS?

10. Renewable energy (p18, para 66); Could the Commission explain para 66 bullet 4, and comment on any implications for the provision / incentivisation of renewable generation? What sort of lead times are in consideration, for example?

11. Integration issues (para 78): Does the dropping of the old para 78 have any implications for the integration of hydro and wind generation?

12. Objectives for the provision of transmission services (para 71, 5th bullet): Could the Commission tease out the implications of this bullet for renewable electricity generation (noting its reference to the grid facilitating the contribution of renewables)?

13. Investment in … the network (para 77, 2nd bullet): What work is going on or planned to ensure adequate identification of opportunities for transmission alternatives, especially local generation?

14. Transmission alternatives (para 96) and Cost recovery. (para 99): Taking these two paragraphs together, how are these two paragraphs to be aligned? Could the 'strong incentives… [for] options… including distributed

generation' (para 99) take the form of 'payments' (para 96)? Are they likely to take this form?

15. To what extent, as wind generation increases, will further hydro or thermal firming capacity be required, to maintain security of supply?

Energy efficiency

16. What is the expected effect of the energy efficiency measures to be included in the upcoming budget on electricity demand?

17. Are other countries and jurisdictions such as the USA or California, Australia, UK and Europe increasing their rate of autonomous energy efficiency improvements in their modelling looking forward?

18. Can you provide the most recent historical data on energy efficiency uptake? Looking forward, likely uptake?

19. What effect is the installation of solar hot water systems expected to have on electricity demand in 2025 – within some bounds of uncertainty?

20. What does the data show about solar water heating uptake and looking forward what is the likely uptake?

21. Are there any districts (other than Nelson) providing support for solar water heating, such as financial planning, etc?

Small-scale generation

22. What contribution does up to 4 MW and up to 10 MW generation deliver?

23. Can MED provide any statistics regarding communities that are not connected to the distribution lines?

## Answers

### Renewable target and modelling

**Q1: What is the timetable for completion of the review of the NZ Energy Strategy?**

4. We expect the update of the Energy Strategy to be completed by the end of this year.

**Q2: What effect will proportions of renewables above 90% have on the cost of delivered electricity per megawatt hour?**

5. The impact on the cost of delivered electricity from higher levels of renewables has not been modelled.

**Q3: What effect will proportions of renewables above 90% have on the cost of transmission?**

6. Modelling in support of the renewable electricity target did not consider transmission costs for proportions of renewable generation greater than 90% in any great depth.

7. The modelling did assess *approximate* incremental inter-regional transmission costs required to support different proportions of renewable electricity. The modelling indicated that for most of the scenarios considered transmission costs decrease as the proportion of renewable electricity increases from approximately 90% to 93%. This implies that the additional renewable generation required to reach 93% was located close to major sources of electricity demand. No analysis of the results was, though, undertaken to confirm this.

**Q4: What is the expected capacity growth in electricity generated from the wind between 2007 and 2025?**

8. We are not able to expand any further on our answer previously given.

**Q5: What are the expected effects of the emission trading scheme or system on the price of and demand for electricity looking forward to 2025?**

9. The most recent published estimates are from the Benefit Cost Analysis of the New Zealand Energy Strategy, October 2007. This analysis suggests that, compared with a zero emissions price, a $25/tonne emissions price would increase the wholesale electricity price by around 3%, and reduce total electricity demand in 2025 by around 0.5%. Updated information is expected to be available in August.

**Q6: Was there any work done to estimate the impact on electricity supply of the decision to repeal the Renewables Preference Act?**

10. Work was completed to estimate the impact of introduction of the renewables preference policy, which broadly concluded that the impact would be minimal, or nil, as, assuming an emissions price, baseload renewable options were likely to be the most cost-effective options anyway.

**Q7: Has the modelling of the electricity generation system been updated to take into account the needs of increased security of supply?**

11. No. There have been no changes to security of supply needs.

## Electricity commission

**Q8: What are the expected outputs of the Electricity Commission's Transmission To Enable Renewables report, has the report identified any possible refinements to the regulatory framework and, if so, what refinements have been identified?**

12. Phase 1 of the project was completed in 2008. The output was a report by the Commission[1]. Key questions that remain unanswered from phase 1 which need addressing prior to the Commission considering possible refinements to the regulatory framework are:

    12.1 Where and of what magnitude are the economic renewable resources located? Key factors (as inputs to the economic modelling) include resource quality, capital cost, distance from existing grid (cost of connection), distance to demand (electrical losses), and cost of inter-regional transmission upgrades.

    12.2 What are the costs and constraints for the development of these resources and what new technology should be considered?

13. Phase 2 of the TTER project is broken into two broad analysis areas;

    13.1 Economic Analysis. Further development and use of the Commission's model to provide a set of co-optimized future renewable power system scenarios (given the inputs developed in Phase 1 of the TTER project and

[1] http://www.electricitycommission.govt.nz/pdfs/opdev/transmis/renewables/TTER-Final-report.pdf

feedback derived from the new technologies research reports which will be available by the end of July 2009); and,

13.2 New Technologies. Investigate new technologies — for example, giving further consideration to the issues raised in Phase 1 submissions regarding the use of new technologies such as high temperature conductor, special protection schemes and investigate the possible economic benefits that could result from these technologies.

14. Outputs of the above research will then be used to investigate possible changes to the regulatory framework — for example, considering whether a specific new connection contracting and pricing framework is required.

**Q9: How could Part F of the Electricity Governance Rules be utilised to support the integration of renewable electricity generation into the New Zealand electricity system? In particular, should these rules be considered an alternative to a NPS or as an enhancement to an NPS?**

15. The Electricity Governance Rules (EGRs) and the proposed NPS deal with different issues. As such, the EGRs would not be an alternative or enhancement to an NPS. To support the integration of renewable generation, the EGRs seek to minimise barriers to entry and to provide accurate cost reflectivity to ensure efficient development of both renewable and non-renewable resources (e.g. peaking plant to provide back up to wind generation).

**Q10: Renewable energy (p18, para 66); Could the Commission explain para 66 bullet 4, and comment on any implications for the provision / incentivisation of renewable generation? What sort of lead times are in consideration, for example?**

16. The Commission and Transpower have agreed on a Grid Upgrade Investment Review Policy[2]. This combined with the Grid Investment Test (GIT) (schedule F4 of Section III of Part F of the Electricity Governance Rules 2003 (Rules)) allows use of market development scenarios which include modelled projects. Modelled projects in each scenario include potentially economic generation development opportunities identified through the Transmission to Enable Renewables (TTER) work. When appropriate, this enables the Commission to approve transmission investment in advance of decisive by generator commitments to build. This is

[2] http://www.electricitycommission.govt.nz/opdev/transmis/gridupgradepolicy

important when new transmission lines are needed as these can have lead times in excess of five years. The Commission has to weigh up the benefit of approving such investment against the costs of the transmission investments as if not used, would still be paid by consumers.

**Q11: Integration issues (para 78): Does the dropping of the old para 78 have any implications for the integration of hydro and wind generation?**

17. No, it does not have any implications for the integration of hydro and wind generation.

**Q12: Objectives for the provision of transmission services (para 71, 5th bullet): Could the Commission tease out the implications of this bullet for renewable electricity generation (noting its reference to the grid facilitating the contribution of renewables)?**

18. To ensure the least cost provision of electricity, the Commission's focus is on facilitating development of the most economic generation sources, whether these are renewable or not. The participation of the Electricity Sector in a future Emissions Trading Scheme impacts the costs of thermal generation. This is taking account of when developing market development scenarios and so when considering the need for transmission investment.

**Q13: Investment in … the network (para 77, 2nd bullet): What work is going on or planned to ensure adequate identification of opportunities for transmission alternatives, especially local generation?**

19. Transpower currently has the opportunity to contract for Transmission alternatives and seek approval from the Commission for recovery of the costs incurred. Transpower has progressed this through its Grid Support Contracts (GSCs) arrangements[3]. However, there are concerns whether this process is effective as $2.7 billion of transmission investment has been approved but no funding has been approved for transmission alternatives (excluding the trial noted below).

**Q14: Transmission alternatives (para 96) and Cost recovery.. (para 99): Taking these two paragraphs together, how are these two paragraphs to be aligned? Could the 'strong incentives… [for] options… including distributed generation' (para 99) take the form of 'payments' (para 96)? Are they likely to take this form?**

20. The process for aligning the objectives and outcomes set out in paragraphs 96 and 99 of the GPS has evolved over time as the Commission has responded to both the

[3] http://www.gridnewzealand.co.nz/gsc

GPS, the requirements embedded in the Electricity Governance Rules 2003 (rules) and its wider responsibilities stemming from Electricity Act 1992. The relevant Commission initiatives, with respect to paragraphs 96 and 99, were the consideration of transmission alternatives (TA) and the development of a transmission pricing methodology (TPM).

21. In May 2005, the Commission prepared a consultation paper that asked industry stakeholders for their views on various policy options to enable the consideration and provision of TAs. In December 2005, the Commission published a summary of submissions and the Commission response, and sought cross submissions and comments on the Commission's analysis of submissions. The Commission published a review of cross submissions in June 2006. The Commission noted that there was no clear consensus emerging from the consultation with most generators expressing caution with respect to any rules setting out how Transpower could procure TA.

22. Major Energy Users Group and Todd Energy Limited generally supported the Commission's approach to developing a policy on the procurement of TA, Genesis Energy Limited, Mighty River Power Limited, the Electricity Networks Association and Meridian Energy Limited generally considered that a TA procurement mechanism was not necessary. Contact Energy Limited (Contact) supported a mechanism for procuring TAs as a risk management measure, but did not support central procurement of TAs that delay or avoid the need for transmission investment. Many cross-submitters repeated their views that a cost benefit assessment should be undertaken before any TA policy is introduced.

23. The Board decided that it would hold back the development of a mandatory policy (rules) to see if the industry and Transpower developed a bilateral contract that would facilitate the development of economic alternatives to transmission. The Commission supported this development by approving of $8.27 million of expenditure by Transpower to conduct a trial on the availability and reliability of demand-side participation to respond to requests to manage load in order to potentially defer transmission investment and for the development of a grid

24. As part of the process for developing the TPM, the Commission published a guideline that noted "Transpower may be required in the future to fund alternatives to transmission" and required that Transpower "should indicate in its proposed methodology how it intends to allocate the costs of transmission alternatives if they are funded by Transpower." Transpower's TPM includes such a provision.

**Q15: To what extent, as wind generation increases, will further hydro or thermal firming capacity be required, to maintain security of supply?**

25. The Electricity Commission expects some additional peaking generation capacity will be needed to support large wind investment, although this would still be small in comparison with the overall size of the national generation base. Further, the Commission would expect that wind generation investors would take account of the likely costs of this additional peaking provided by market price signals and so when wind generation investment does occur it would be part of an overall economic least cost efficient market national investment process.

26. Wind generation in New Zealand is expected to have a lower amount of annual variation than hydro as low wind yields and low hydro inflows are not fully correlated, that is, overall wind will not always be low during dry spells. In this respect, additional wind generation is better than hydro as it does not exacerbate dry year issues and so from an annual energy viewpoint, wind does not create a security of supply problem that is different to what would arise from underinvestment in any other generation technology. More information is available at http://www.nzier.co.nz/includes/download.aspx?ID=97640.

27. However, wind generation, along with non-storage (run of river) cannot be relied upon to meet peak load. Typical capacity factors of between 20 to 40% are applied. The greater the amount of wind in a system, the lower overall capacity factor and once wind energy generation exceeds 20%, the Commission would see

this as a significant issue. As other analysis have shown, New Zealand is well positioned to be able to efficiently integrate wind at up to this 20% penetration level by relying on peaking generating capacity provided mostly by existing hydro generation.

28. The Electricity Commission has noticed from initial evaluation of data from wind sites dispersed across the country that weather conditions and the linear NZ geographic layout can result in infrequent periods of simultaneous still air and no generation. For example, if this were to occur once every five years, then sufficient generation (or demand management) arrangements would be needed to meet demand at that time.

29. Going forward, more investment in peaking generation capacity will be needed as demand increases and the load shape exceeds the ability of existing largely hydro plant to meet demand peaks. Internationally, most electricity systems are peak constrained. Historically, New Zealand was different as it tended to be energy constrained. However, with load growth, New Zealand is reverting to the norm. Higher levels of wind penetration will also require further peaking generation.

30. When modelling wind generation for the 2008 Statement of Opportunities (SOO), the Commission made a number of conservative assumptions including one that it did not contribute to meeting peak demand at all (see section 8.14, page 115). These assumptions also help to reflect other system operation issues for which additional reserve generation may be required.

31. Managing security and reliability of supply at the least cost over time requires investment in the correct mix of generation and transmission assets. In the "sustainable path" scenario, the Commission modelled carbon prices rising to $60/tonne by 2018 (refer figure 26 in 2008 SOO). With this carbon price assumption, optimising generation development in this scenario resulted in substantial investment in wind generation from 2020 onwards (see figure 57).

32. Comparing the "sustainable path" scenario with, say, the "medium renewables" scenario, which has a significantly lower amount of wind generation (as figure 57

## Energy efficiency

**Q16: What is the expected effect of the energy efficiency measures to be included in the upcoming Budget on electricity demand?**

33. EECA project savings of 9.89 PJ over 22 years from three years of funding the Budget initiatives. This includes autonomous savings.

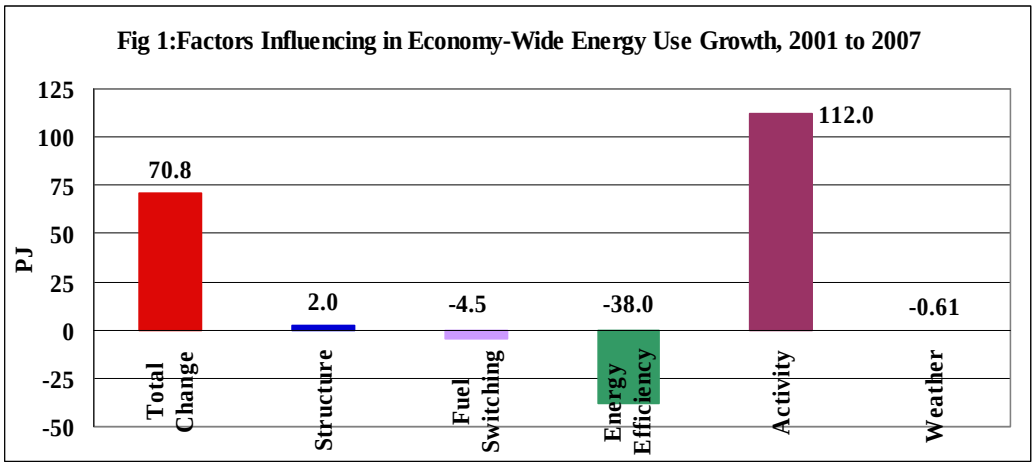
**Q17: Are other countries and jurisdictions such as the USA or California, Australia, UK and Europe increasing their rate of autonomous energy efficiency improvements in their modelling looking forward?**

34. We are not aware of what other jurisdictions are doing in this area.

**Q18: Can you provide the most recent historical data on energy efficiency uptake? Looking forward, likely uptake?**

35. Economy-wide energy use increased from 454 PJ in 2001 to 525 PJ in 2007 (a difference of 71 PJ). During the same period, energy efficiency improved, offsetting 38 PJ of energy use. Thus, if energy efficiency had not improved, our energy use would have been 563 PJ instead of the observed 525 PJ in 2007. On 454 PJ energy use in 2001, economy-wide energy efficiency improved at an average rate of 1.4% pa.

36. The analysis showed that about 35% of the increase in energy services enjoyed by New Zealanders was due not to new supply but due to efficiency gains. Figure 1 below shows the relationship between the change drivers and the net effect on energy demand in the economy.



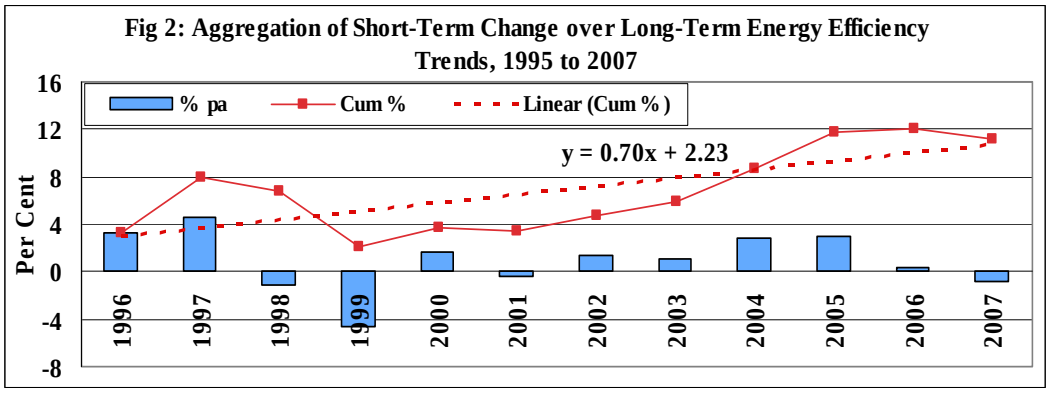

37. Most of the overall energy efficiency gains of 38 PJ came from electricity (17.6 PJ or 46.4%) followed by wood (10.4 PJ or 27.4%), solid fuel (6.5 PJ or 17.0%) and liquid fuel (4.9 PJ or 12.8%). Gas use energy efficiency worsened by around 1 PJ.

38. Residential energy use grew by 5.5 PJ from 59 PJ in 2001 to 64.5 PJ in 2007. Activity expansion alone caused energy use to grow by 7.1 PJ, mainly for an increasing population (4.5 PJ). Fewer people per household and larger dwelling sizes respectively contributed 1.1 PJ and 1.5 PJ towards the household structural effect. Improved living standards or wealth effect, especially higher heating levels, are reflected in these figures. It is mainly because of this (take-back) that energy efficiency improvement has not become visible. Fuel switching (a shift away from fossil fuels to electricity) caused energy use to decline by 1.1 PJ.

39. Commercial sector energy use decreased by 1 PJ from 48.4 PJ in 2001 to 47.4 PJ in 2007. Expansion of activity levels caused energy growth at 11.4 PJ. A 0.6 PJ decrease came from within the sector's structural change, with financial and construction sub-sector growing faster than trade or government services. Shifts towards more efficient fuels contributed a decrease of 3.2 PJ. Improvements in energy efficiency saved a total of 8.7 PJ of energy use (3.2%pa) out of which 4.7 PJ came from electricity.

40. Industrial, including agriculture, energy use increased by 32 PJ from 160 PJ in 2001 to 192 PJ in 2007 with activity expansion alone contributing 64 PJ. A trend

41. Transportation overall energy use increased by 35 PJ from 186 PJ in 2001 to 221 PJ in 2007. This sector's energy efficiency improved reducing energy demand by around 0.7 PJ.



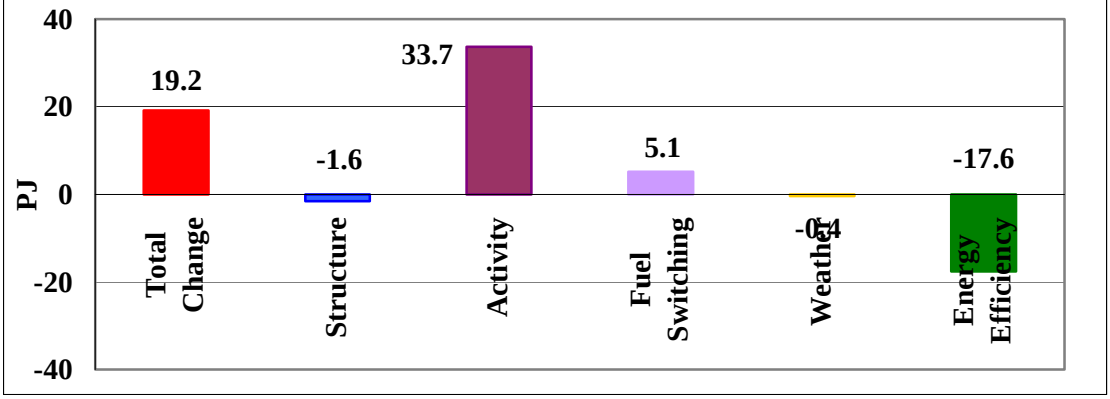

42. Figure 2 above shows that a more typical economy-wide medium term (1996 to 2007) energy efficiency improvement rate is 0.7% pa and this is likely to occur over the next few years. The most recent change of 1.4% pa from 2001 – 2007 is boosted significantly by the export-led increase in GDP, (and measuring export sectors in terms of international prices), and is likely to be a short-term situation.

43. The over-riding energy use drivers in the New Zealand economy are economic and population growth. Strong propensity for economic growth and demand for improved household and passenger transport services continued to drive New Zealand's energy use growth.

44. New Zealand's overall energy efficiency performance compares favourably with many other countries. For example, between 1990 and 2004, energy efficiency in the 14 IEA countries improved by a total of 14% or around 1% pa – much lower

45. The above analysis has also been undertaken for electricity. Figure 3 shows the analysis for the drivers behind the change in electricity demand over the past 6 years. Although activity led demand for electricity grew by 34 PJ, much of that growth in demand for electricity has been offset by the higher technical efficiencies (18PJ) enabled by new end-use technologies.

**Fig 3: Factors Affecting Electricity Use Growth, 2001 to 2007**




**Q19: What effect is the installation of solar hot water systems expected to have on electricity demand in 2025 – within some bounds of uncertainty?**

46. For determining the 2009-2025 impact of SWH, EECA used three scenarios that included various assumptions regarding sales trends and other factors.

47. The "most likely" scenario results in cumulative savings of 11.26 PJ for the said period. The "pessimistic" scenario results in 9 PJ savings and the "optimistic" scenario gives 14.6 PJ savings.

48. The wide range from the lowest to highest scenarios relates largely to attempting to forecast sales, which has fluctuated in recent years. Total industry sales increased from annual installations of less than 1000 in 2001, to over 4000 in 2007. Industry sales then declined in 2008 and continue to be affected by the downturn in the new homes market, a key market for SWH. However, EECA still anticipates installations to grow, on average, through to 2025.

49. 2008/2009 solar water heating (SWH) installation data collected from the Solar Industries Association and other suppliers suggests SWH installations will be similar or slightly lower than 2007/2008. This follows a decline of almost 20% in 2007/2008.

50. Forecast growth in the SWH market has not been realised over the past two years. Reasons for this include the economic downturn and resultant downturn in the new build housing market (a key market for SWH) and the lack of uptake of residential grants during the first year (07/08) of the current SWH programme

51. Government SWH grants issued during 2008/2009 exceeded forecasts. Many installations depended on government grant funding to proceed. This indicates that the SWH finance schemes are helping mitigate the effect of the economic downturn on the SWH industry.

52. Future growth in SWH installation volume will depend on a range of factors including the extent and length of the current recession, the availability of government grants to incentivise SWH installations, competition from other technologies, the ability of the industry to maintain or improve installation quality and performance.

**Q21: Are there any districts (other than Nelson) providing support for solar water heating, such as financial planning, etc?**

53. A number of councils provide support for SWH through the provision of zero or reduced fee building consents.

54. Councils providing support via zero or reduced building consent fees include (but are not limited to): Taupo, Hamilton, Waitakare, Westland, and Christchurch ($200 subsidy).

55. A number of Regional Energy Strategies are at various stages of development. These strategies often mention SWH as an opportunity in their district.

56. Expanding on the Nelson project, Nelson City Council is establishing New Zealand's first system of providing loans paid off through targeted rates specifically for the purpose of encouraging uptake of solar water heating. That scheme is scheduled to start in the 2009/10 financial year with the council seeking tenders probably in August / September for suppliers to participate in the scheme. Nelson City Council has also set up a highly streamlined process for assessing building consent applications for solar water heating installations.

**Small scale**

**Q22: What contribution does up to 4 MW and up to 10 MW generation deliver?**

57. In 2008, 4MW or below contributed 0.9% of capacity and 0.8% of generation. Generation 10MW or below contributed 2.4% of capacity and 2.2% of generation.

**Q23: Can MED provide any statistics regarding communities that are not connected to the distribution lines?**

58. It is not known exactly how many communities are not connected to the distribution lines in New Zealand, although unlike countries such as Australia where the number of remote off-grid communities is relatively high, in New Zealand this is not the case.

59. Neither the Chatham Island nor Stewart Island communities are connected to the mainland distribution networks. In both situations, reticulated electricity is provided through micro grids that connect the various houses and business on the islands.

60. There are also a number of communities and villages, especially in the East Coast region, where there is no connection to the electricity distribution network and as a result alternative energy supply options are used. The village of Papueru, for example, relies on a diesel generator to power the Marae and other buildings. There are thought to be a relatively small number communities similar to Papueru, although this has not been quantified.

62. tely 1600 domestic-scale stand alone power systems in New Zealand, with about 70-90 being installed each year. These systems typically power a single dwelling.