



**Confidential**

# **Comment on real revenue growth factor**

**Final Report to WE**

**20 May 2011**



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## Key findings

Our initial analysis provides evidence to support a view that there is considerable doubt about the Commerce Commission's assumption of 1.5% RRG for the 2010-2015 period.

### GDP is not necessarily an appropriate benchmark

- There is little analytical support provided for the Commerce Commission assumption that GDP is the sole, or most appropriate, driver of electricity demand.
- GDP is not the best driver of residential electricity demand. Household numbers, average temperature and household spending have a much stronger causal relationship with residential electricity use.
- We recommend using household numbers as the best benchmark for residential demand, as household spending patterns are currently experiencing significant structural change and are thus volatile. In addition, there are no available forecasts of household spending at the regional level, which is crucial for WE.
- GDP appears to be an appropriate driver for industrial and commercial electricity demand at the *national* level. However our analysis for WE found no evidence that Wellington GDP is a statistically significant driver of *regional* electricity demand.

### Regional trends do not mirror national trends

- Using national GDP growth rates for any benchmarking purpose related to WE's demand will likely overestimate the usage in Wellington.
- The Wellington regional economy has grown – and is forecast to grow – more slowly than the national economy, suggesting that an average GDP growth rate of 2.5% (and thus an RRG of 1.5%) is highly optimistic for WE in considering its likely electricity demand growth.
- Wellington household numbers – our preferred driver of residential electricity demand – are projected by Statistics New Zealand to grow more slowly than the national average. This will depress the demand for WE electricity relative to the New Zealand average.

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## 1. Purpose

Wellington Electricity (WE) has engaged NZIER to comment on the Commerce Commission's suggested real revenue growth<sup>1</sup> (RRG) figure of 1.5% for the 2010-2015 period.<sup>2</sup> This RRG has "a large impact on a supplier's forecast revenues" (Commerce Commission, 2011, p.22). This in turn has an important bearing on whether WE can reasonably be expected to earn a normal rate of return over the forecast period, and hence its appropriate starting price.

## 2. Framework

Commerce Commission (2011) starts by assuming that GDP growth is the primary driver of RRG. This is based on the analysis by Economics Insights (2009).<sup>3</sup> The RRG of 1.5% is then estimated by the Commerce Commission by:

1. Forecasting real GDP out to 2015, with an average growth rate of 2.5%
2. Subtracting a historical average gap between GDP growth and RRG of 1%

This analysis is done at the national level, rather than the regional level. The Commerce Commission notes (2011, p.28) "the assumption about the forecast real revenue growth over the regulatory period is an important input" to the starting price adjustment calculation. It also "intends to further develop these assumptions" (p.34).

This approach provides two key questions to consider in thinking about whether a RRG of 1.5% is appropriate for WE:

- (i) Is GDP growth an appropriate measure for benchmarking electricity demand against?; and
- (ii) Is the national level analysis suitable to be extrapolated on a regional basis – and specifically for the Wellington region?

We examine each of these questions in turn.

## 3. The GDP-electricity demand relationship

The calculations for RRG are based on an assumption that electricity demand growth is related to GDP growth. There is little discussion of the source of this assumption in the Commerce Commission paper, which solely presents the chart below as the basis for its discussion.<sup>4</sup>

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<sup>1</sup> RRG is Commerce Commission's term for changes in the volume of electricity demand.

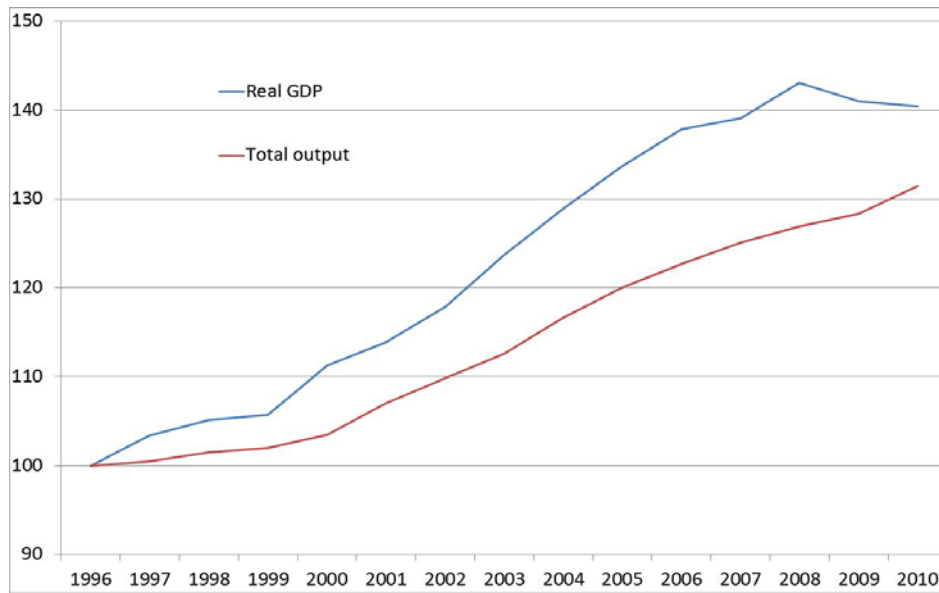
<sup>2</sup> Commerce Commission. (2011). *2010-15 Default Price-Quality Path Starting Price Adjustments and Other Amendments*. April 2011.

<sup>3</sup> Economic Insights. (2009). *Electricity Distribution Industry Productivity Analysis: 1996-2008*. Report prepared for Commerce Commission, September 2009.

<sup>4</sup> Total output is the Commerce Commission proxy for electricity demand.

**Figure 1 GDP, electricity demand and population**

Index, 1996 = 100



Source: NZIER, Commerce Commission

### 3.1 Conceptual drivers

It is perhaps reasonable at first glance to expect that as the amount of economic activity expands, more goods and services are produced that require an increased amount of intermediate inputs such as electricity. So for retail and industrial electricity demand, this feels like an appropriate assumption.<sup>5</sup>

However, there is a less obvious link between GDP and residential electricity demand (which accounts for almost 50% of WE's total demand). It might be expected rather that household demand for electricity might instead be driven by growth in the number of households and changes in the amount of use per household. Conceptually, population growth, the average size of household formation and demand for new housing will determine the former, while household income, preference changes and technological change will likely drive the latter.

### 3.2 Empirical tests of drivers

To test the relevance of GDP and other easily measurable factors as drivers of electricity demand, we carried out pair-wise Granger Causality tests between a number of potential drivers of electricity demand and the three types of electricity usage, using national data between 1970 and 2009. The results are shown in Table 1, with Y representing a statistically significant causal relationship.

<sup>5</sup> Although there is also a question about whether the GDP-electricity demand relationship is stable over time. As Figure 1 shows, the GDP series fell and flattened during the recent recession. Electricity demand, however, did not follow. Indeed it rose 3.6% during a period when economic activity contracted by 1.9%.

**Table 1 Pair-wise Granger Causality Test for drivers of different sectors' electricity demand**

Driver	Residential	Commercial	Industry
Population		Y	Y
Households	Y	Y	Y
GDP		Y	Y
Real electricity price			Y
Temperature	Y		
Private consumption expenditure	Y		

NOTE: Time period 1979-2009, lagged with one time period, Y = significant at 5% level

Source: NZIER

The analysis shows that:

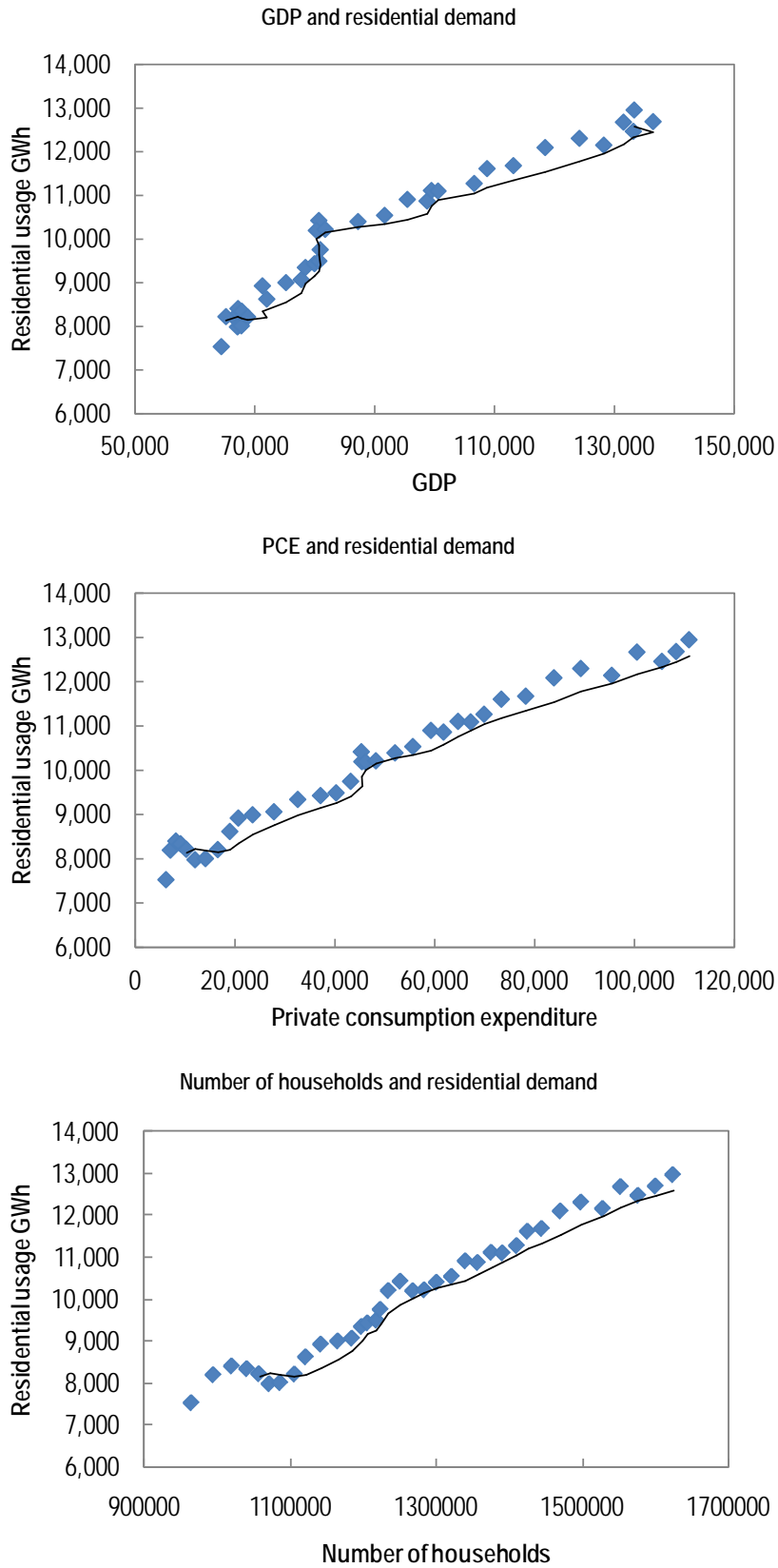
1. GDP is an appropriate driver for industrial and commercial electricity demand, at the national level.
2. The main drivers of residential electricity demand at the national level are the number of households, temperature and private consumption expenditure (PCE) (i.e. total household spending).

So GDP is not a statistically causal driver of residential electricity demand in New Zealand, based on a significance level of 5%.<sup>6</sup> The different drivers can be seen in Figure 2, with PCE and number of households moving more closely with residential demand than GDP.<sup>7</sup>

<sup>6</sup> The GDP result is statistically significant at just over the 10% level, so our analysis does indicate that it has some degree of causal power, but just not as much as other drivers. The full set of results is in Appendix A.

<sup>7</sup> There was some variability in the 1970s data due to the energy crisis, which has reduced the fit during this period.

**Figure 2 Drivers of residential electricity demand**



Source: NZIER, Statistics New Zealand, MED

### 3.3 Projecting residential demand

For the Commerce Commission's use of data in determining RRG out to 2015, reliable forecasts are required for 5 years. Therefore forecasts of the number of households and/or private consumption expenditure would be required to replace the use of GDP as the benchmark for residential demand.<sup>8</sup>

Statistics New Zealand provides forecasts of households out to 2031, both regionally and nationally. If one variable is to be used, this is likely the most robust to forecast as it does not tend to fluctuate greatly.

Forecasts for private consumption expenditure are also provided by RBNZ and NZIER. For the 2011-2014 period<sup>9</sup>, the RBNZ's forecast for PCE averages 1.1%, compared to 2.5% for GDP growth.

There are two important caveats around using PCE forecasts:

- Household spending patterns are currently going through significant structural change. Following the global financial crisis, households have been 'deleveraging' at a great rate – that is, they are saving more and spending less. This means that less discretionary spending is available. This may have an impact on the PCE-residential demand relationship in coming years.
- PCE is not available at a regional level at the current time. There are no official regional expenditure GDP estimates produced by Statistics New Zealand, and NZIER forecasts regional GDP on an industry basis only.

**Consequently our preferred driver of residential electricity demand – especially at the regional level – is household numbers.<sup>10</sup>**

The projected growth rates of households are expected to decline over the next 5-10 years (see Table 2) and suggest national residential electricity growth of 1.35% and 1.17% for Wellington over the next 5 years.

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<sup>8</sup> Assuming that temperatures do not change significantly in the forecast period.

<sup>9</sup> The RBNZ has not yet published its forecast for 2015.

<sup>10</sup> Another approach would be adjusting household numbers for changes in household formation. However, this results in using population growth as the key driver. Historical analysis (see Granger Causality tests) suggests that simple household numbers are a more accurate driver than population.

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**Table 2 Household growth and electricity demand**

Compound Annual Growth Rate

	National household growth	Wellington household growth	National residential demand
1974-2009	1.50%	1.29%	1.56%
1999-2009	1.56%	1.33%	1.56%
2004-2009	1.62%	1.31%	1.04%
2010-2015	1.35%	1.17%	
2010-2020	1.27%	1.07%	

Source: NZIER, Statistics New Zealand, MED

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## 4. The regional aspect

The discussion above shows that we have some doubts about the Commerce Commission's calculation of RRG at the national level surrounding the validity of selecting just GDP as the best driver of electricity demand.

At the Wellington regional level, our concerns are amplified further.

### 4.1 Does regional GDP drive regional electricity demand?

The Commerce Commission implicitly assumes that what holds true at the national level also applies at a regional level. However, we find little evidence that Wellington GDP is a good predictor of electricity demand for Wellington Electricity.<sup>11</sup> A statistical analysis of the potential drivers of WE's electricity demand (GDP, GDP per capita, population, energy prices, etc) for the 2004-2011 period provided no statistical support to the hypothesis that GDP is driving the demand for WE's electricity in the Wellington region.<sup>12</sup>

### 4.2 Does Wellington demand grow like national demand?

The dynamics of the Wellington market for electricity may be different to those of the national market. As shown in Figure 3 the demand for WE electricity does not appear to move in sync with national demand (as measured by Commerce Commission's total output series). Over the past 7 years, we estimate demand for WE's electricity

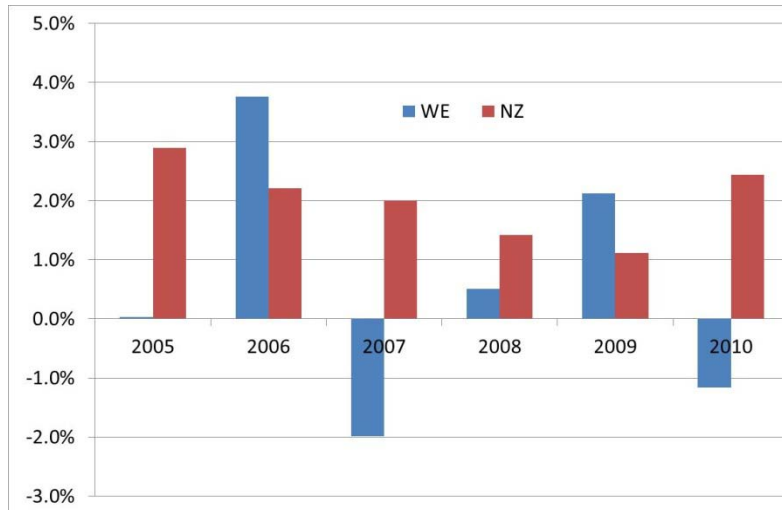
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<sup>11</sup> Note that we do not have access to other EDBs' historical demand growth, so have only looked at WE's data. It is possible that total demand in Wellington moves differently from the demand for WE. This is an avenue for further exploration, if data can be obtained.

<sup>12</sup> Two further caveats apply to this analysis. First, there is no official series of regional GDP in Wellington. We have constructed a series that uses employment shares and industry productivity movements to approximate the rate of change of economic activity in the Wellington region. Second, we only had 7 years of electricity demand data from WE to use in our analysis and 28 GDP estimates. This does not provide a large panel of data for identifying statistically significant relationships.

has grown by an average of 0.5% per year. National level demand has grown by a much stronger average of 2.0% over the same period.

**Figure 3 Wellington and New Zealand electricity demand**  
Annual growth



Source: NZIER

### 4.3 Does Wellington GDP grow like national GDP?

There is no reason to assume that all regional economies grow at the same rate as the national aggregate used by Commerce Commission. We might expect regions such as Auckland, Tauranga and Queenstown to grow more rapidly than the New Zealand-wide average due to urban drift and the settlement of international migrants (Auckland), retirement to the sun (Tauranga) and internal migration (Queenstown).

According to NZIER estimates, **GDP growth in the Wellington region has been lower than that at the national level.** It has grown by an average of 2.0% between 1998 and 2010, compared to 2.4% at the national level. This divergence is shown in Figure 4 below.

**Figure 4 Wellington and New Zealand GDP**

Index, 1998 = 100

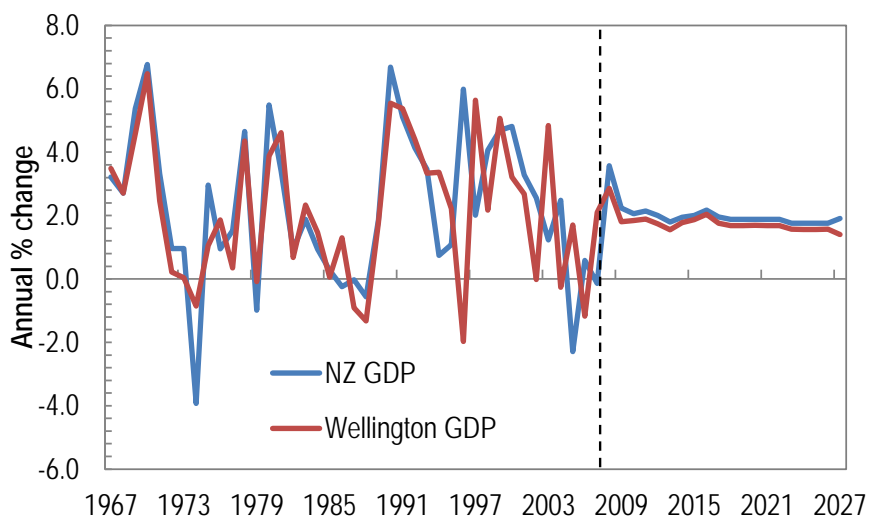


Source: NZIER, RBNZ

Due to the prominence of the government sector in Wellington, which is set to shrink in coming years due to fiscal constraints, forecast GDP growth is expected to average 1.9% in Wellington between 2010 and 2015. This **is lower than our national forecast** of 2.1% average GDP growth for the same period (see Figure 5), and well below the 2.5% assumed by the Commerce Commission.

**Figure 5 GDP growth in NZ and Wellington**

Annual % growth



Source: NZIER, Statistics New Zealand

A full set of regional GDP forecasts can be found in Appendix B. It shows the wide divergences between regional economic dynamism, again suggesting **that a**

**national level benchmark is unlikely to be appropriate for a regional-focused EDB like WE.**

## 4.4 Population growth

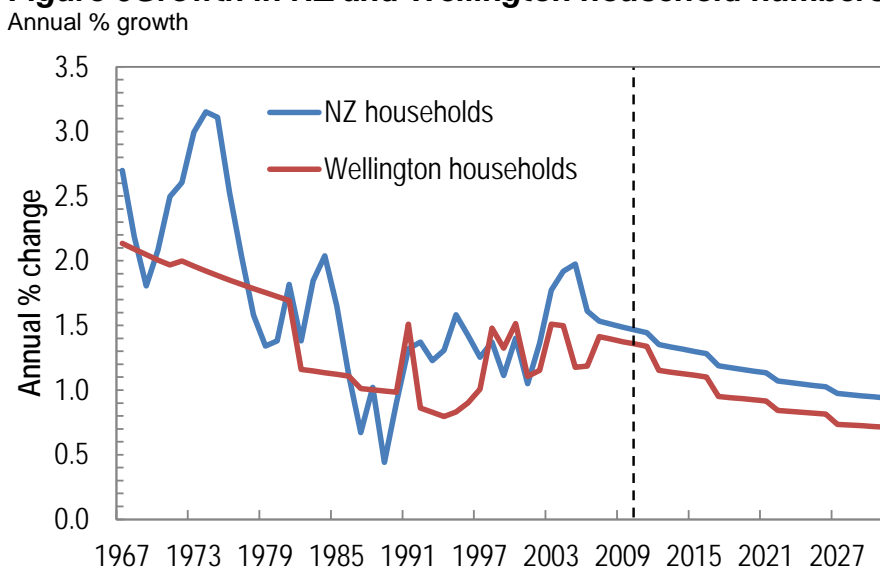
A similar story emerges for population growth, which is a driver of industrial and commercial electricity demand (see Table 1, section 3.2). National population growth has averaged 1.1% since 1998, compared to 0.9% for Wellington. Looking ahead, Wellington's population is projected by Statistics New Zealand to grow by just 0.6% per year from 2011-2016, compared to the national average of 0.9%.

A full set of regional population projections can be found in Appendix B.

## 4.5 Household numbers

Forecasts indicate that growth in the number of households at a national level is expected to grow at a faster rate than in Wellington (Figure 6). Using the national growth rates for any benchmarking purpose related to WE's demand will overestimate the usage in Wellington. This differential is likely to be even larger in other non-major centres.

**Figure 6** Growth in NZ and Wellington household numbers



Source: Statistics New Zealand

## 4.6 Summary of regional aspects

- The demand for WE electricity moves differently to the national level demand.
- Regional GDP for Wellington does not appear to drive WE electricity demand.
- Wellington's GDP has grown, and is forecast to grow, more slowly than national level GDP.
- Population and household number growth is also projected to grow more slowly in Wellington than across New Zealand as a whole over the forecast period.

## 5. Conclusions

We consider that the Commerce Commission should undertake further work, as outlined in this report, before settling on a RRG of 1.5%.

## Appendix A Causality results

**Table 3 Granger Causality Test**

	Obs	Commercial		Residential		Industry	
		F-Statistic	Prob.	F-Statistic	Prob.	F-Statistic	Prob.
Population	30	10.6948	0.0029	2.56863	0.1206	5.52399	0.0263
Households	30	7.91508	0.009	6.55586	0.0164	6.01519	0.0209
GDP	30	19.3842	0.0002	2.84385	0.1032	6.64154	0.0157
Real electricity price	30	0.00016	0.99	0.00031	0.9861	8.73295	0.0064
People per household	30	0.81074	0.3759	1.5808	0.2194	0.11155	0.741
Temperature	30	0.04665	0.8306	4.55208	0.0421	0.96913	0.3336
Households final consumption expenditure	30			5.1481	0.0315		

Source: NZIER

## Appendix B Regional GDP and population projections

**Table 4 Regional GDP and population growth estimates**

Compound Annual Growth Rates

	GDP growth 2010-2015	Population growth 2011-2016
Northland	1.2	0.6
Auckland	3.8	1.5
Waikato	1.4	0.7
Bay of Plenty	1.0	0.9
Gisborne-Hawke's Bay	0.2	0.2
Taranaki	1.1	0.0
Manawatu-Wanganui	1.5	0.2
Wellington	2.1	0.6
Upper South Island	1.8	0.5
Canterbury	2.5	0.8
Otago	-1.9	0.5
Southland	0.0	-0.3
Total New Zealand	2.2	0.9

Notes: (1) Statistics New Zealand produce their population estimates in 5-yearly periods, based on Census timing. This is why the time period is different to the GDP projections.

Source: NZIER GDP projections, Statistics New Zealand population projections