ELECTRICITY DEMAND FORECASTING ASSUMPTIONS

PURPOSE

1. This paper summarises the high level assumptions underlying the national level demand forecasts and briefly outlines the results of sensitivity analysis carried out to illustrate the relative impact of uncertainty in the underlying drivers of demand.

DISCUSSION

National level forecast assumptions

2. Electricity demand forecasts are prepared by the Electricity Commission as part of the grid planning assumptions underpinning the Statement of Opportunities. The draft national level forecasts that have been developed by the Commission incorporate forecasts of underlying drivers that are themselves subject to significant uncertainty. A key emphasis of the work undertaken by the Commission has been to assess the impact this uncertainty has on the stability of the forecasts.

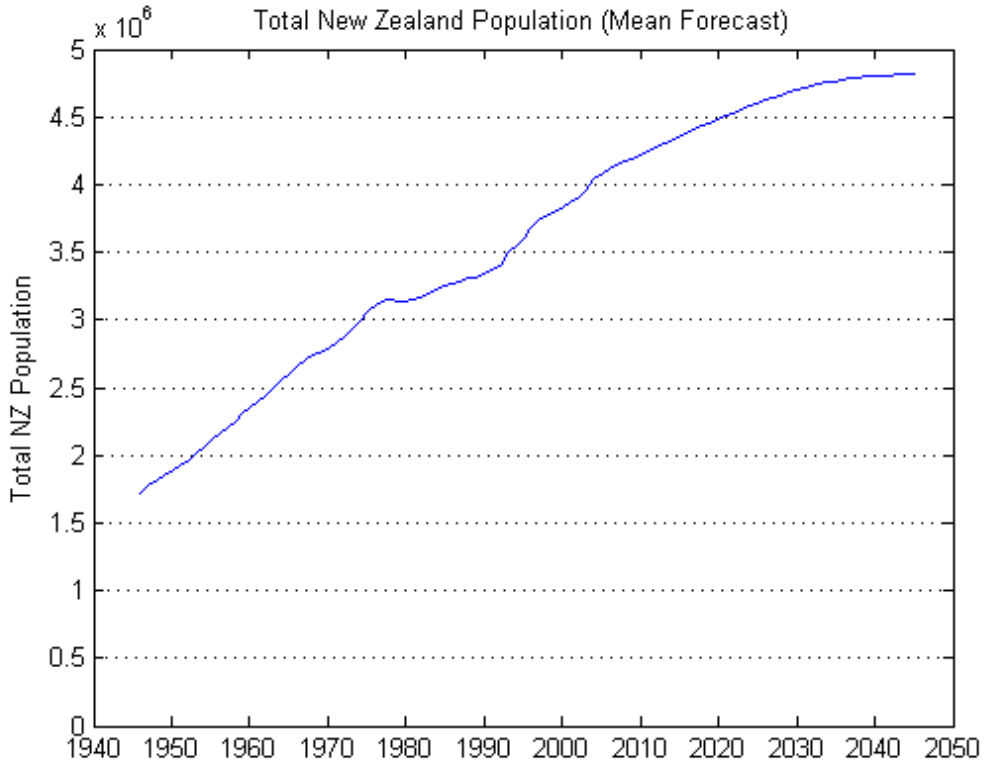
3. The forecast drivers are, where possible, obtained from external agencies in order to provide an independent and neutral assessment of possible outcomes. The following sections outline the various drivers used in the Commission's demand forecast model and their sources.

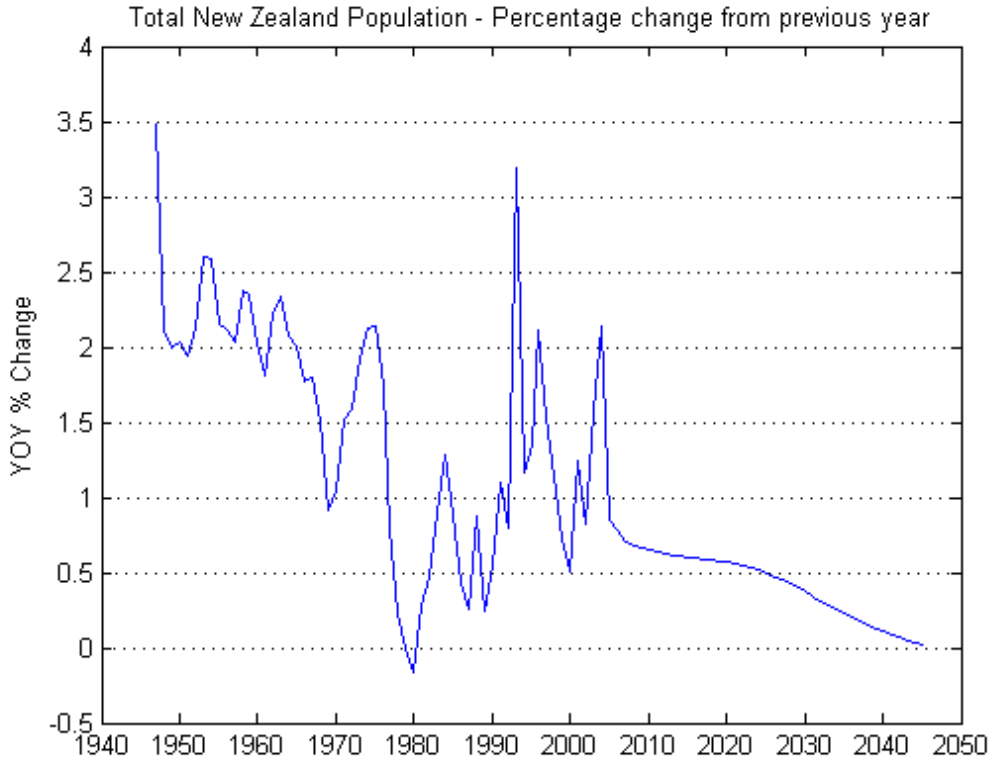
Population

4. Population forecasts are used directly in the residential forecast model, but also impact indirectly on the GDP assumptions used in the commercial/light industrial model. Long term population projections are prepared by Statistics New Zealand and are made publicly available through their monthly publications and on their website. Statistics provide a number of population scenarios, based on differing assumptions on birth, death and immigration rates.

5. The Commission is using the mid-level growth scenario published by Statistics New Zealand as a baseline for forecasting and assessing uncertainty. This scenario assumes medium fertility, medium mortality and long term net migration of 5,000 people per year[1]. The following graphs show historical and projected population, in total population and percentage growth terms.

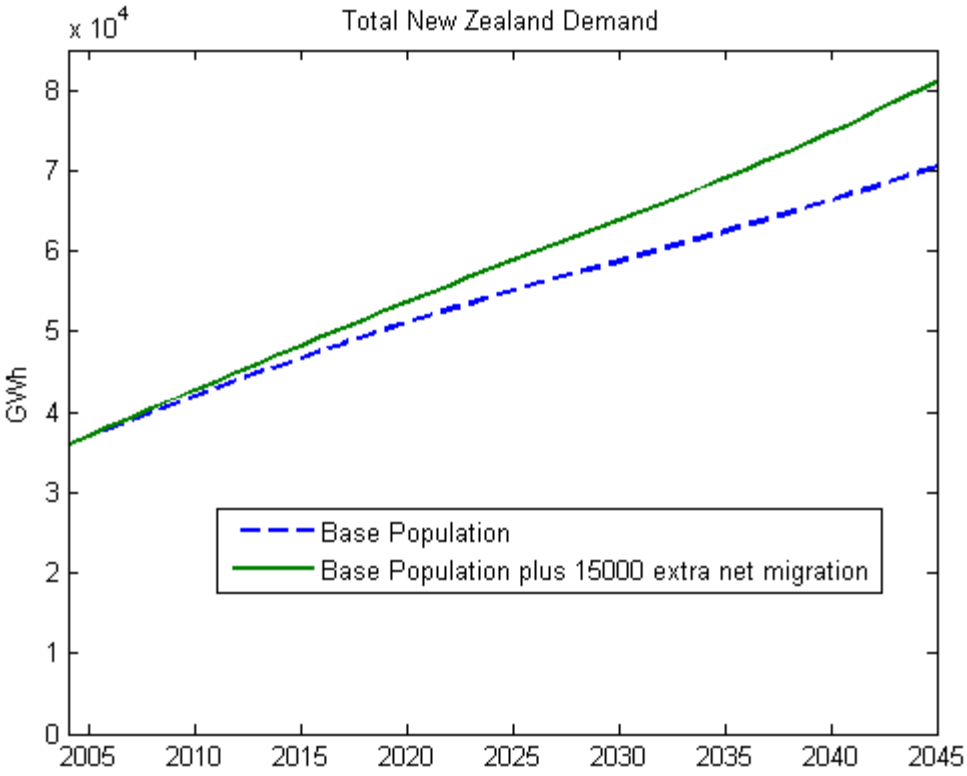
[1] Medium fertility = moving to an average of 1.85 births per woman from 2011 (in 2001 it was 1.97), Medium mortality = average life expectancy of 82.5 years for men and 86.5 for woman by 2051 (in 2001 it was 76.1 and 81.0 respectively)





6. Uncertainty in the population forecasts has been dealt with by applying a scale factor to the forecasts based on the various Statistics New Zealand scenarios. To illustrate the sensitivity of the forecasts to

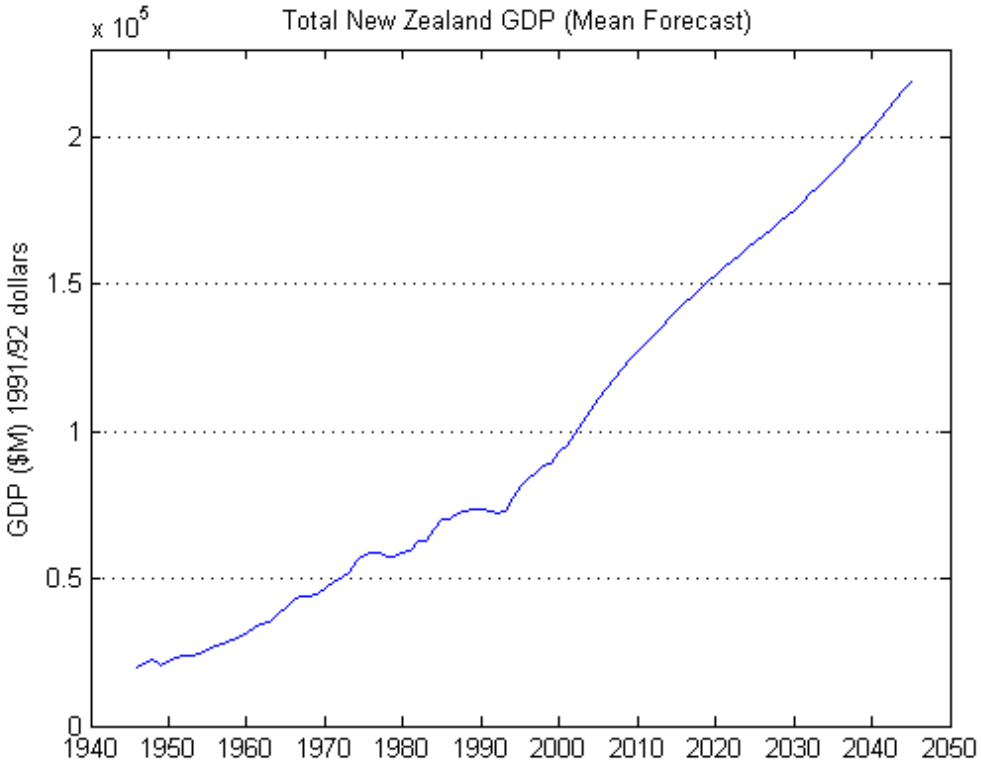
changes in the population assumptions, the following graph shows the impact of increasing the assumed net migration rate from 5,000 per year to 20,000 per year (raising the projected population in 2045 from 4,814,300 to 5,676,000). The average migration rate over the past ten years has been around 13,500 per year, although over the past two years it has been in the region of 35,000 to 40,000 per year.

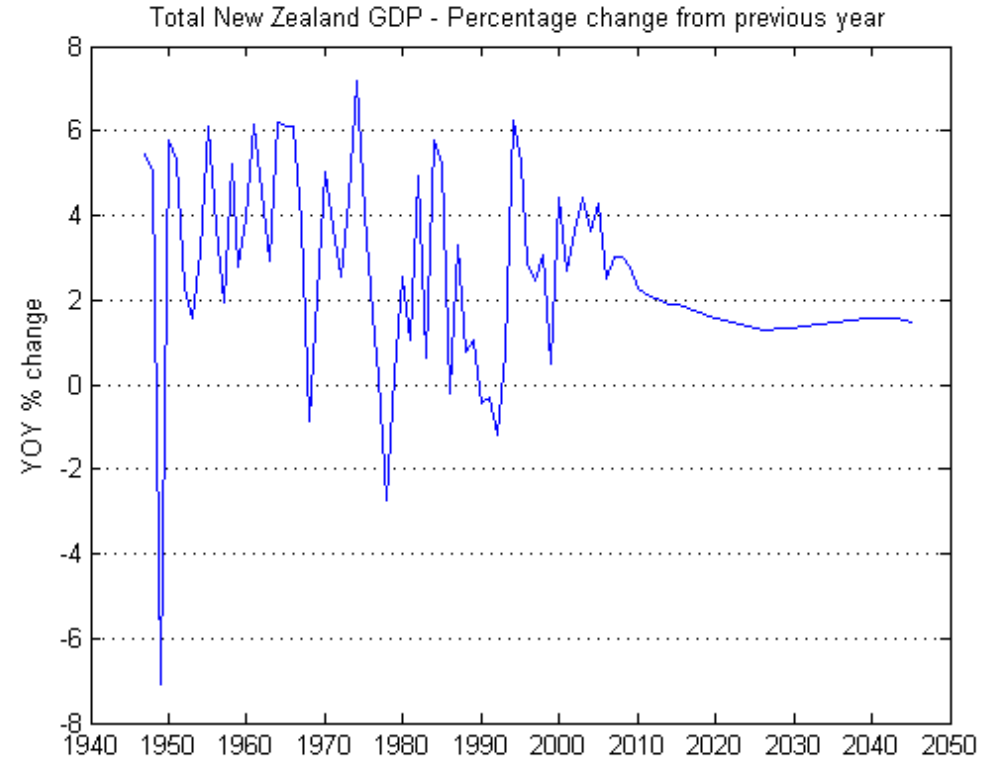


GDP

7. Gross Domestic Product (GDP) is used as a measure of total production in the economy and is an input to both the residential and light industrial/commercial models. NZIER are the only independent New Zealand agency that we are aware of that publishes long term forecasts (i.e. over 5 years).

8. The NZIER forecasts are derived from two underlying factors: projected population growth (consistent with the mid-level growth scenario published by Statistics New Zealand); and an assumed rate of productivity improvement. The following graph shows historical and projected GDP out to 2045.

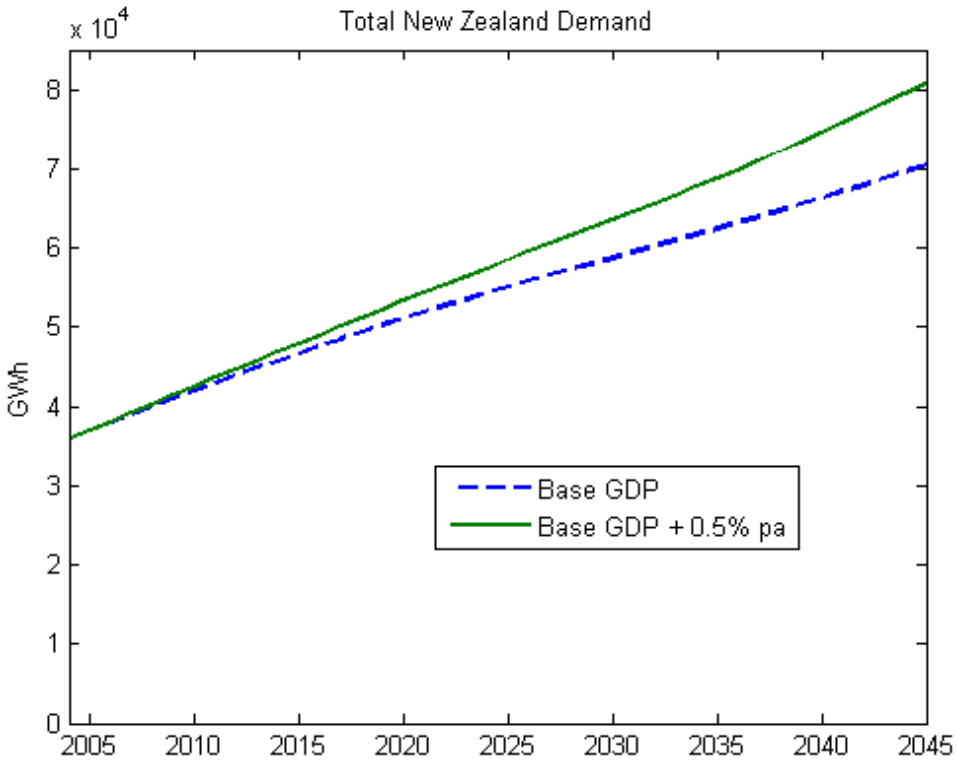




9. The NZIER GDP forecasts gradually reduce to a stable level of about 1.5% p.a. by 2025. For comparison, the Ministry of Economic Development assume a flat GDP growth rate of 2.5% out to 2025 for their “reference” demand forecast presented in their Energy Outlook publication.

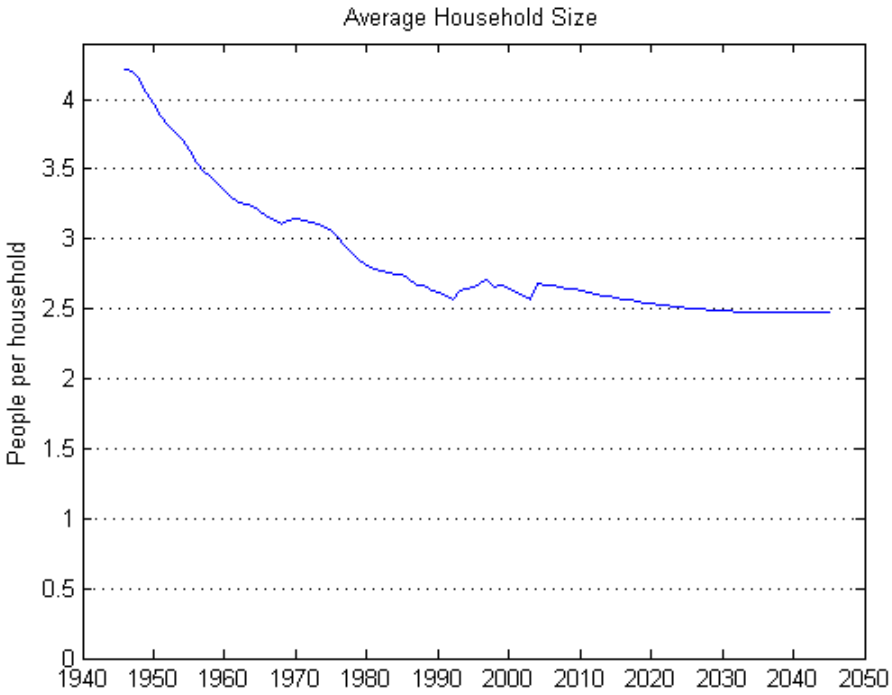
10. Uncertainty in the GDP forecasts uses three different sources of variation. The population component of GDP is kept consistent with the population scaling discussed above. The productivity component is varied based on an estimated range. Finally, a random component is included to introduce shocks from changes in the international environment (e.g. overseas market conditions). The shock component is based on historical variation against the underlying trend.

11. The following graph illustrates the sensitivity of the forecast to changes in GDP. In this case we have assumed an underlying increase in productivity of 0.5% per year over the current mean GDP forecast (population growth has been left unchanged).



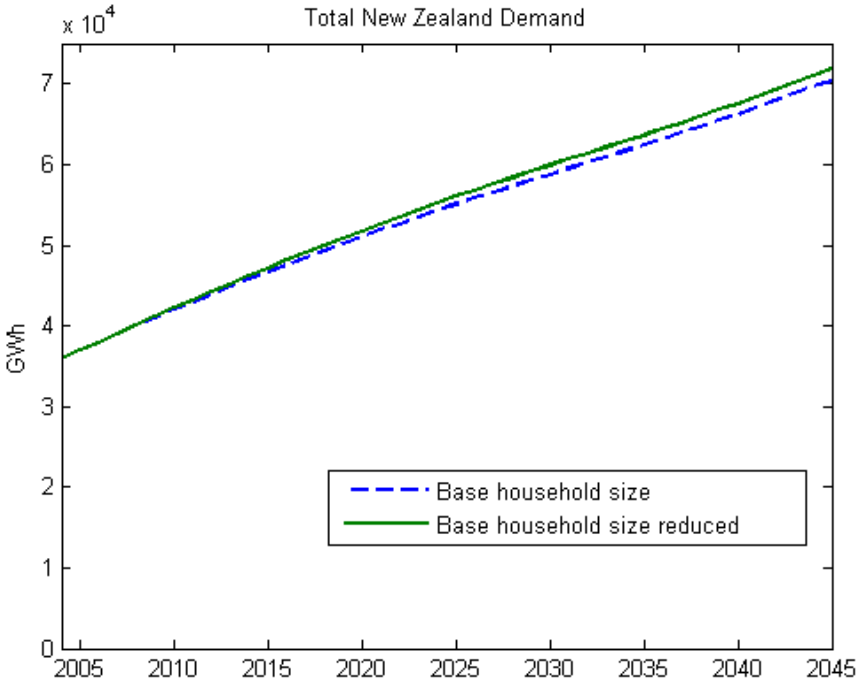
Households

12. The number of households is used as an input to the residential model. Household forecasts are prepared by Statistics New Zealand using the same set of scenarios used for the population forecasts. Essentially the only difference between the two is the inclusion of a projection of changes in average household size. The following graph shows historical and projected changes in household size used for the Commission's baseline forecast.



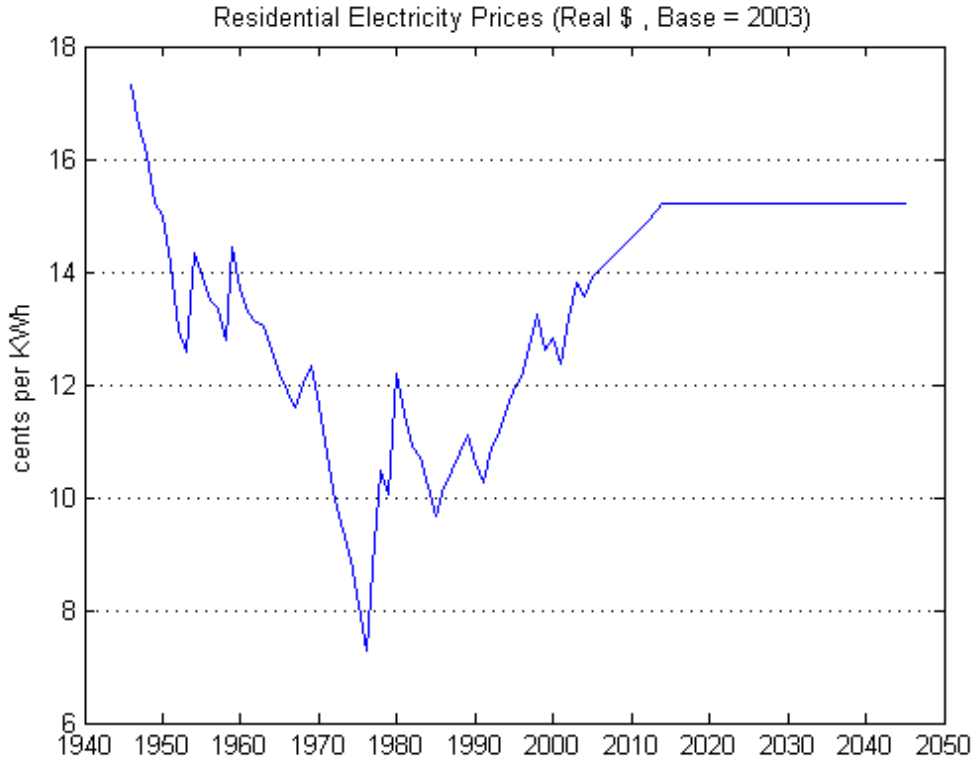
13. Uncertainty in forecast household size uses two sources of variation. Population changes are kept consistent with the population changes discussed above, and household size is varied based on the Statistics New Zealand scenarios.

14. The sensitivity of the forecasts to changes in household size is demonstrated in the graph below. In the baseline forecast average household sizes are projected to reduce from 2.7 people per household in 2003 to 2.5 in 2045. The graph shows the impact of reducing to an average household size of 2.3.



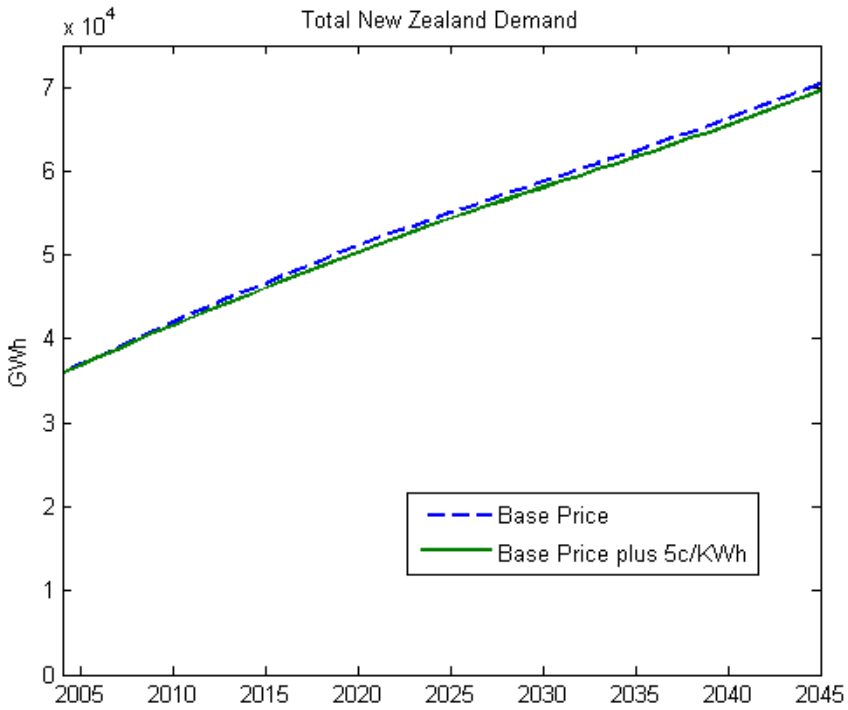
Prices

15. Price forecasts are used in the residential model. Currently the price forecasts are sourced from the Ministry of Economic Development Energy Outlook publication. The following graph shows historical and projected prices used for the baseline forecast.



16. We expect to develop our own view on price movements as a result of future modelling we intend to carry out as part of the ongoing development of the generation scenarios. Price projections resulting from this work will be incorporated into future iterations of the demand forecasts.

17. In the base case, prices increase to a maximum plateau of 15 cents/KWh from 2015 onwards. The graph below illustrates the effect of lifting this price plateau to 20 cents/KWh.


Total New Zealand Demand
x 10^4
GWh
0
1
2
3
4
5
6
7
2005
2010
2015
2020
2025
2030
2035
2040
2045
Base Price
Base Price plus 5c/KWh