Regional peak demand forecast from 2007 – an update

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1. Introduction

This document presents regional, island and national forecasts of peak electricity demand, covering a 40-year period.

In late 2007, the Commission updated the long-term regional peak demand forecast that has been originally published as draft Grid Planning Assumptions (GPAs) in May 2007[1]. That update included new data from winter 2007, a new regional energy forecast, and some changes to assumptions.

This document is a revised version of the late 2007 update, with different treatment of future growth in the demand of the Tiwai aluminium smelter.

The forecast predicts annual half-hourly peak demand at grid exit point (at GXP, i.e. inclusive of local lines losses), by transmission region. Embedded generation is netted from demand – i.e. the demand forecast presented is for the expected demand less that which is satisfied by embedded generation.

This forecast is consistent with the GPAs long-term energy demand forecast[2], which is also expressed in terms of demand at GXP net of embedded generation, and uses the same region definitions.

The forecasts presented are not consistent, however, with the medium-term peak demand forecasts prepared by the Commission for Security of Supply purposes[3]. The medium-term forecast treats embedded generation differently and uses different region definitions. The numbers produced by these two forecasts are therefore not directly comparable.

For some purposes, the instantaneous peak demand is more relevant than the half-hourly peak. The instantaneous peak can be expected to exceed half-hourly peak by a small margin, so an appropriate margin for within-half-hour variation should be allowed when estimating instantaneous peaks. Based on the analysis carried out in the Commission's Security of Supply medium-term demand forecast, an allowance of 1.3% for within-half-hour variation is appropriate on a national level (1.9% for North Island only, 1.4% for South Island only).

The forecast uses a different methodology from that used by the Commission for the Initial Statement of Opportunities (SOO). The goals driving the changes are:

1. to make sure that forecast peak growth over the next few years is similar to actual historical growth over the last few years, in each region; and

2. to provide a 'prudent' forecast, allowing for various influences which may result in higher peak demand than expected.

The initial SOO included an 'expected' peak demand forecast, indicating our expectation of the most likely trajectory of peak demand growth. However there was not time at that stage to also produce a 'prudent' forecast, indicating maximum likely values of peak demand in each year. This document does provide a 'prudent' forecast, for which we have used a 10% probability of exceedance criterion

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[1] http://www.electricitycommission.govt.nz/opdev/modelling/gpas/May2007/Demand/index.html
[2] http://www.electricitycommission.govt.nz/pdfs/opdev/modelling/pdfconsultation/GPA/Demand-Forecast-Review.pdf
[3] http://www.electricitycommission.govt.nz/opdev/modelling/demand/security/index.html

(10% POE, P10) – in any given year, there is a 10% chance that peak demand will exceed the prudent forecast. (Several submitters queried the use of a P10 forecast, commenting that a P5 or P1 forecast would be more prudent. The use of P10 is primarily driven by the requirements of the Grid Investment Test – see section 1.1 below.)

We note that the forecast presented is a 'business as usual' forecast, not explicitly allowing for any changes in consumer behaviour or technology. It also makes no explicit allowance for the possibility of increased future demand-side response with the intention of reducing peak loads. In the Commission's generation scenario modelling work, we treat increased demand-side response as a potential tool for meeting future peaks, rather than as a reduction applied to the peak forecast.

1.1 Use of the prudent forecast in the Grid Investment Test

Several submitters queried the use of a P10 forecast, commenting that a P5 or P1 forecast would be more prudent. The use of P10 is primarily driven by the requirements of the Grid Investment Test.

The prudent forecast can be used only in certain parts of a GIT application, where reliance on that forecast could not lead to substantial actual unserved energy. For major investments, a simple deterministic timing criterion such as meeting a P10 prudent forecast might not be prudent enough.

The timing of transmission investments where there is risk of substantial unserved energy should be determined on the basis of an economic test; that is, the point in time when the annualised cost of the investment is less than the expected benefit of the investment, should set the commissioning date. The Commission would expect this analysis to encompass the full range of possible demand growth rates, and their probabilities (perhaps by using a Load Probability Curve, in a reliability study). This would implicitly include consideration of P1, P5, P10 etc.

For projects with little risk of unserved energy, or modelled projects that occur after a proposed major investment, the P10 prudent forecast can be used. The P10 forecast also provides a useful mechanism to ensure the power system analysis underlying a proposal is complete, in the sense that it includes all credible modelled projects over the 20 year time-frame of the GIT assessment.

2. Methodology

This section describes the methodology used to produce the peak demand forecast. Subsections describe:

- the region definitions used
- the calculation of historical peaks
- the methodology used to produce the expected forecasts
- the Monte Carlo approach used to generate the prudent forecasts
- modifications to the approach used in specific regions.

All references to 'years' in this document denote calendar years, except where otherwise noted.

'Energy demand' refers to total electricity demand in GWh (as opposed to non-electricity energy demand!).

2.1 Region definitions

The analysis has been carried out at the 'transmission region' level, for consistency with the Commission's GPA energy demand forecast. North Island regions are Auckland, Bay of Plenty, Central, Hawkes Bay, North Isthmus, Taranaki, Waikato and Wellington; South Island regions are Canterbury, Nelson/Marlborough, Otago/Southland, South Canterbury, and West Coast.

Forecasts have also been carried out at island and national level. The island and regional forecasts are independently derived from source data – neither is calculated from the other via diversity factors. The national forecast is likewise produced independently of the regional forecasts.

We also include forecasts at the 'half-island' level, again produced independently rather than by a diversity-based approach. These regions include:

- Upper North Island (UNI, defined as Auckland and North Isthmus),
- Lower North Island (LNI, all other North Island regions),
- Upper South Island (USI, defined as Canterbury, Nelson/Marlborough, South Canterbury and West Coast),
- Lower South Island (LSI, Otago/Southland only).

2.2 Historical peak data

GXP-level historical peak data were extracted from the metering data section of the Commission's October 2007 Centralised Dataset (CDS), using the region definitions included in the 'regions.txt' file. This is consistent with the process used to produce the regional load table in the MySQL Halfhourly Database (also included as part of the October 2007 CDS).

The peak for a given year is the maximum half-hourly load over all trading periods in the calendar year. Years included are from 1997 to 2007. (Our view is that, in terms of peak demand, data from before 1997 are not relevant to current conditions.)

The resulting annual peaks are shown in the tables in Section 3.1.

The SQL code used to extract these historical peaks from the MySQL Half-hourly Database can be supplied on request.

2.3 Methodology – expected forecast

The expected peak demand forecast for each region is based on two data sources: (a) the historical peak data described in Section 2.2, and (b) the Commission's GPAs energy demand forecast.

The approach is designed to make expected peak demand growth follow expected energy demand growth in the long run. In the short term the expected peak forecasts follow recent historical trends in peak demand.

For each region, the first step is to calculate a weighted least squares fit of an exponential curve to the historical peaks. The exponential curve is used to represent annual growth by a constant factor in expected peak demand (as opposed to growth by a constant increment, which would be implied by a linear fit). The use of weighted least squares is intended to put high weight on recent data and lower weight on older data, encouraging a good fit to the most recent part of the series. Weights start from a baseline figure in 1997 and increase by 40% in each successive year up till 2005, after which they are held constant. (The exception is that a null weight is assigned to the 2001 and 2003 years in which savings campaigns occurred – see Section 2.5.)

The peak demand forecast starts from the value of the fitted exponential curve for 2007. Beyond that point,

- the predicted growth rate in the first forecast year (2008) is equal to the historical peak growth rate (i.e. the slope of the fitted curve),
- over the following five years, the predicted growth rate trends smoothly from the historical peak growth rate to the growth rate of the GPAs energy demand forecast,
- beyond 2012, the predicted growth rate is equal to that of the energy demand forecast.

2.4 Methodology – prudent forecast

The prudent peak forecast is produced using a Monte Carlo method, based on a 10% POE criterion. The prudent peak forecast in a given region and year is the 90^{th} percentile of a range of randomly generated values distributed around the expected forecast.

The following sources of variation are included in the Monte Carlo analysis:

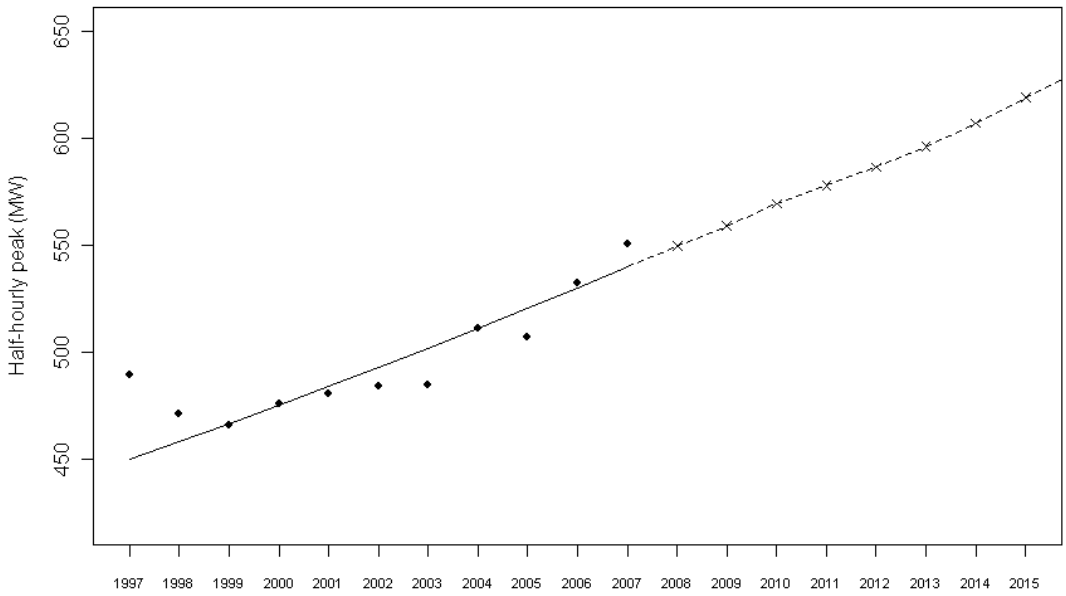
- Between-year variation in peak demand, driven by temperature, use of load control, and consumer behaviour. The peak in any given year may be higher or lower than the expected value, due to any or all of the above factors. We

assume a normal distribution of peaks around the expected value and estimate the standard deviation of this distribution as the standard deviation of the historical peaks around the fitted trend. Each randomisation of peak demand is incremented by a random draw from this normal distribution.

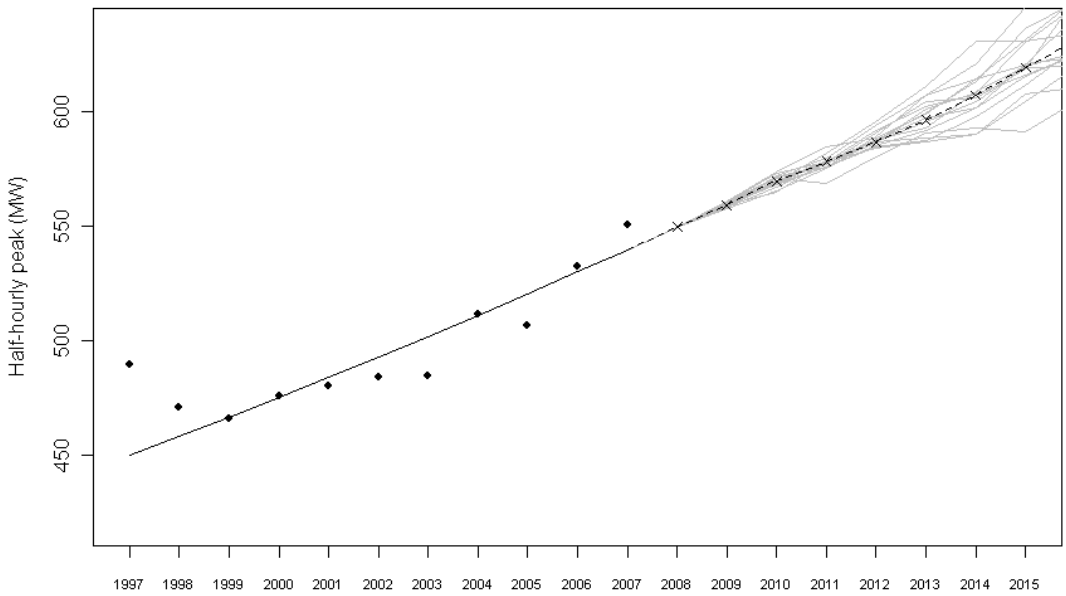
- Uncertainty in energy forecasts. The Monte Carlo analysis of total energy demand can be used to generate randomised trajectories, based on random draws from the assumed distributions of the exogenous variables used in the forecast (e.g. GDP, population). Each randomisation of peak demand is based on a random draw from the list of randomised energy trajectories.
- Peak demand may grow faster than energy demand for a relatively short period (as has recently been observed in the upper North Island). We do not expect to see peak growing faster than total demand in the long term, but the prudent peak demand analysis takes into account the possibility of a period of accelerated peak growth. In one in five (20%) of the randomisations of peak demand, peak growth rates are increased by 1% for an initial five-year period.

The following plots demonstrate the Monte Carlo approach. Numbers shown are chosen for illustrative purposes and do not correspond to actual peak demand figures.

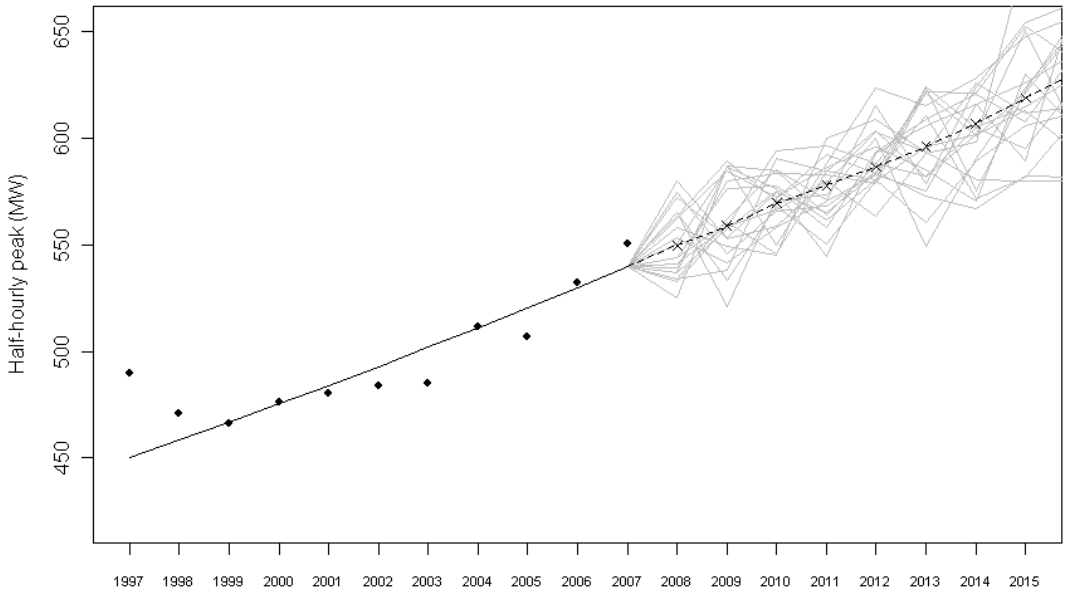
(a) The 'expected' peak forecast is derived from historical trends and from the expected forecast of energy growth.



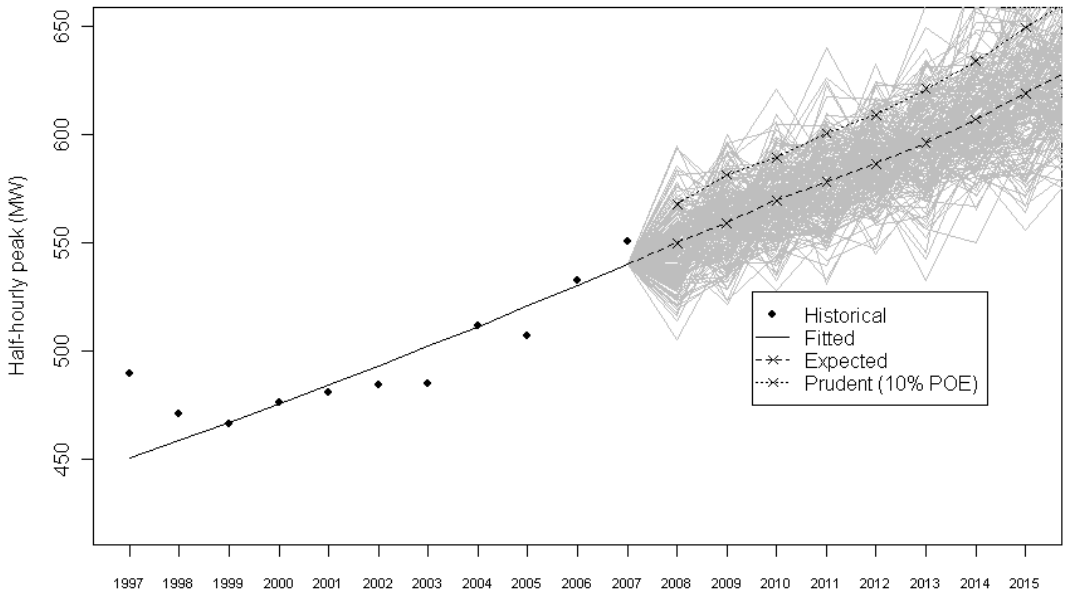
(b) Many randomised trajectories of energy demand growth have been produced; each leads to a different trajectory of peak demand growth. A few of these trajectories are shown here.



(c) Next, in 20% of these randomisations, it is assumed that peak demand growth is faster than energy demand growth over a period of up to 5 years. Then, between-year variation in peak demand is then added to each trajectory.



(d) The 90th percentile of the values in each year is the prudent forecast.



Note that the gap between 'expected' and 'prudent' forecasts is considerably larger than the likely variation from year to year. In the longer term, it would not be expected that peak demand would jump from the current 'expected' forecast to the 'prudent' forecast from one year to the next. Rather, it would be expected that the level of the prudent forecast would be reached only after several years of growth above the 'expected' line.

2.5 Treatment of 'savings campaign years'

The data for the 2001 and 2003 'savings campaign years' have been removed from analyses – i.e. those data points have been assigned a weight of zero in the regressions and are not included in the estimation of variability.

Both of these years were affected by electricity shortages, leading to nationwide savings campaigns, which in both cases overlapped the winter period in which annual peaks might have occurred. The 2003 savings campaign covered the period from March to June; the 2001 campaign was from August to September. Since annual peaks typically occur between May and August inclusive, either savings campaign might have had the effect of reducing peak demand. The 2003 annual peak was certainly low, nationally and in most regions; it is unclear to what extent this is due to the savings campaign, as opposed to the generally mild winter.

We justify the removal of these data points from the analysis as follows:

- the demand forecast is intended to project future peak demand *in the absence of unusual demand-side response*. Demand-side response over and above the usual (e.g. that caused by political intervention at a nationwide level) is considered as a possible means of meeting the forecast peaks, rather than as an influence towards reducing them. Thus, the forecast should not be based on historical years that were affected by savings campaigns.

- the 2003 point is a statistical outlier – including it has the effect of inflating the estimate of between-year variation in peak demand, and hence of increasing the prudent (P10) forecast for all future years. This increase is spurious, stemming from the technique used to model between-year variation. Logically, the existence of a year when demand was considerably less than predicted should not lead to a prediction that demand may be considerably *more* than predicted in some future year. (We would prefer to use a nonparametric 'bootstrapping' approach which would avoid this problem, but a series of 10 data points is arguably too short to use bootstrapping.)

- the removal of 'shortage years' is consistent with the methodology used by the Commission in the national energy forecast, where 1992, 2001 and 2003 data points are excluded.

A better way to model these 'shortage years' would be to estimate what the peak demand in these years *would have been* in the absence of the savings campaigns and to replace the actual points by these estimates. However, it is not clear at this stage how these estimates could be calculated.

2.6 Modifications used in specific regions

Historical events impacting on peak demand have made some modifications to the approach necessary.

The last decade of historical peak demand data for the Taranaki region is dominated by a sharp drop caused by the closure of the Motunui Methanex plant. It has not yet been confirmed that this plant will reopen in the near future. If no adjustments are

made to the statistical model for this area, then the forecast is for continuing reduction in peak demand.

To fix this problem, the Taranaki historical series has been calculated 'net of Methanex' – in other words, the historical peak and energy demand figures have been produced from data with the Methanex load subtracted. (This has the effect of subtracting about 10 MW from the relevant peaks and about 7 MW from the average energy demand.) The consequence should be a more accurate demand forecast (though the historical figures shown will be lower than actuals).

The 2006 winter peak in South Canterbury was low, due to the outages experienced that June. This is not representative of underlying demand growth in the region. Accordingly the actual South Canterbury peak and total energy demand figures for 2006 have been replaced with 2005 figures inflated by 3%.

An extra 22 MW of load has been added to the West Coast region and all combinations of regions including it (Upper South Island, South Island, New Zealand), to account for new loads including the Pyke River coal mine, Westland Dairy powder plant, and Globe Progress gold mine.

An extra 5 MW of load has been added to the Otago/Southland region and all combinations of regions including it (Lower South Island, South Island, New Zealand), to account for new irrigation load at Black Point.

An extra 9 MW of load has been added to the Taranaki region and all combinations of regions including it (Lower North Island, North Island, New Zealand), to account for new gas processing load.

In the Otago/Southland region, the future growth of the Tiwai smelter demand needs to be considered. The smelter demand has been increasing in recent years. However, the demand is expected to plateau at 605 MW (at regional peak). The recent trend in regional peak, therefore, should not be expected to continue. To model this, the historical demand of the Tiwai smelter has been replaced by a steady 605 MW for the purposes of calculating regional trend. The effect of this adjustment is to reduce projected growth in the region over the next few years.

2.8 Impacts of energy efficiency and demand-side response

The Commission's forecasts make no explicit allowances for the impact of improved energy efficiency on energy consumption or peak demand. Energy efficiency has steadily improved during the historical period on which the forecasts are based, and we expect that this trend will continue, but our forecast does not assume that the rate of improvement in energy efficiency will increase over the long term.

However, if it can be robustly established that an expected policy change will lead to a substantial change in future peak demand, we will consider incorporating that change into the forecasts as an explicit adjustment. The policy would need to be clearly different from previous policies, rather than an evolution of past changes.

Similarly, the Commission's forecasts of energy consumption and peak demand make no explicit allowance for the possible impacts of increased availability of demand-side response. We have not revised our peaks downwards to model the effect of active load management. We consider that active load management will be

one of the options for dealing with the demand peaks that are forecast (other options include building new baseload or peaking plant).

3. Forecasts

This section presents the numerical forecasts. For each region, each island, and all New Zealand, the expected and prudent (10% POE) forecasts are presented in table form. These forecasts are also available for download as text files at: INSERT LINK.

Plots of forecasts are also provided, covering the period to 2020 only.

All forecasts are of annual peak electricity demand at GXP, on a half-hourly time frame, including local area losses and net of embedded generation.

3.1 Forecasts (as tables)

National forecast

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	5376	-	-
1999	5579	-	-
2000	5606	-	-
2001	5786	-	-
2002	5859	-	-
2003	5749	-	-
2004	6089	-	-
2005	6119	-	-
2006	6421	-	-
2007	6466	-	-
2008	-	6620	6763
2009	-	6742	6908
2010	-	6881	7100
2011	-	6998	7271
2012	-	7110	7457
2013	-	7224	7602
2014	-	7339	7729
2015	-	7456	7878
2016	-	7561	7995
2017	-	7669	8148
2018	-	7777	8284
2019	-	7887	8403
2020	-	7998	8556
2021	-	8094	8688
2022	-	8191	8825
2023	-	8290	8934
2024	-	8389	9103
2025	-	8489	9238
2026	-	8587	9335
2027	-	8686	9491
2028	-	8785	9624
2029	-	8884	9746
2030	-	8988	9928
2031	-	9094	10054
2032	-	9200	10201
2033	-	9307	10342
2034	-	9414	10527
2035	-	9523	10698
2036	-	9639	10835
2037	-	9756	10959
2038	-	9876	11128
2039	-	9996	11347
2040	-	10118	11540
2041	-	10240	11690
2042	-	10364	11909
2043	-	10491	12093
2044	-	10612	12240
2045	-	10743	12384
2046	-	10866	12628
2047	-	10990	12821

Island forecasts

North Island

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	3557	-	-
1999	3699	-	-
2000	3705	-	-
2001	3894	-	-
2002	3885	-	-
2003	3851	-	-
2004	4110	-	-
2005	4087	-	-
2006	4307	-	-
2007	4328	-	-
2008	-	4431	4555
2009	-	4521	4660
2010	-	4623	4778
2011	-	4711	4896
2012	-	4797	5048
2013	-	4889	5145
2014	-	4986	5282
2015	-	5088	5390
2016	-	5185	5496
2017	-	5284	5646
2018	-	5383	5771
2019	-	5485	5866
2020	-	5586	6017
2021	-	5673	6104
2022	-	5762	6256
2023	-	5850	6360
2024	-	5939	6504
2025	-	6028	6577
2026	-	6115	6715
2027	-	6201	6856
2028	-	6289	6943
2029	-	6376	7031
2030	-	6467	7178
2031	-	6560	7304
2032	-	6652	7441
2033	-	6746	7571
2034	-	6840	7659
2035	-	6936	7811
2036	-	7038	7901
2037	-	7140	8058
2038	-	7245	8218
2039	-	7350	8389
2040	-	7457	8547
2041	-	7564	8685
2042	-	7673	8873
2043	-	7785	9021
2044	-	7892	9180
2045	-	8006	9294
2046	-	8115	9471
2047	-	8225	9625

South Island

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	1826	-	-
1999	1888	-	-
2000	1901	-	-
2001	1967	-	-
2002	1994	-	-
2003	1941	-	-
2004	2026	-	-
2005	2071	-	-
2006	2121	-	-
2007	2173	-	-
2008	-	2221	2251
2009	-	2255	2303
2010	-	2295	2361
2011	-	2326	2413
2012	-	2354	2465
2013	-	2379	2504
2014	-	2401	2520
2015	-	2420	2542
2016	-	2434	2557
2017	-	2447	2586
2018	-	2461	2605
2019	-	2475	2619
2020	-	2489	2650
2021	-	2502	2652
2022	-	2515	2680
2023	-	2529	2696
2024	-	2544	2705
2025	-	2559	2736
2026	-	2574	2754
2027	-	2590	2793
2028	-	2606	2804
2029	-	2622	2839
2030	-	2639	2844
2031	-	2656	2880
2032	-	2673	2891
2033	-	2690	2914
2034	-	2708	2952
2035	-	2725	2964
2036	-	2744	2992
2037	-	2763	3017
2038	-	2783	3042
2039	-	2802	3093
2040	-	2822	3121
2041	-	2841	3144
2042	-	2861	3176
2043	-	2882	3220
2044	-	2900	3233
2045	-	2921	3258
2046	-	2941	3316
2047	-	2961	3317

Half-island forecasts

Upper North Island

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	1658	-	-
1999	1658	-	-
2000	1664	-	-
2001	1793	-	-
2002	1771	-	-
2003	1823	-	-
2004	1892	-	-
2005	1941	-	-
2006	2059	-	-
2007	2052	-	-
2008	-	2122	2202
2009	-	2179	2267
2010	-	2242	2348
2011	-	2298	2422
2012	-	2355	2493
2013	-	2415	2571
2014	-	2480	2634
2015	-	2550	2716
2016	-	2616	2822
2017	-	2685	2897
2018	-	2754	2978
2019	-	2825	3081
2020	-	2895	3161
2021	-	2958	3235
2022	-	3021	3327
2023	-	3084	3423
2024	-	3147	3486
2025	-	3211	3573
2026	-	3272	3650
2027	-	3333	3727
2028	-	3394	3829
2029	-	3456	3877
2030	-	3519	3984
2031	-	3584	4057
2032	-	3649	4141
2033	-	3715	4253
2034	-	3782	4338
2035	-	3849	4408
2036	-	3920	4509
2037	-	3992	4587
2038	-	4065	4711
2039	-	4139	4833
2040	-	4214	4948
2041	-	4289	5021
2042	-	4366	5134
2043	-	4444	5236
2044	-	4520	5358
2045	-	4600	5462
2046	-	4677	5575
2047	-	4755	5684

Lower North Island

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	1946	-	-
1999	2074	-	-
2000	2060	-	-
2001	2130	-	-
2002	2127	-	-
2003	2064	-	-
2004	2220	-	-
2005	2179	-	-
2006	2293	-	-
2007	2301	-	-
2008	-	2341	2402
2009	-	2376	2447
2010	-	2417	2505
2011	-	2450	2558
2012	-	2482	2603
2013	-	2515	2646
2014	-	2549	2696
2015	-	2584	2741
2016	-	2616	2780
2017	-	2648	2826
2018	-	2681	2876
2019	-	2714	2942
2020	-	2747	2986
2021	-	2774	3010
2022	-	2802	3050
2023	-	2829	3107
2024	-	2857	3150
2025	-	2884	3181
2026	-	2912	3217
2027	-	2939	3267
2028	-	2967	3293
2029	-	2995	3358
2030	-	3024	3381
2031	-	3054	3464
2032	-	3083	3492
2033	-	3114	3516
2034	-	3143	3571
2035	-	3174	3637
2036	-	3207	3682
2037	-	3240	3731
2038	-	3273	3783
2039	-	3307	3832
2040	-	3342	3867
2041	-	3376	3959
2042	-	3411	4011
2043	-	3447	4059
2044	-	3480	4145
2045	-	3517	4155
2046	-	3551	4227
2047	-	3586	4291

Upper South Island

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	875	-	-
1999	917	-	-
2000	905	-	-
2001	968	-	-
2002	1000	-	-
2003	942	-	-
2004	994	-	-
2005	1023	-	-
2006	1069	-	-
2007	1078	-	-
2008	-	1124	1151
2009	-	1149	1181
2010	-	1177	1218
2011	-	1201	1249
2012	-	1223	1287
2013	-	1243	1309
2014	-	1261	1328
2015	-	1276	1347
2016	-	1288	1365
2017	-	1299	1382
2018	-	1310	1402
2019	-	1323	1416
2020	-	1335	1442
2021	-	1347	1449
2022	-	1359	1476
2023	-	1372	1494
2024	-	1385	1513
2025	-	1399	1533
2026	-	1413	1556
2027	-	1428	1572
2028	-	1442	1596
2029	-	1456	1609
2030	-	1472	1637
2031	-	1487	1658
2032	-	1503	1683
2033	-	1518	1704
2034	-	1534	1729
2035	-	1550	1750
2036	-	1567	1778
2037	-	1584	1807
2038	-	1601	1823
2039	-	1618	1845
2040	-	1636	1877
2041	-	1653	1907
2042	-	1671	1927
2043	-	1689	1960
2044	-	1706	1992
2045	-	1725	2012
2046	-	1742	2037
2047	-	1760	2061

Lower South Island

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	963	-	-
1999	974	-	-
2000	996	-	-
2001	1017	-	-
2002	1025	-	-
2003	1012	-	-
2004	1040	-	-
2005	1059	-	-
2006	1062	-	-
2007	1103	-	-
2008	-	1105	1118
2009	-	1115	1138
2010	-	1127	1163
2011	-	1135	1182
2012	-	1142	1200
2013	-	1148	1207
2014	-	1154	1213
2015	-	1159	1216
2016	-	1162	1218
2017	-	1165	1225
2018	-	1168	1231
2019	-	1171	1234
2020	-	1174	1237
2021	-	1176	1234
2022	-	1178	1239
2023	-	1180	1240
2024	-	1182	1243
2025	-	1184	1249
2026	-	1187	1251
2027	-	1189	1254
2028	-	1192	1258
2029	-	1195	1264
2030	-	1198	1264
2031	-	1201	1270
2032	-	1203	1273
2033	-	1206	1280
2034	-	1209	1283
2035	-	1212	1289
2036	-	1216	1294
2037	-	1219	1300
2038	-	1222	1306
2039	-	1226	1310
2040	-	1229	1321
2041	-	1233	1324
2042	-	1236	1333
2043	-	1240	1332
2044	-	1243	1346
2045	-	1247	1346
2046	-	1250	1348
2047	-	1254	1359

North Island regional forecasts

Auckland

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	1038	-	-
1999	1056	-	-
2000	1046	-	-
2001	1128	-	-
2002	1112	-	-
2003	1130	-	-
2004	1172	-	-
2005	1211	-	-
2006	1310	-	-
2007	1299	-	-
2008	-	1338	1402
2009	-	1375	1445
2010	-	1415	1495
2011	-	1452	1544
2012	-	1488	1591
2013	-	1529	1628
2014	-	1573	1687
2015	-	1621	1742
2016	-	1668	1792
2017	-	1716	1854
2018	-	1765	1915
2019	-	1815	1958
2020	-	1864	2049
2021	-	1908	2078
2022	-	1952	2143
2023	-	1997	2192
2024	-	2040	2248
2025	-	2085	2321
2026	-	2127	2366
2027	-	2169	2408
2028	-	2212	2467
2029	-	2254	2518
2030	-	2298	2577
2031	-	2343	2634
2032	-	2388	2690
2033	-	2434	2772
2034	-	2480	2811
2035	-	2527	2880
2036	-	2576	2931
2037	-	2626	3004
2038	-	2677	3089
2039	-	2729	3140
2040	-	2781	3220
2041	-	2834	3278
2042	-	2887	3340
2043	-	2942	3400
2044	-	2996	3494
2045	-	3052	3543
2046	-	3106	3628
2047	-	3160	3680

Bay of Plenty

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	374	-	-
1999	390	-	-
2000	402	-	-
2001	408	-	-
2002	422	-	-
2003	412	-	-
2004	444	-	-
2005	442	-	-
2006	456	-	-
2007	428	-	-
2008	-	455	473
2009	-	462	483
2010	-	469	493
2011	-	476	504
2012	-	482	513
2013	-	488	520
2014	-	495	526
2015	-	501	536
2016	-	508	545
2017	-	515	556
2018	-	522	568
2019	-	530	578
2020	-	539	592
2021	-	546	603
2022	-	554	614
2023	-	562	622
2024	-	570	634
2025	-	579	649
2026	-	587	660
2027	-	595	667
2028	-	603	681
2029	-	611	690
2030	-	619	708
2031	-	628	721
2032	-	636	729
2033	-	645	741
2034	-	654	752
2035	-	663	764
2036	-	672	784
2037	-	681	791
2038	-	691	805
2039	-	701	821
2040	-	711	839
2041	-	721	855
2042	-	731	865
2043	-	741	877
2044	-	751	896
2045	-	762	908
2046	-	771	919
2047	-	782	953

Central

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	304	-	-
1999	298	-	-
2000	307	-	-
2001	319	-	-
2002	312	-	-
2003	307	-	-
2004	325	-	-
2005	310	-	-
2006	334	-	-
2007	335	-	-
2008	-	335	346
2009	-	339	351
2010	-	345	359
2011	-	350	367
2012	-	354	374
2013	-	358	382
2014	-	363	387
2015	-	367	393
2016	-	371	400
2017	-	375	401
2018	-	378	409
2019	-	382	413
2020	-	386	418
2021	-	388	422
2022	-	391	425
2023	-	394	430
2024	-	396	433
2025	-	399	438
2026	-	402	443
2027	-	404	448
2028	-	407	452
2029	-	410	457
2030	-	413	460
2031	-	416	464
2032	-	419	470
2033	-	422	475
2034	-	425	479
2035	-	428	485
2036	-	431	492
2037	-	435	498
2038	-	438	503
2039	-	441	509
2040	-	445	515
2041	-	448	522
2042	-	452	525
2043	-	455	530
2044	-	459	534
2045	-	462	538
2046	-	466	546
2047	-	469	558

Hawkes Bay

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	272	-	-
1999	278	-	-
2000	285	-	-
2001	293	-	-
2002	287	-	-
2003	279	-	-
2004	291	-	-
2005	291	-	-
2006	283	-	-
2007	296	-	-
2008	-	294	301
2009	-	296	304
2010	-	299	309
2011	-	301	314
2012	-	303	319
2013	-	305	321
2014	-	307	324
2015	-	308	327
2016	-	309	329
2017	-	311	332
2018	-	312	336
2019	-	314	338
2020	-	315	341
2021	-	317	344
2022	-	318	347
2023	-	319	350
2024	-	321	353
2025	-	322	356
2026	-	324	359
2027	-	326	361
2028	-	327	363
2029	-	329	368
2030	-	331	370
2031	-	333	374
2032	-	335	376
2033	-	336	379
2034	-	338	383
2035	-	340	389
2036	-	342	389
2037	-	344	391
2038	-	347	397
2039	-	349	400
2040	-	351	404
2041	-	353	410
2042	-	355	411
2043	-	357	417
2044	-	359	422
2045	-	362	425
2046	-	364	430
2047	-	366	435

North Isthmus

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	622	-	-
1999	629	-	-
2000	635	-	-
2001	673	-	-
2002	688	-	-
2003	701	-	-
2004	725	-	-
2005	748	-	-
2006	808	-	-
2007	797	-	-
2008	-	831	857
2009	-	856	886
2010	-	883	916
2011	-	907	948
2012	-	929	979
2013	-	950	1002
2014	-	973	1033
2015	-	995	1057
2016	-	1016	1086
2017	-	1038	1108
2018	-	1059	1140
2019	-	1081	1164
2020	-	1103	1197
2021	-	1123	1221
2022	-	1143	1249
2023	-	1163	1278
2024	-	1184	1298
2025	-	1205	1328
2026	-	1224	1358
2027	-	1245	1389
2028	-	1265	1410
2029	-	1285	1434
2030	-	1306	1475
2031	-	1327	1502
2032	-	1348	1528
2033	-	1370	1564
2034	-	1392	1588
2035	-	1413	1626
2036	-	1437	1650
2037	-	1460	1696
2038	-	1483	1723
2039	-	1507	1758
2040	-	1531	1791
2041	-	1555	1826
2042	-	1580	1861
2043	-	1605	1894
2044	-	1629	1946
2045	-	1654	1971
2046	-	1679	2006
2047	-	1703	2042

Taranaki (*)

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	125	-	-
1999	124	-	-
2000	135	-	-
2001	126	-	-
2002	129	-	-
2003	123	-	-
2004	126	-	-
2005	125	-	-
2006	131	-	-
2007	131	-	-
2008	-	139	144
2009	-	140	145
2010	-	141	147
2011	-	141	148
2012	-	142	150
2013	-	143	151
2014	-	143	152
2015	-	144	153
2016	-	144	154
2017	-	145	155
2018	-	145	155
2019	-	145	156
2020	-	145	157
2021	-	145	157
2022	-	145	158
2023	-	145	158
2024	-	146	159
2025	-	146	160
2026	-	146	160
2027	-	146	161
2028	-	147	162
2029	-	147	163
2030	-	147	162
2031	-	148	165
2032	-	148	165
2033	-	149	165
2034	-	149	167
2035	-	149	168
2036	-	150	170
2037	-	150	170
2038	-	151	171
2039	-	152	173
2040	-	152	175
2041	-	153	175
2042	-	153	177
2043	-	154	177
2044	-	154	179
2045	-	155	180
2046	-	155	180
2047	-	156	182

(*) Net of Methanex plant. Values from 2008 on are increased by 8 MW to account for new loads

Waikato

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	471	-	-
1999	466	-	-
2000	476	-	-
2001	481	-	-
2002	484	-	-
2003	485	-	-
2004	511	-	-
2005	507	-	-
2006	532	-	-
2007	551	-	-
2008	-	550	570
2009	-	559	585
2010	-	570	595
2011	-	579	609
2012	-	587	623
2013	-	597	634
2014	-	608	649
2015	-	619	665
2016	-	631	678
2017	-	642	694
2018	-	653	706
2019	-	664	721
2020	-	675	739
2021	-	683	752
2022	-	692	758
2023	-	700	772
2024	-	708	780
2025	-	716	792
2026	-	724	807
2027	-	731	816
2028	-	739	829
2029	-	747	835
2030	-	755	851
2031	-	763	859
2032	-	771	872
2033	-	780	891
2034	-	788	896
2035	-	796	907
2036	-	805	917
2037	-	814	936
2038	-	823	953
2039	-	833	967
2040	-	842	984
2041	-	851	996
2042	-	861	1014
2043	-	871	1018
2044	-	880	1033
2045	-	890	1048
2046	-	899	1072
2047	-	909	1085

Wellington

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	545	-	-
1999	556	-	-
2000	572	-	-
2001	567	-	-
2002	580	-	-
2003	555	-	-
2004	626	-	-
2005	592	-	-
2006	639	-	-
2007	653	-	-
2008	-	655	676
2009	-	667	691
2010	-	681	708
2011	-	693	725
2012	-	704	743
2013	-	716	753
2014	-	728	769
2015	-	740	786
2016	-	751	802
2017	-	761	817
2018	-	772	828
2019	-	782	842
2020	-	792	855
2021	-	800	866
2022	-	809	880
2023	-	817	889
2024	-	825	903
2025	-	833	914
2026	-	841	921
2027	-	849	934
2028	-	857	950
2029	-	866	959
2030	-	874	970
2031	-	883	987
2032	-	891	996
2033	-	900	1006
2034	-	909	1023
2035	-	918	1037
2036	-	928	1052
2037	-	937	1067
2038	-	947	1073
2039	-	957	1100
2040	-	967	1116
2041	-	977	1125
2042	-	987	1134
2043	-	998	1159
2044	-	1008	1181
2045	-	1018	1190
2046	-	1029	1208
2047	-	1039	1218

South Island regional forecasts

Canterbury

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	615	-	-
1999	648	-	-
2000	632	-	-
2001	681	-	-
2002	711	-	-
2003	663	-	-
2004	700	-	-
2005	707	-	-
2006	750	-	-
2007	744	-	-
2008	-	764	786
2009	-	779	804
2010	-	797	828
2011	-	813	848
2012	-	829	870
2013	-	843	889
2014	-	856	905
2015	-	868	919
2016	-	878	936
2017	-	887	949
2018	-	897	962
2019	-	907	976
2020	-	918	994
2021	-	927	1003
2022	-	937	1017
2023	-	947	1030
2024	-	958	1056
2025	-	969	1065
2026	-	980	1087
2027	-	992	1108
2028	-	1003	1113
2029	-	1014	1139
2030	-	1026	1150
2031	-	1038	1169
2032	-	1050	1192
2033	-	1062	1213
2034	-	1074	1218
2035	-	1087	1249
2036	-	1100	1266
2037	-	1113	1277
2038	-	1126	1305
2039	-	1139	1324
2040	-	1153	1341
2041	-	1166	1359
2042	-	1180	1389
2043	-	1194	1407
2044	-	1207	1420
2045	-	1221	1446
2046	-	1235	1471
2047	-	1248	1490

Nelson/Marlborough

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	156	-	-
1999	166	-	-
2000	165	-	-
2001	175	-	-
2002	179	-	-
2003	180	-	-
2004	189	-	-
2005	194	-	-
2006	198	-	-
2007	213	-	-
2008	-	214	220
2009	-	221	227
2010	-	228	235
2011	-	233	243
2012	-	238	250
2013	-	241	255
2014	-	244	258
2015	-	247	261
2016	-	248	263
2017	-	249	266
2018	-	250	267
2019	-	252	270
2020	-	253	273
2021	-	255	276
2022	-	257	278
2023	-	259	282
2024	-	260	284
2025	-	263	289
2026	-	265	292
2027	-	267	294
2028	-	269	298
2029	-	271	301
2030	-	274	304
2031	-	276	309
2032	-	279	311
2033	-	281	316
2034	-	283	320
2035	-	286	323
2036	-	288	327
2037	-	291	332
2038	-	294	336
2039	-	296	339
2040	-	299	344
2041	-	302	350
2042	-	305	354
2043	-	307	357
2044	-	310	362
2045	-	313	366
2046	-	315	370
2047	-	318	373

Otago/Southland (*)

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	963	-	-
1999	974	-	-
2000	996	-	-
2001	1017	-	-
2002	1025	-	-
2003	1012	-	-
2004	1040	-	-
2005	1059	-	-
2006	1062	-	-
2007	1103	-	-
2008	-	1105	1120
2009	-	1115	1139
2010	-	1127	1161
2011	-	1135	1179
2012	-	1142	1198
2013	-	1148	1204
2014	-	1154	1211
2015	-	1159	1220
2016	-	1162	1216
2017	-	1165	1225
2018	-	1168	1229
2019	-	1171	1234
2020	-	1174	1235
2021	-	1176	1238
2022	-	1178	1239
2023	-	1180	1240
2024	-	1182	1244
2025	-	1184	1248
2026	-	1187	1244
2027	-	1189	1255
2028	-	1192	1261
2029	-	1195	1268
2030	-	1198	1268
2031	-	1201	1273
2032	-	1203	1271
2033	-	1206	1279
2034	-	1209	1286
2035	-	1212	1291
2036	-	1216	1290
2037	-	1219	1300
2038	-	1222	1304
2039	-	1226	1316
2040	-	1229	1322
2041	-	1233	1330
2042	-	1236	1331
2043	-	1240	1336
2044	-	1243	1346
2045	-	1247	1348
2046	-	1250	1352
2047	-	1254	1362

(*) Values from 2008 on are increased by 5 MW to account for new loads

South Canterbury

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	75	-	-
1999	75	-	-
2000	78	-	-
2001	80	-	-
2002	87	-	-
2003	91	-	-
2004	94	-	-
2005	93	-	-
2006	101	-	-
2007	98	-	-
2008	-	104	107
2009	-	107	111
2010	-	111	116
2011	-	114	119
2012	-	117	123
2013	-	119	126
2014	-	120	127
2015	-	121	129
2016	-	122	131
2017	-	122	132
2018	-	122	131
2019	-	123	133
2020	-	123	134
2021	-	124	135
2022	-	125	137
2023	-	126	139
2024	-	127	140
2025	-	128	141
2026	-	129	143
2027	-	130	145
2028	-	131	146
2029	-	132	149
2030	-	133	152
2031	-	135	152
2032	-	136	155
2033	-	137	157
2034	-	139	159
2035	-	140	161
2036	-	142	164
2037	-	143	167
2038	-	145	168
2039	-	146	172
2040	-	148	173
2041	-	150	176
2042	-	151	179
2043	-	153	182
2044	-	155	185
2045	-	157	188
2046	-	158	190
2047	-	160	192

(*) Value used for 2006 is artificial – real value was affected by outages

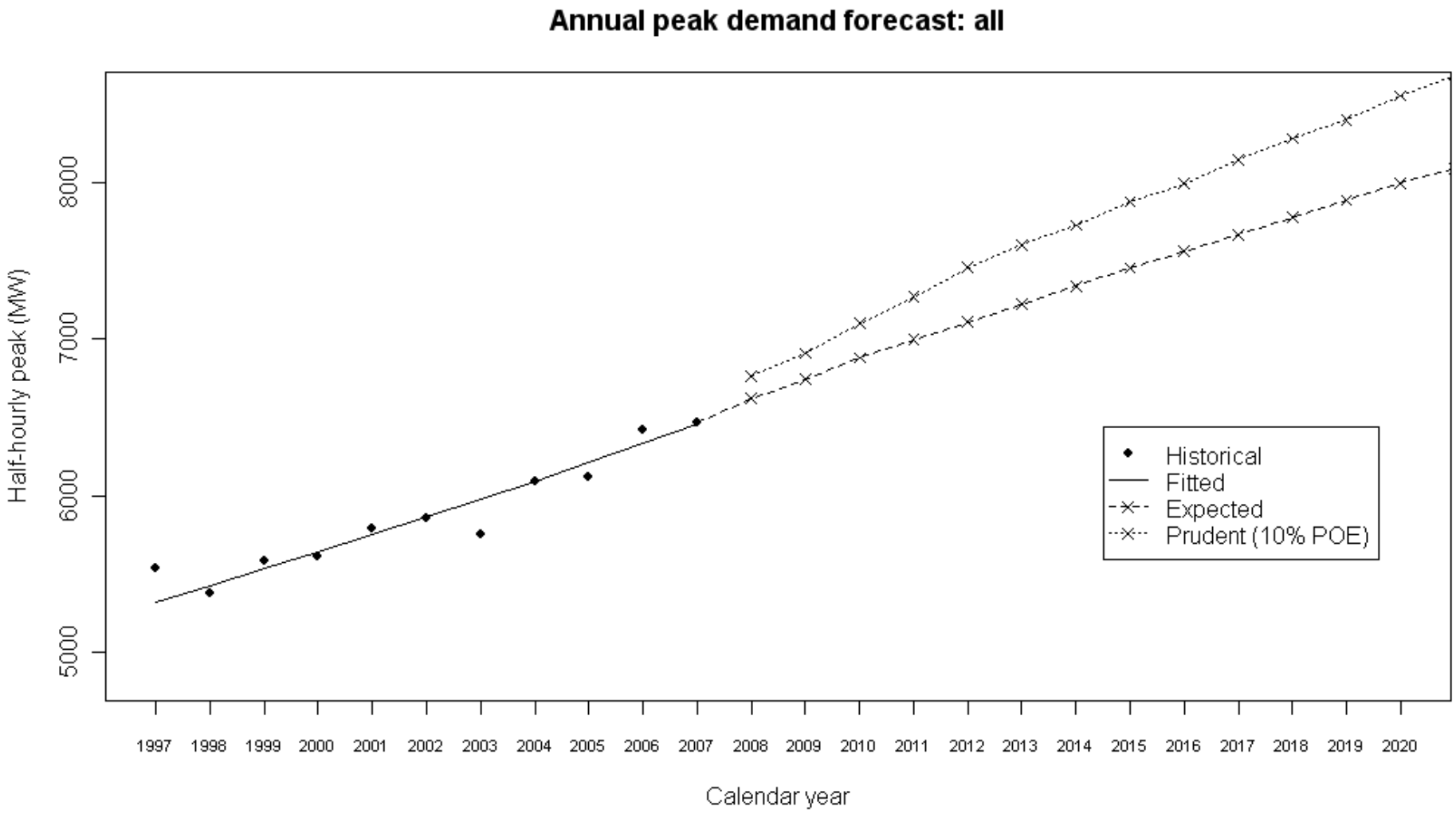
West Coast

Year	Observed peak (MW)	Expected peak (MW)	Prudent peak (MW)
1998	42	-	-
1999	43	-	-
2000	43	-	-
2001	44	-	-
2002	47	-	-
2003	44	-	-
2004	46	-	-
2005	47	-	-
2006	49	-	-
2007	50	-	-
2008	-	72	74
2009	-	73	75
2010	-	74	77
2011	-	75	78
2012	-	76	79
2013	-	76	80
2014	-	77	81
2015	-	77	81
2016	-	78	82
2017	-	78	82
2018	-	79	83
2019	-	79	84
2020	-	80	84
2021	-	80	84
2022	-	80	85
2023	-	81	86
2024	-	81	86
2025	-	81	86
2026	-	81	87
2027	-	82	88
2028	-	82	88
2029	-	82	89
2030	-	83	89
2031	-	83	90
2032	-	83	90
2033	-	84	91
2034	-	84	91
2035	-	84	92
2036	-	85	93
2037	-	85	93
2038	-	86	94
2039	-	86	95
2040	-	86	95
2041	-	87	96
2042	-	87	96
2043	-	88	98
2044	-	88	98
2045	-	89	99
2046	-	89	100
2047	-	89	100

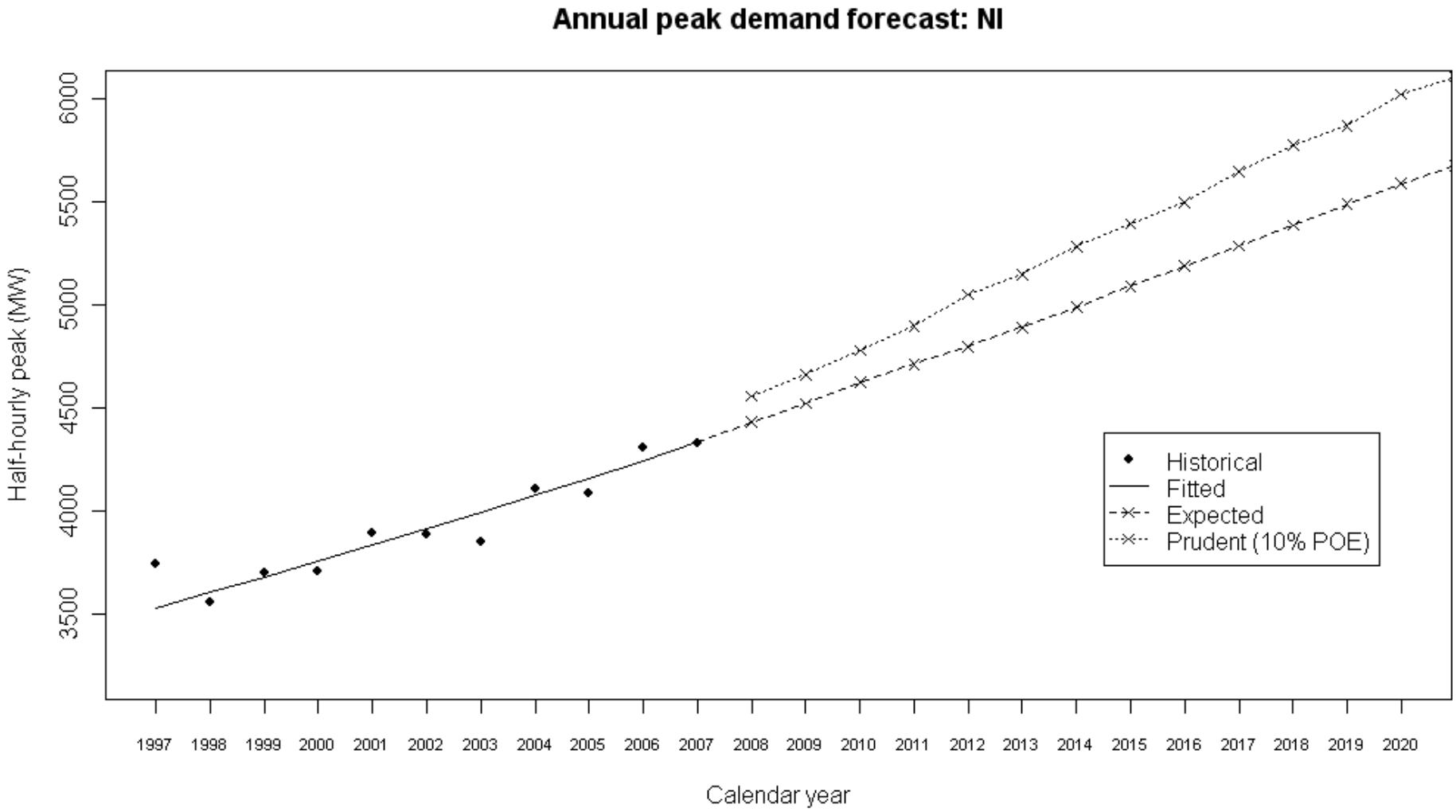
(*) Values from 2008 on are increased by 22 MW to account for new loads

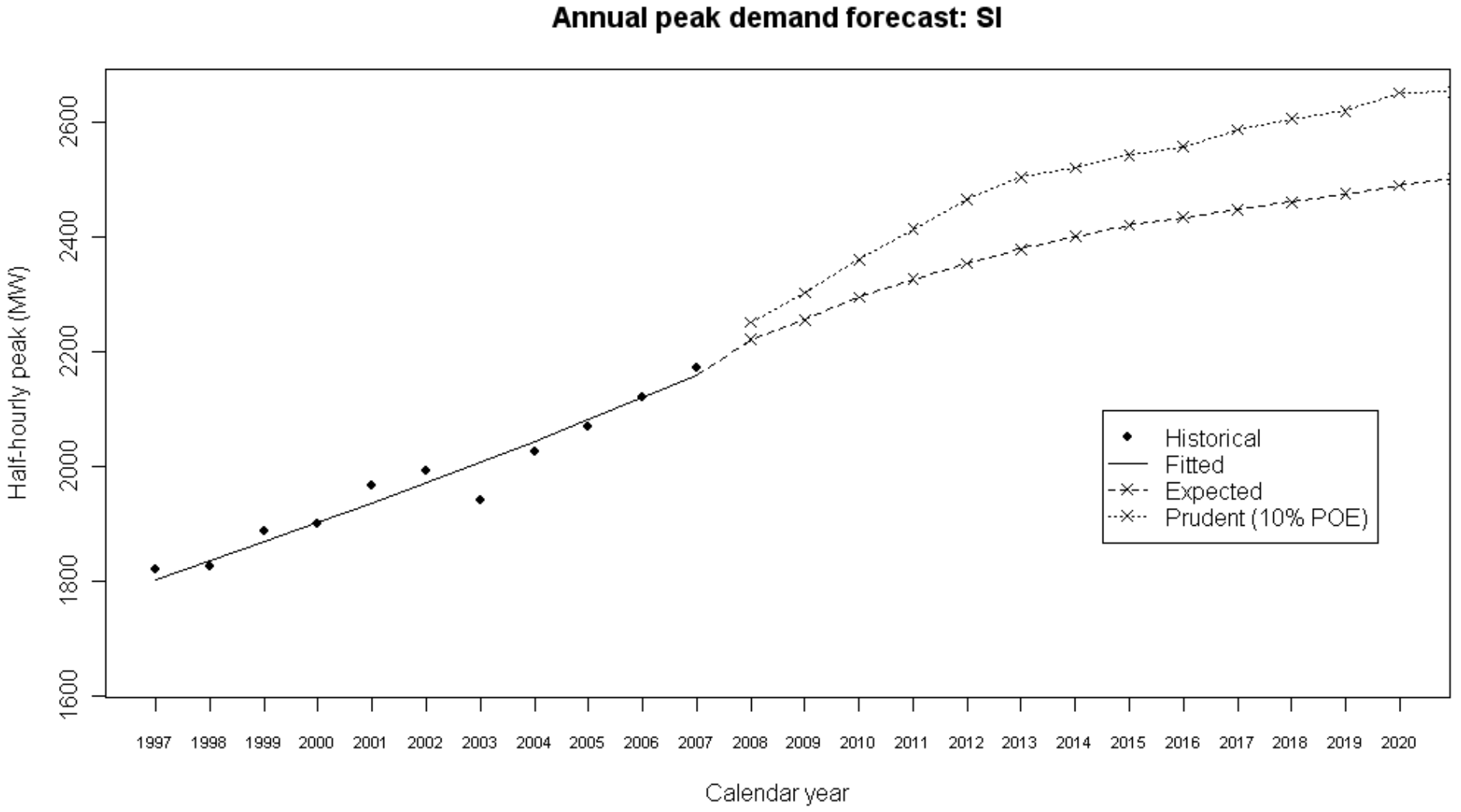
3.2 Forecasts (as plots)

The national forecast is as follows:

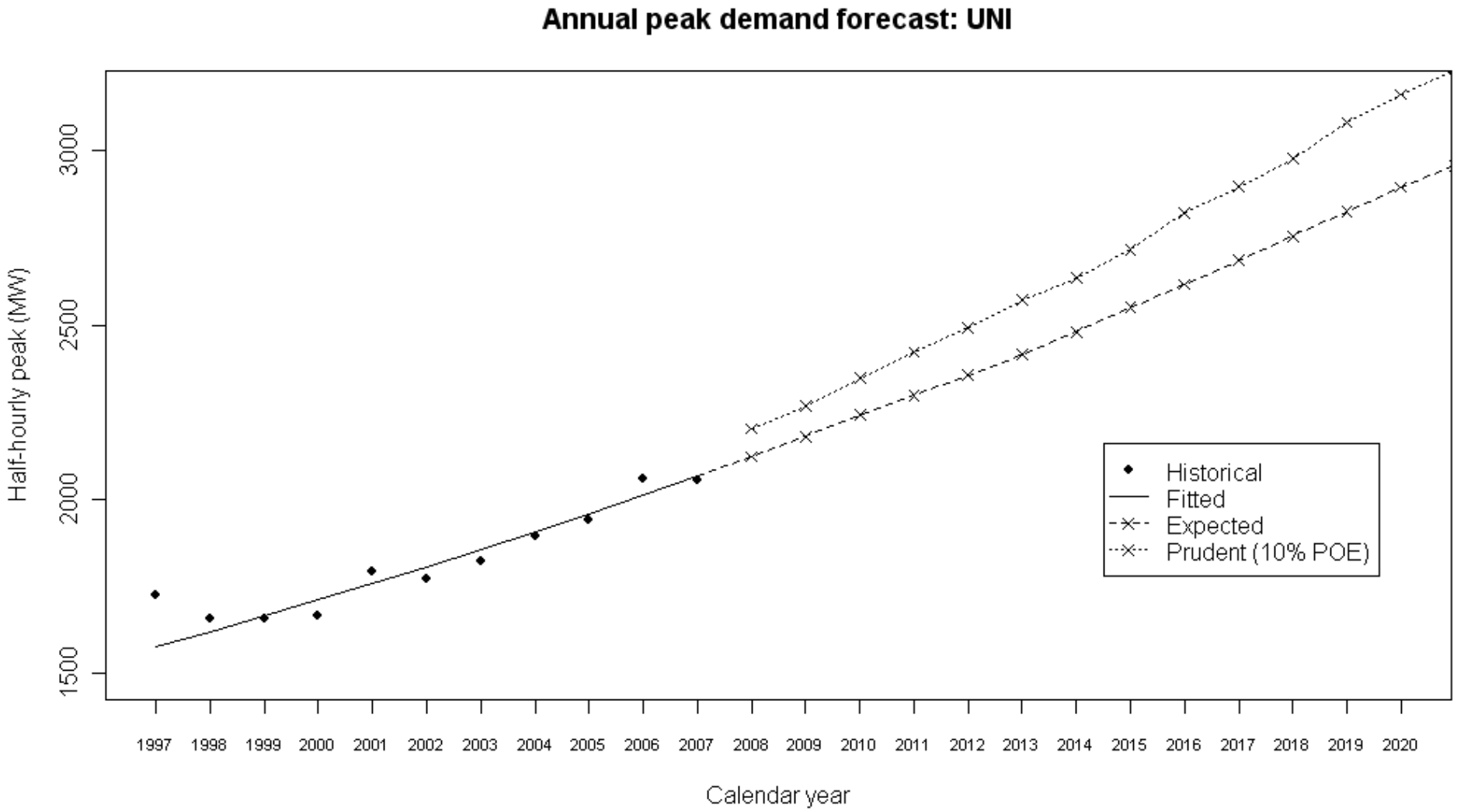


Island forecasts follow:

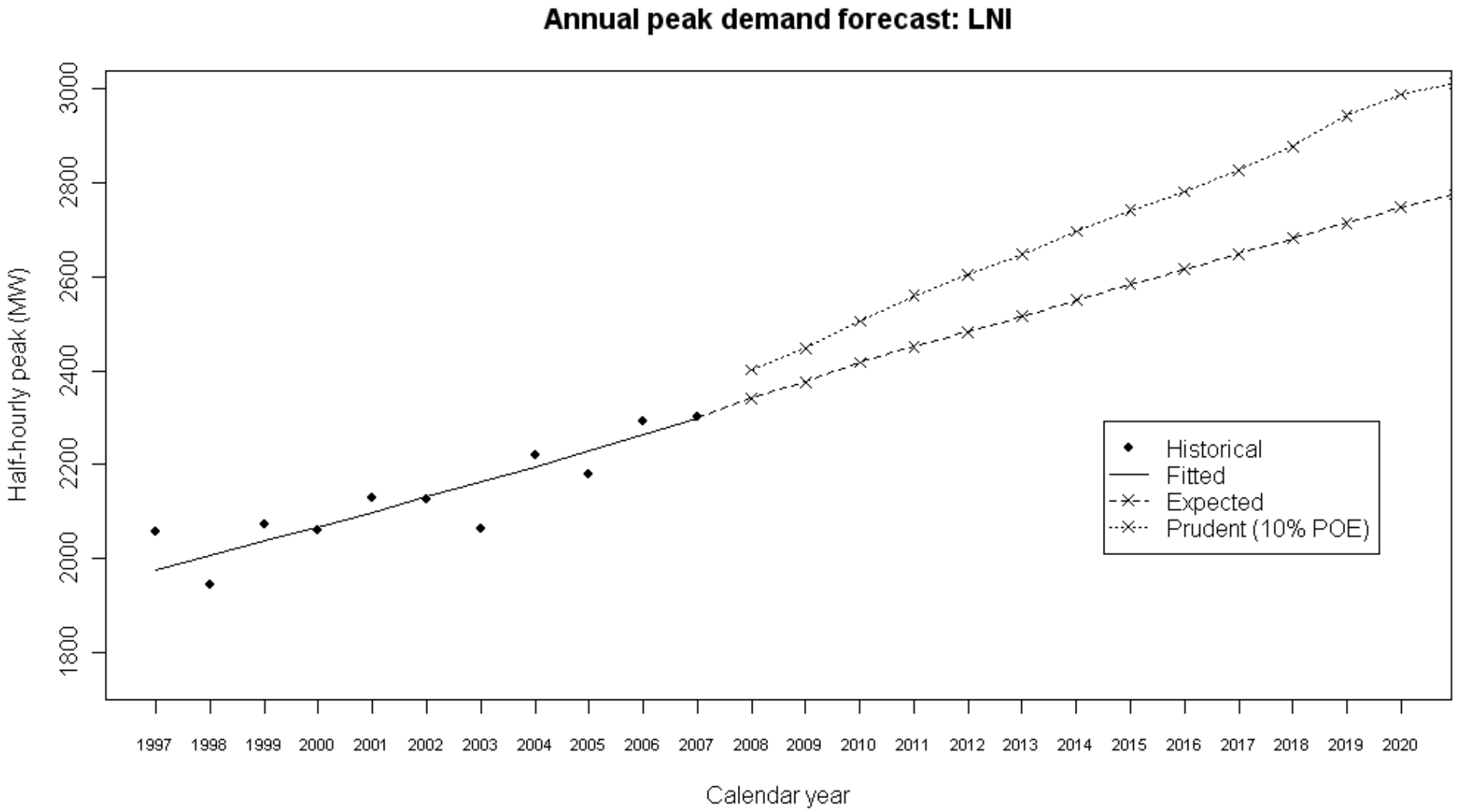



Annual peak demand forecast: SI
Half-hourly peak (MW)
1600
1800
2000
2200
2400
2600
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)

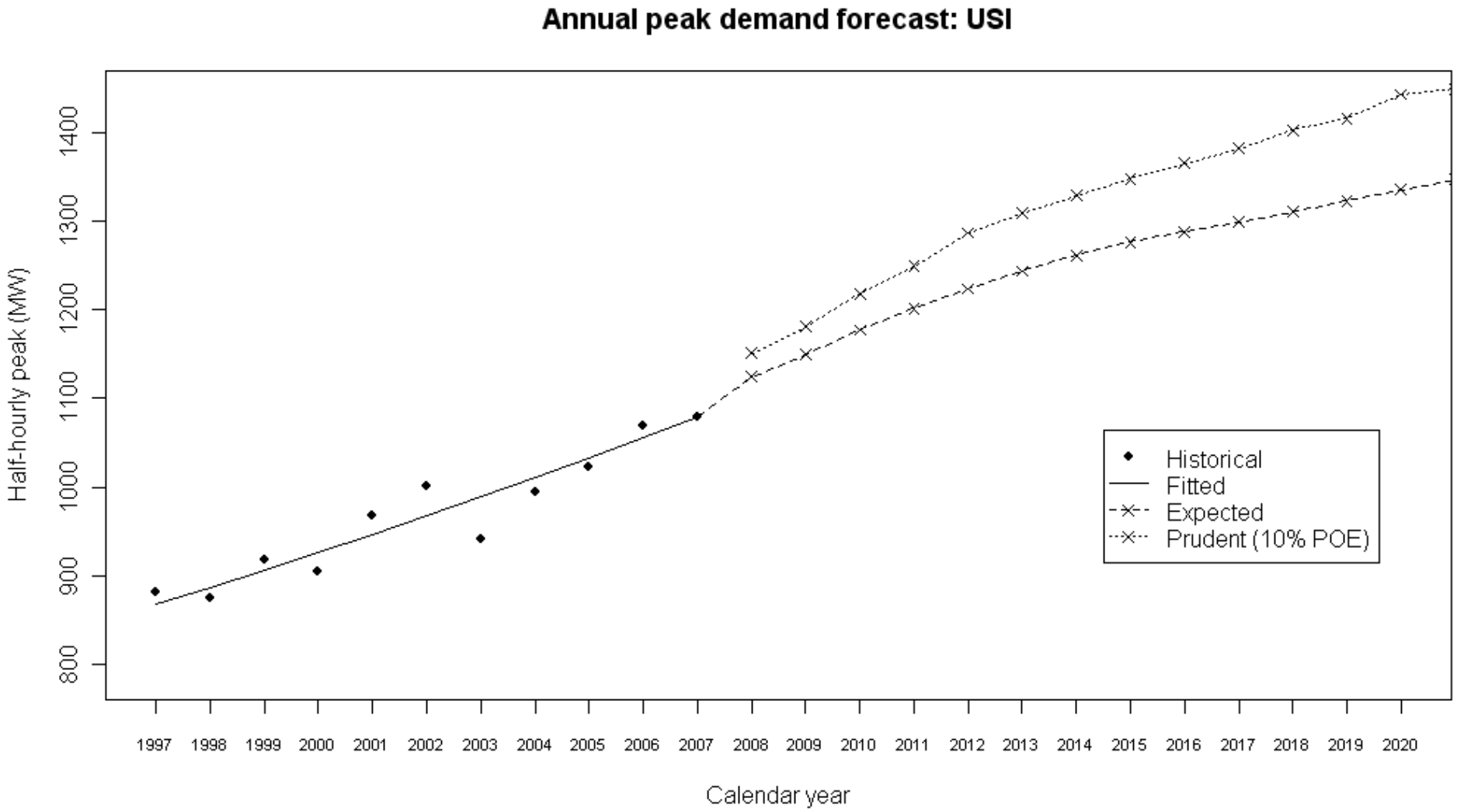
The upper North Island forecast:



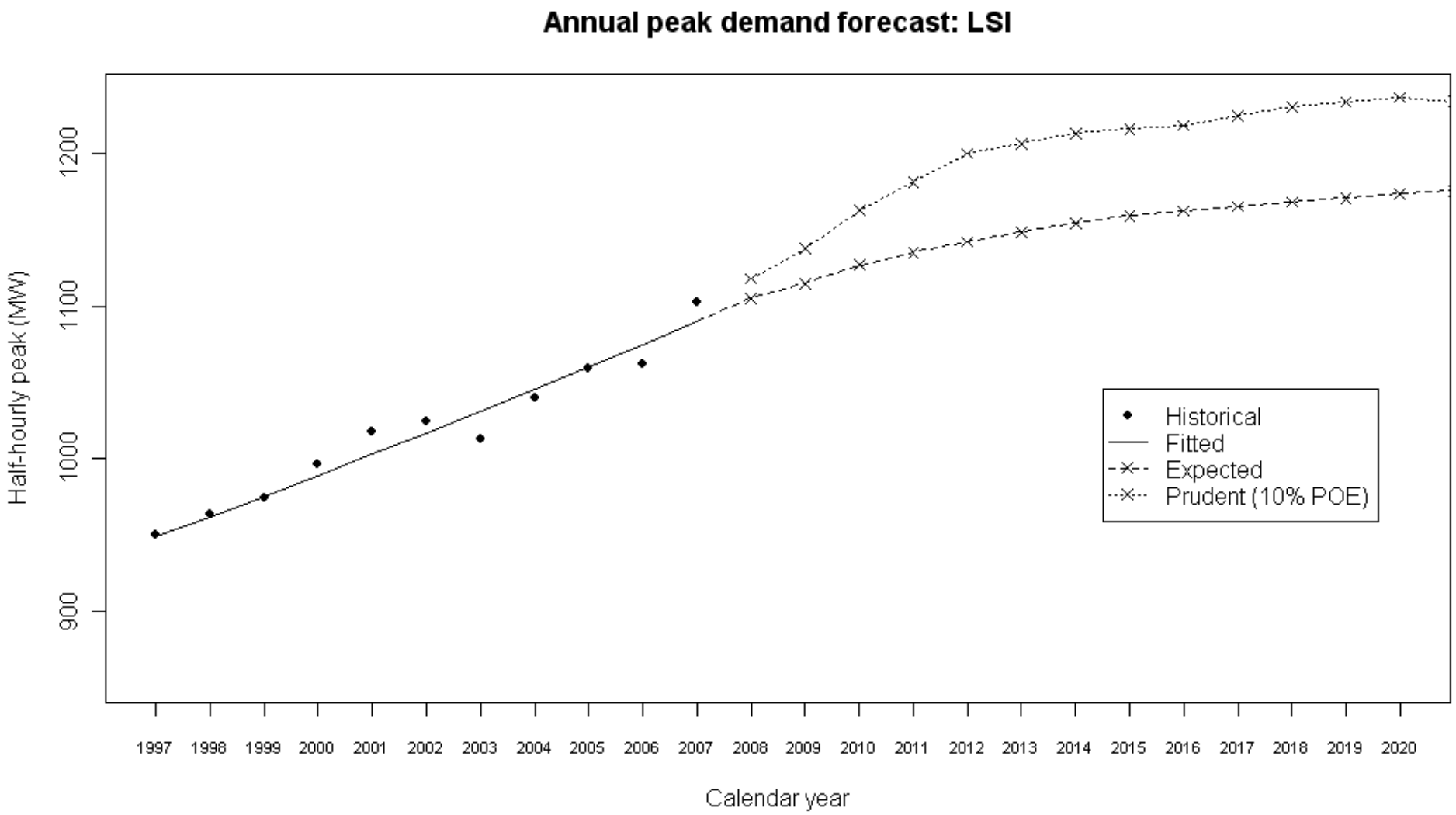
The forecast for the remainder of the North Island:



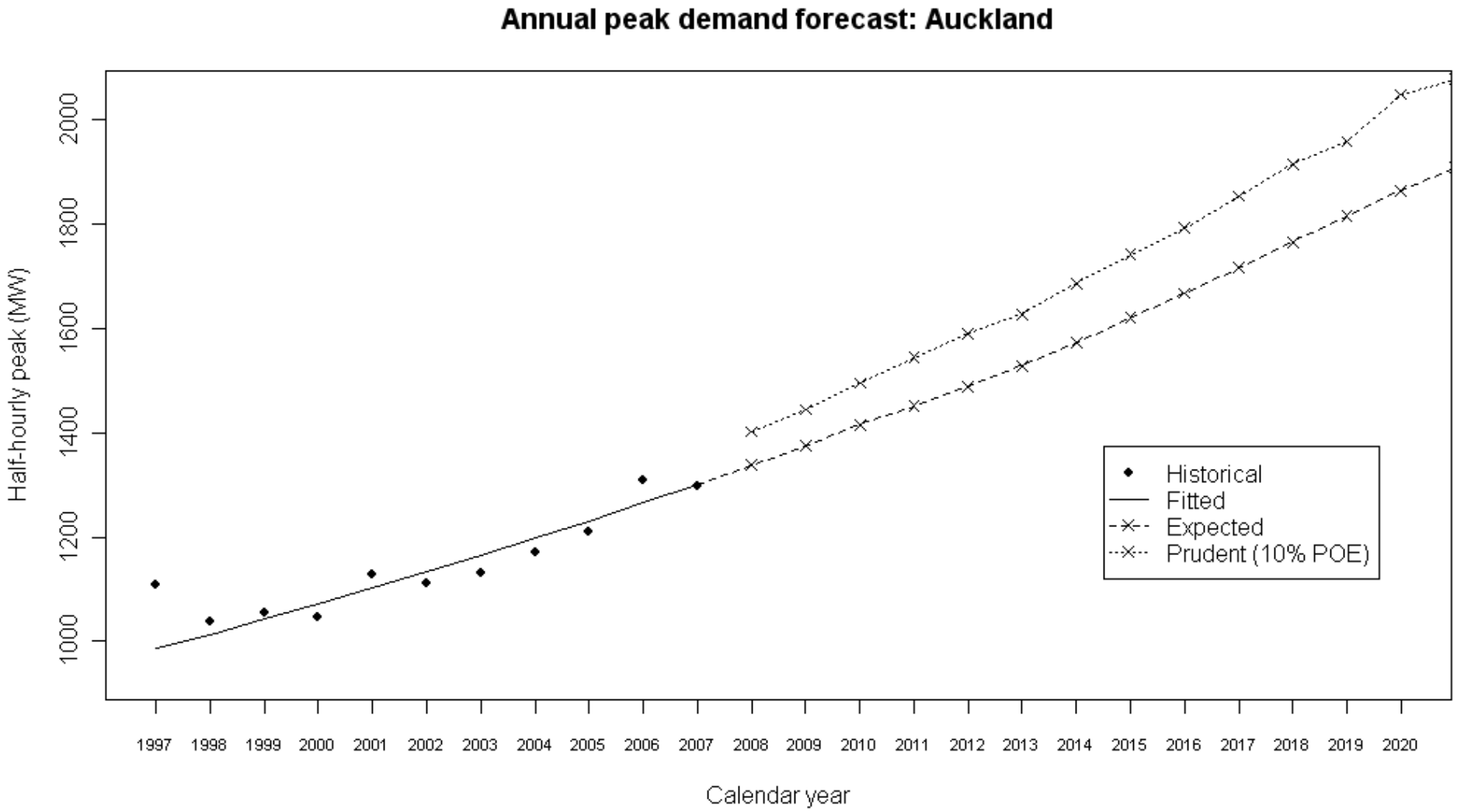
The upper South Island forecast:

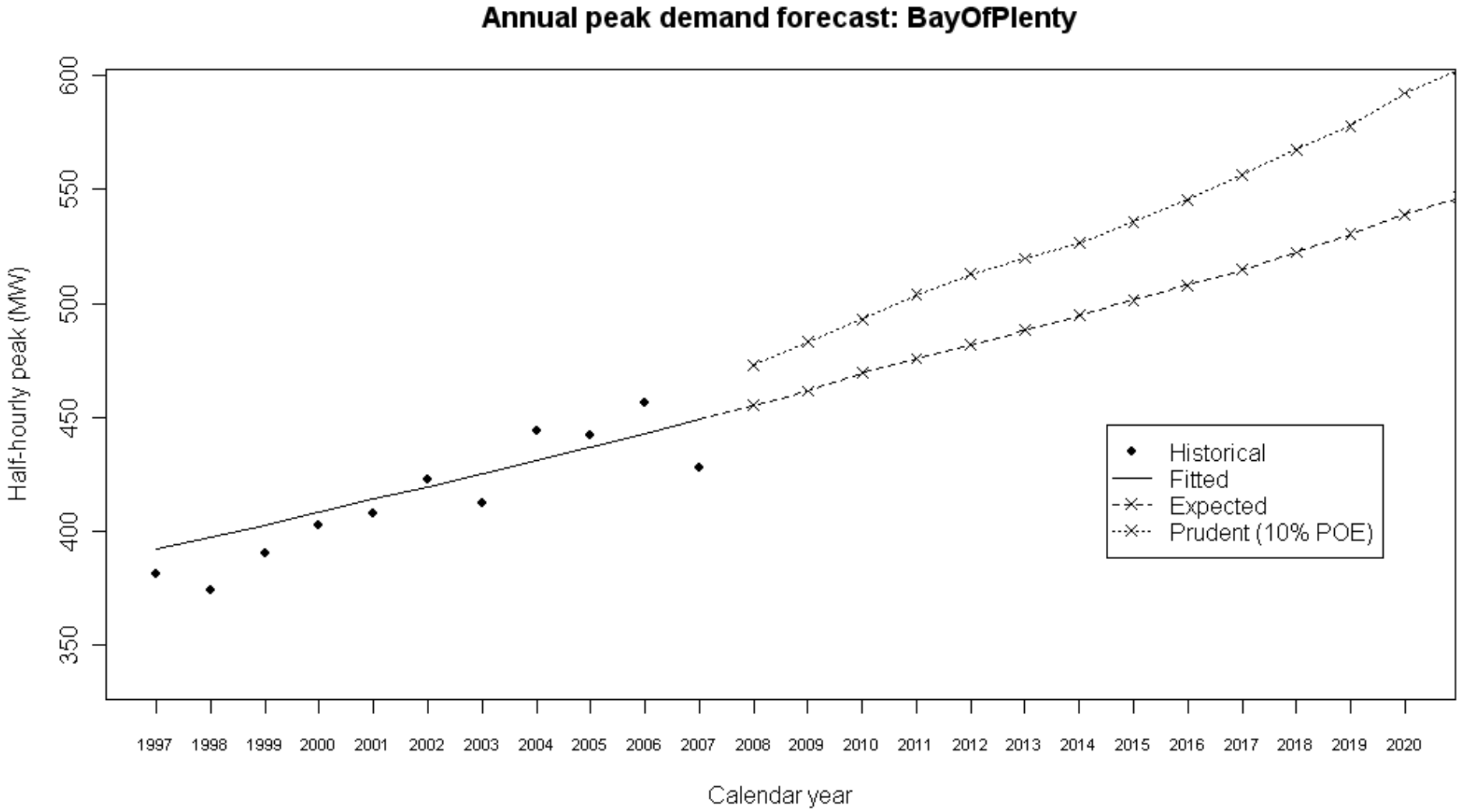


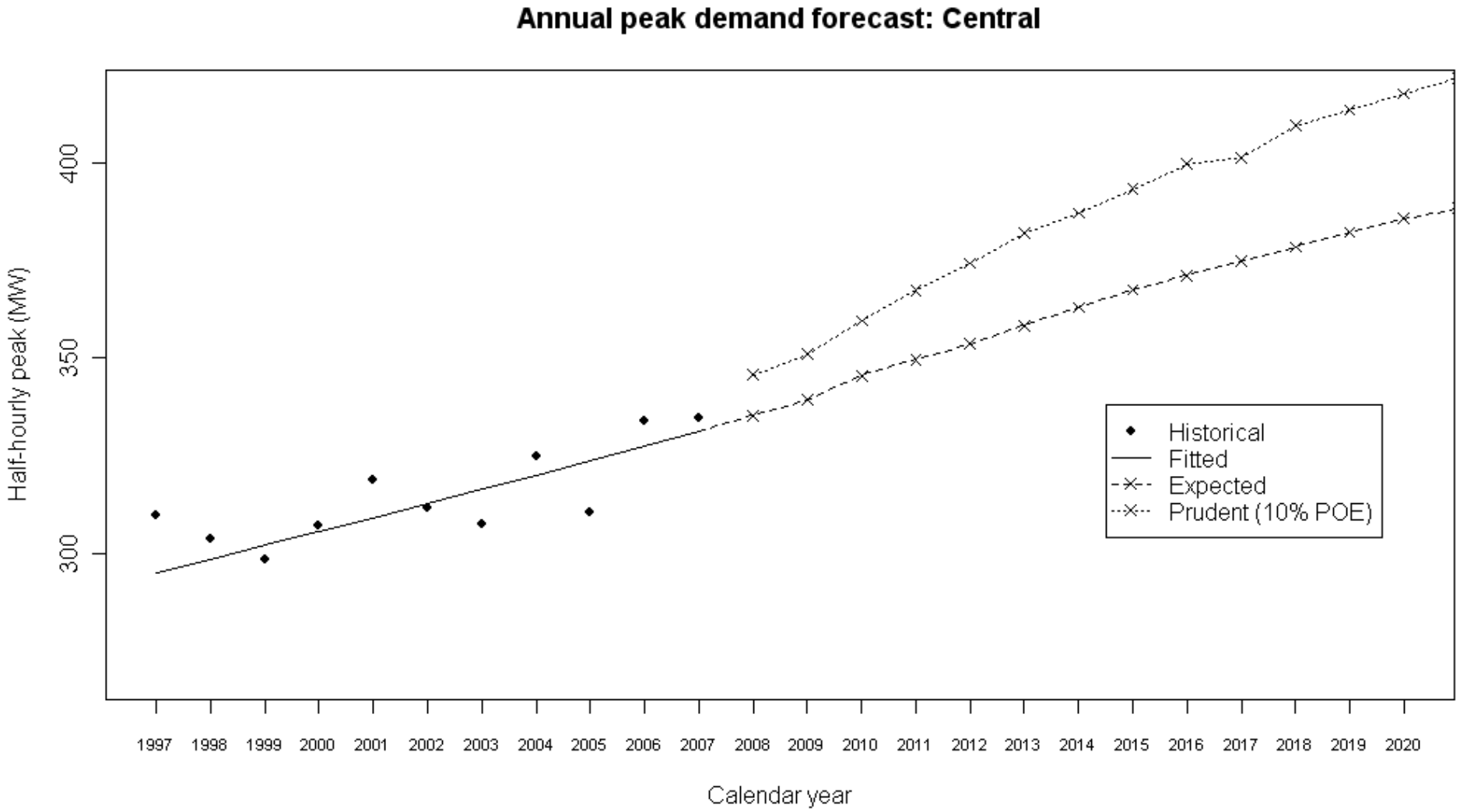
The forecast for the lower South Island:

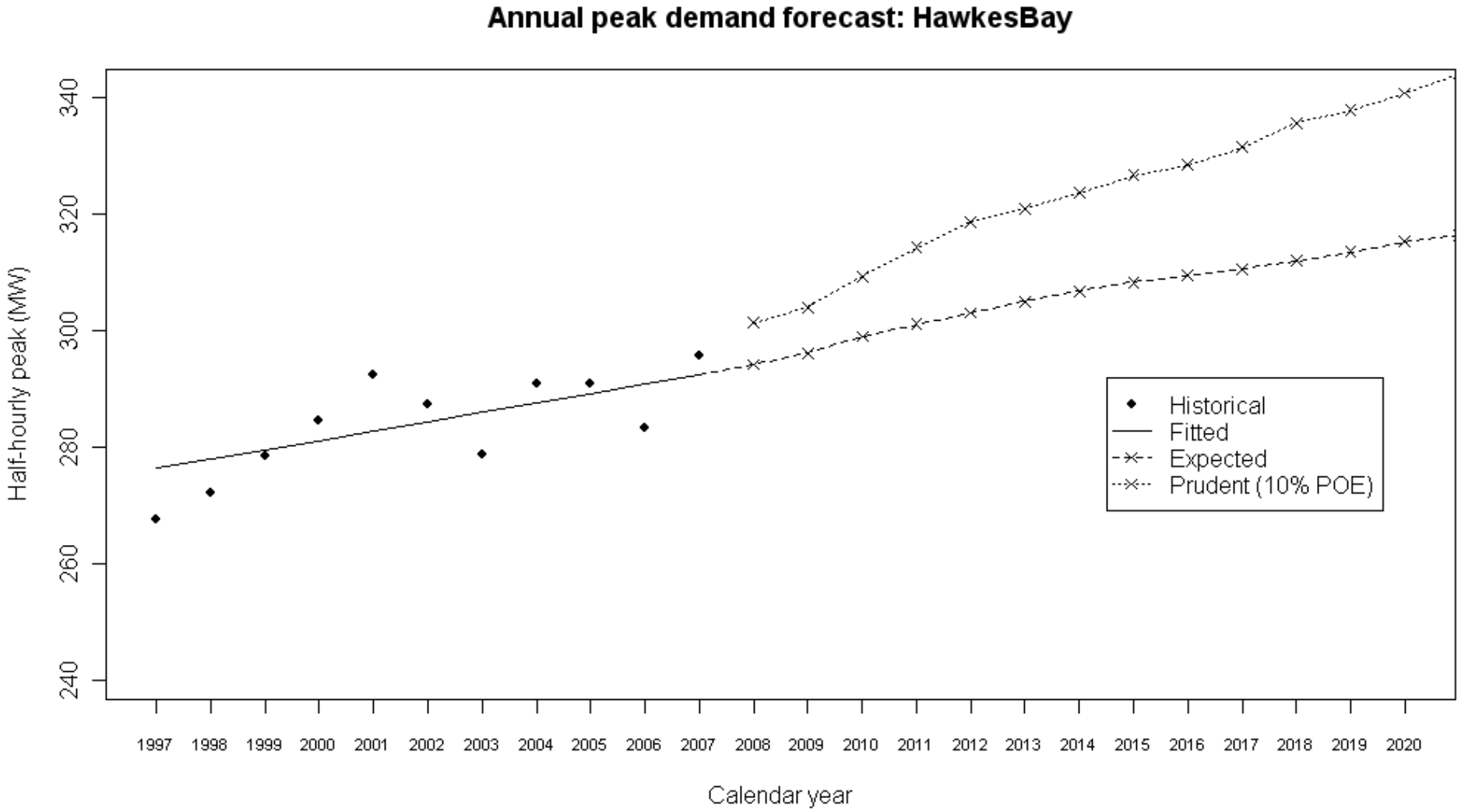


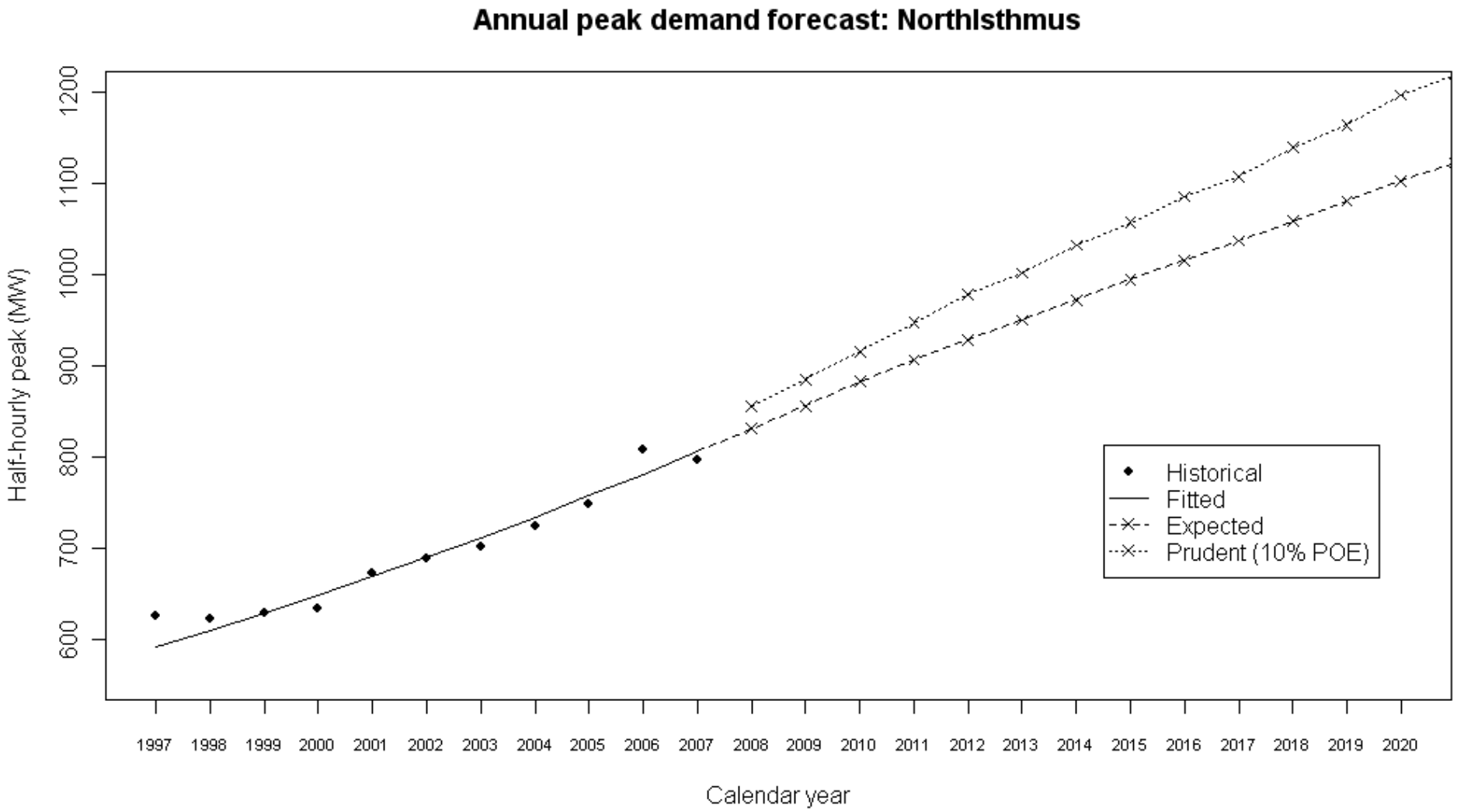
North Island regional forecasts:



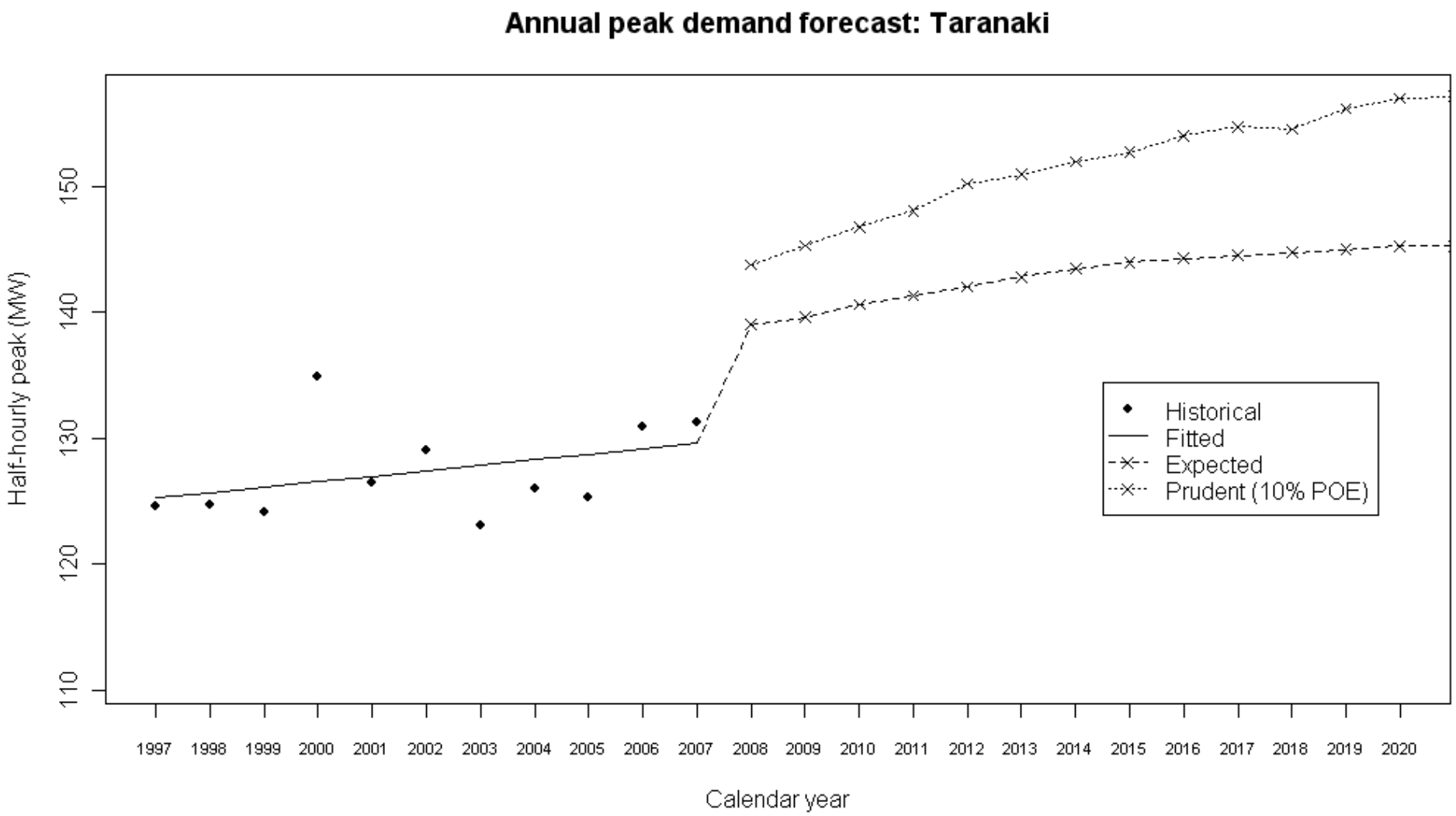

Annual peak demand forecast: BayOfPlenty
Half-hourly peak (MW)
350
400
450
500
550
600
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)

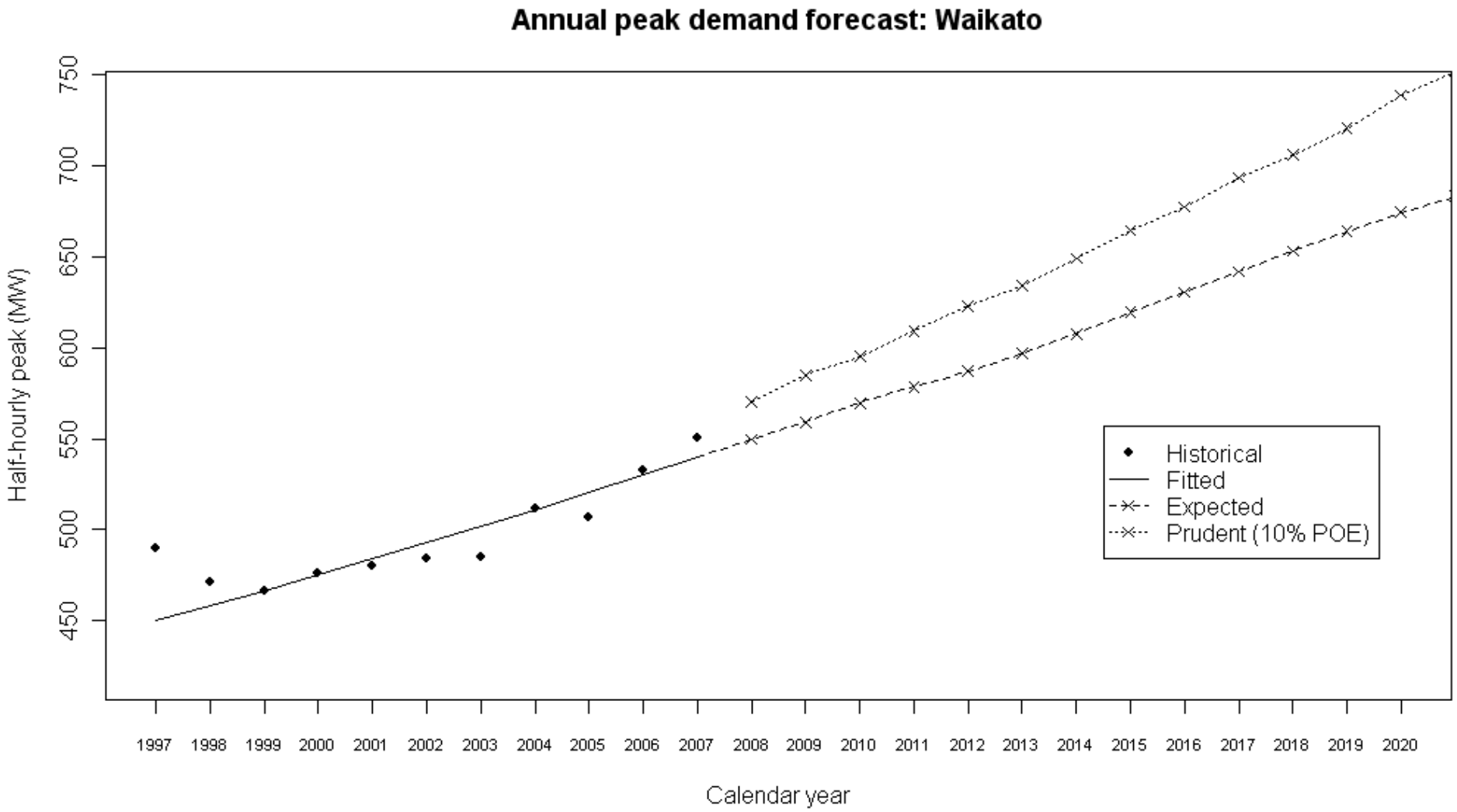

Annual peak demand forecast: Central
Half-hourly peak (MW)
300
350
400
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)

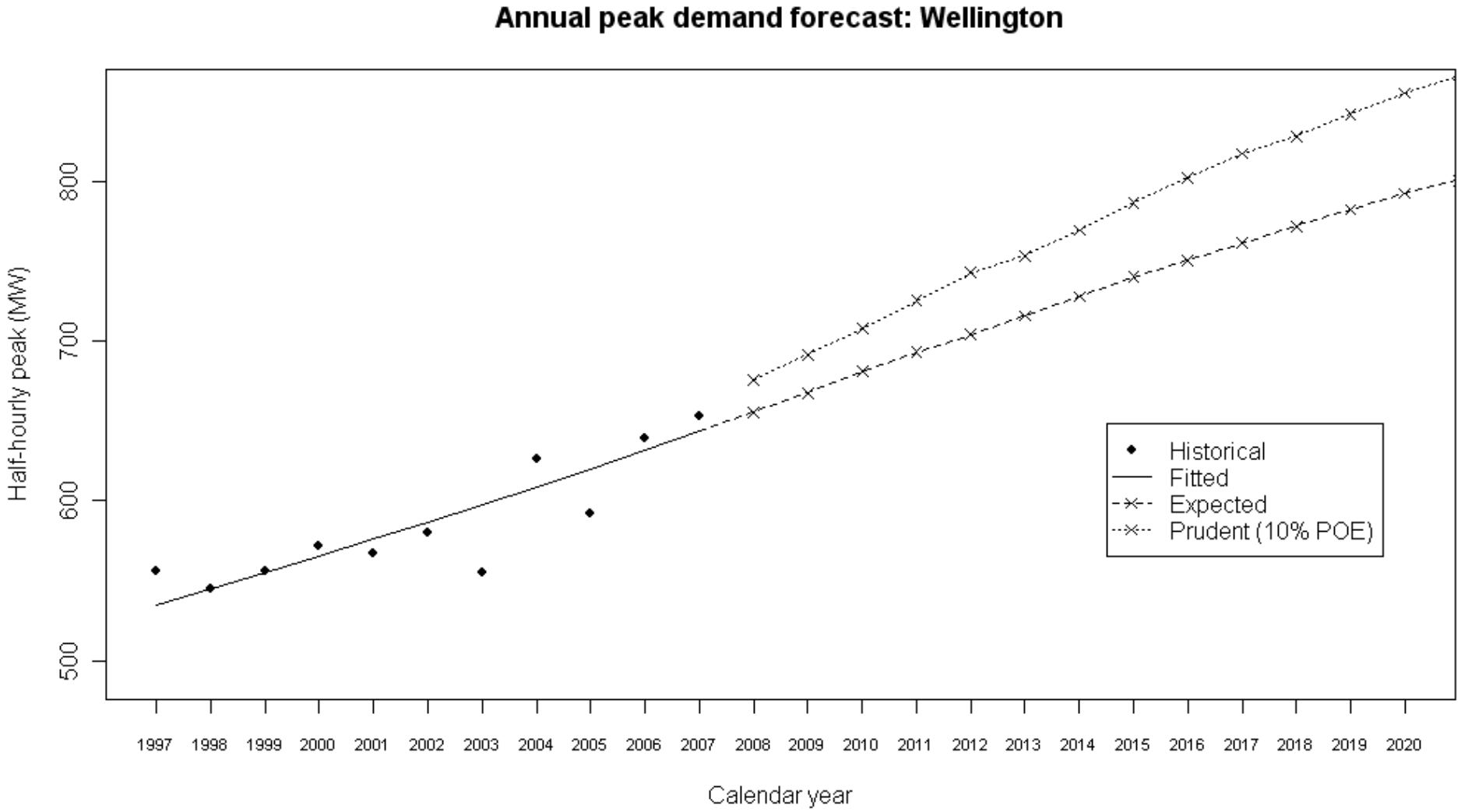

Annual peak demand forecast: HawkesBay
Half-hourly peak (MW)
240
260
280
300
320
340
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)


Annual peak demand forecast: NorthIsthmus
Half-hourly peak (MW)
600
700
800
900
1000
1100
1200
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)

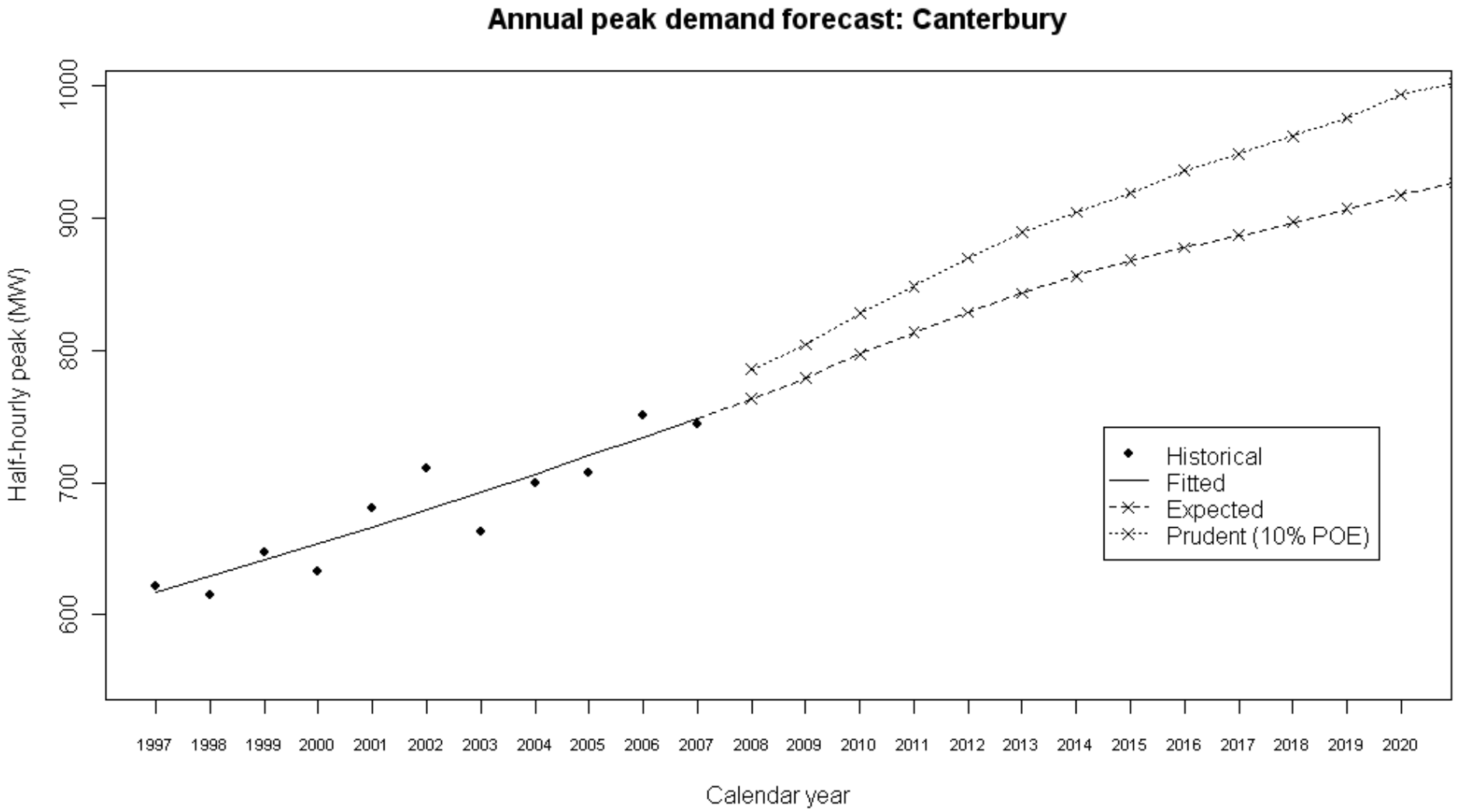
(Note: Taranaki forecast is net of Methanex plant)

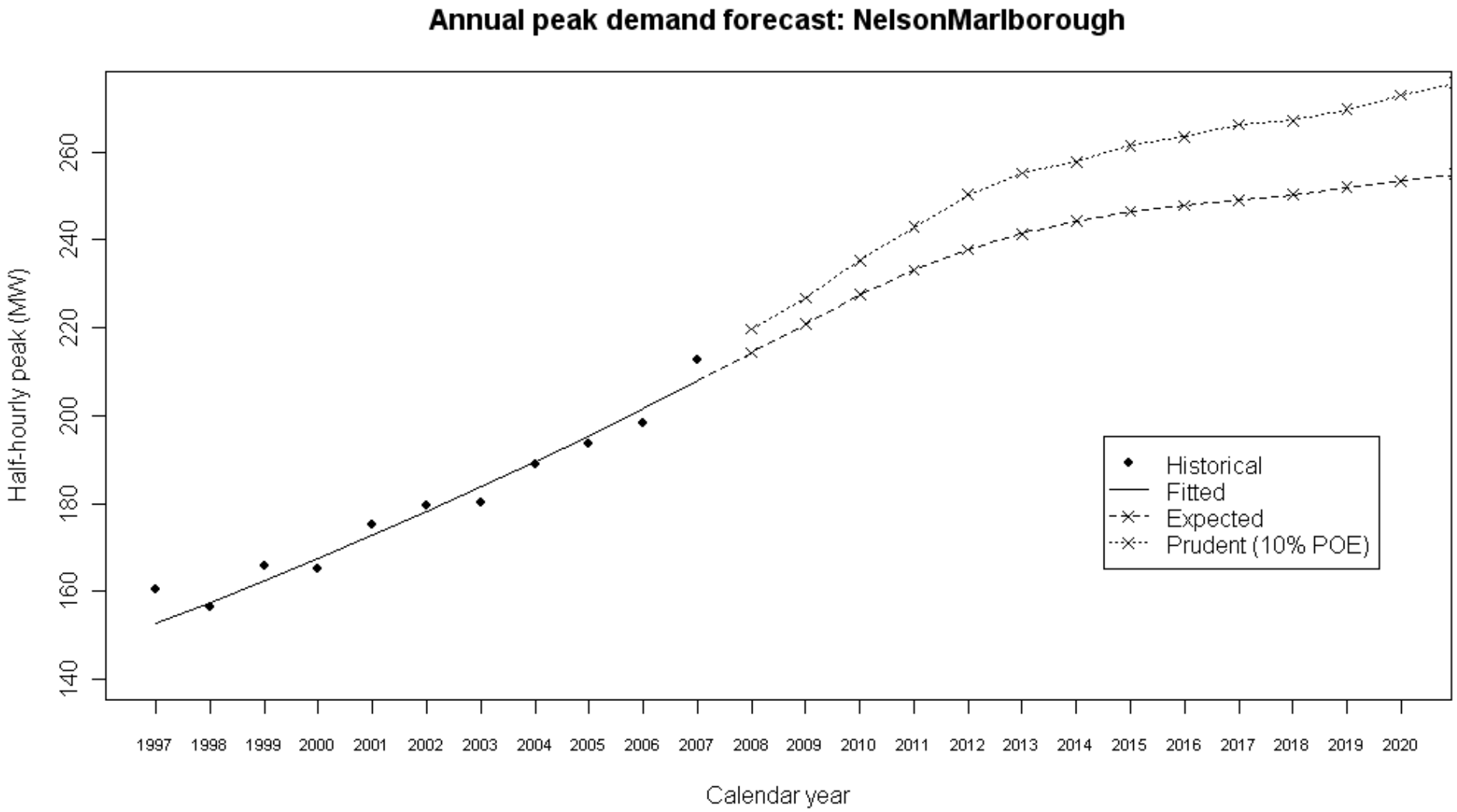


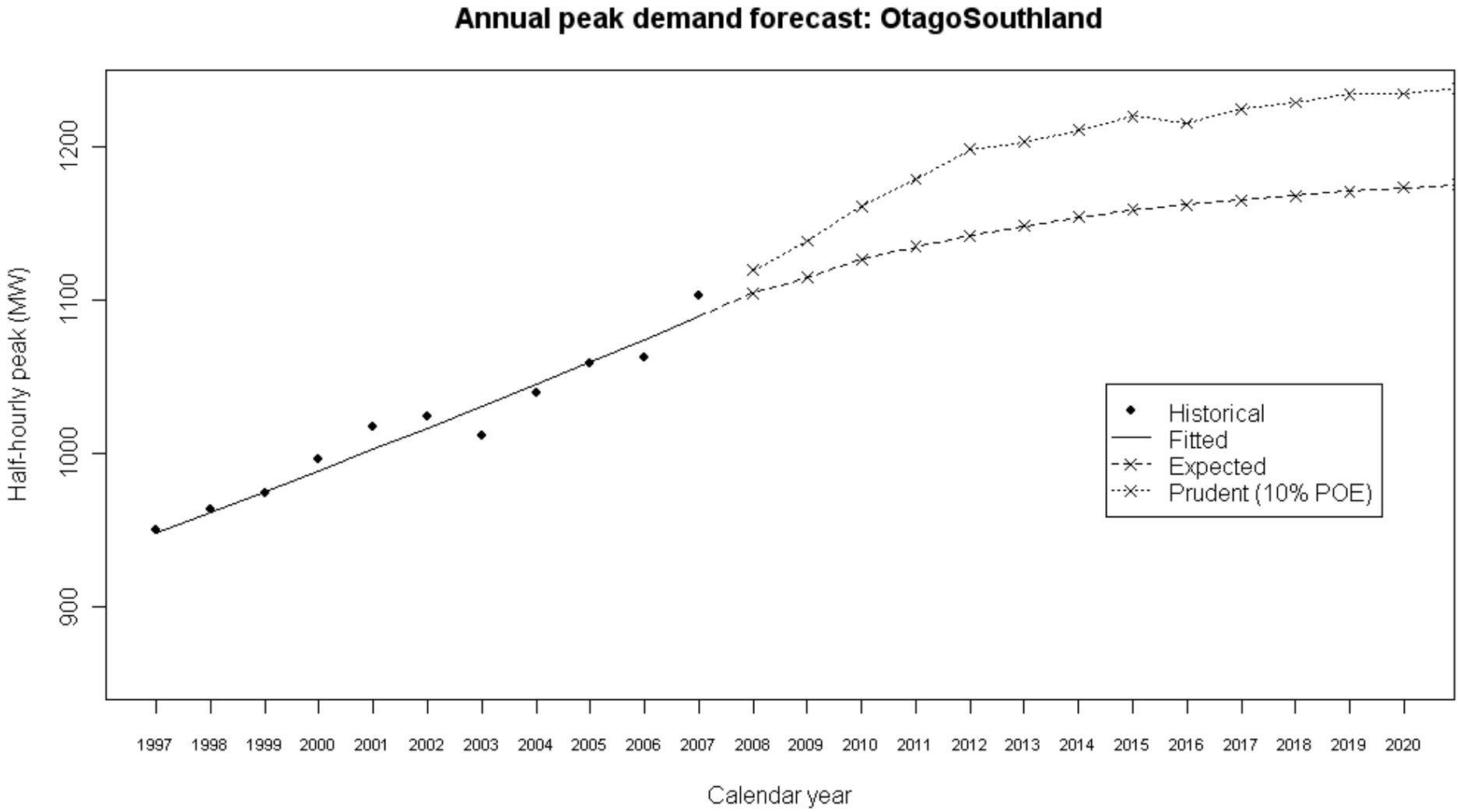

Annual peak demand forecast: Waikato
Half-hourly peak (MW)
450
500
550
600
650
700
750
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)


Annual peak demand forecast: Wellington
Half-hourly peak (MW)
500
600
700
800
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)

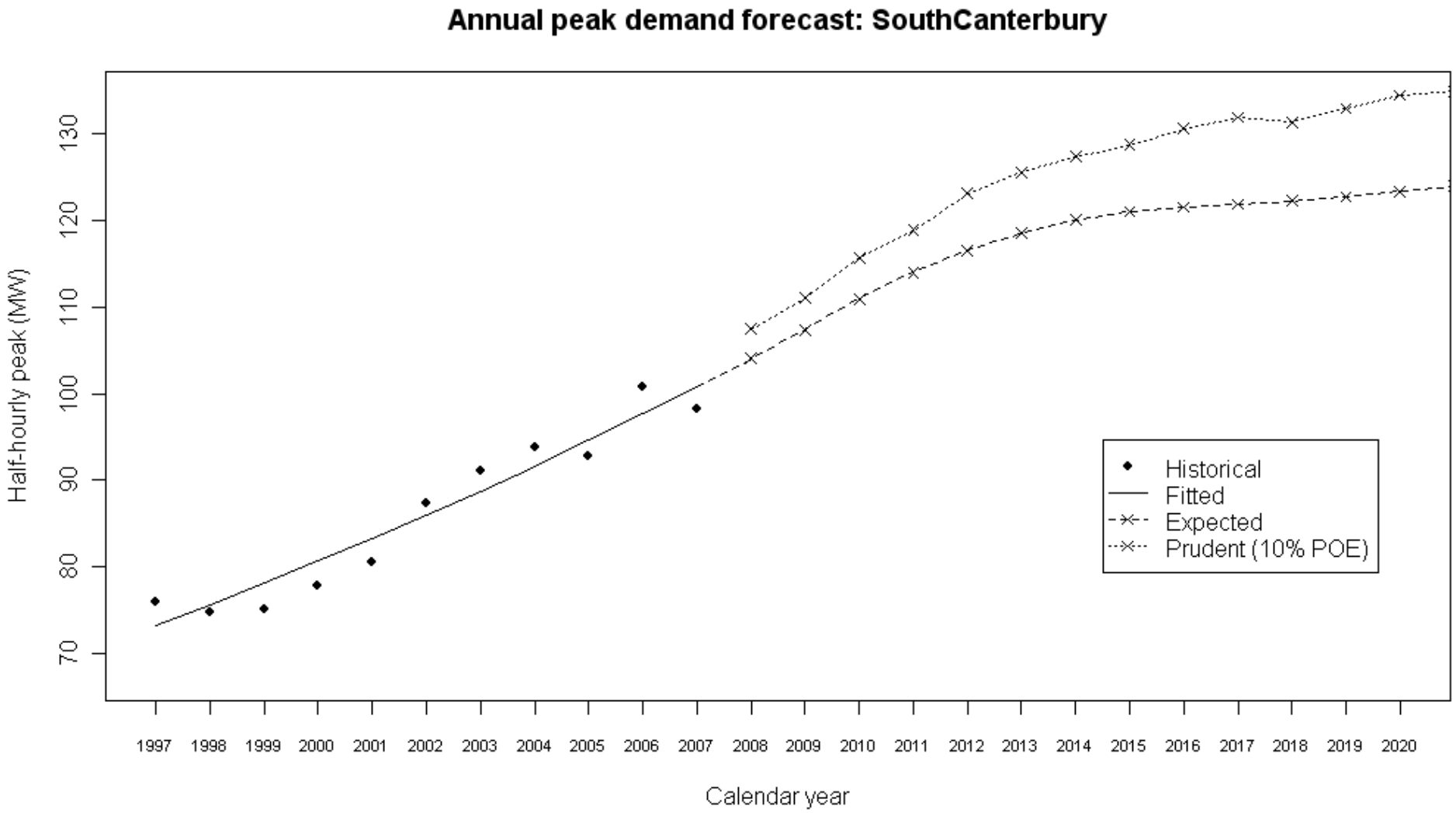
South Island regional forecasts:

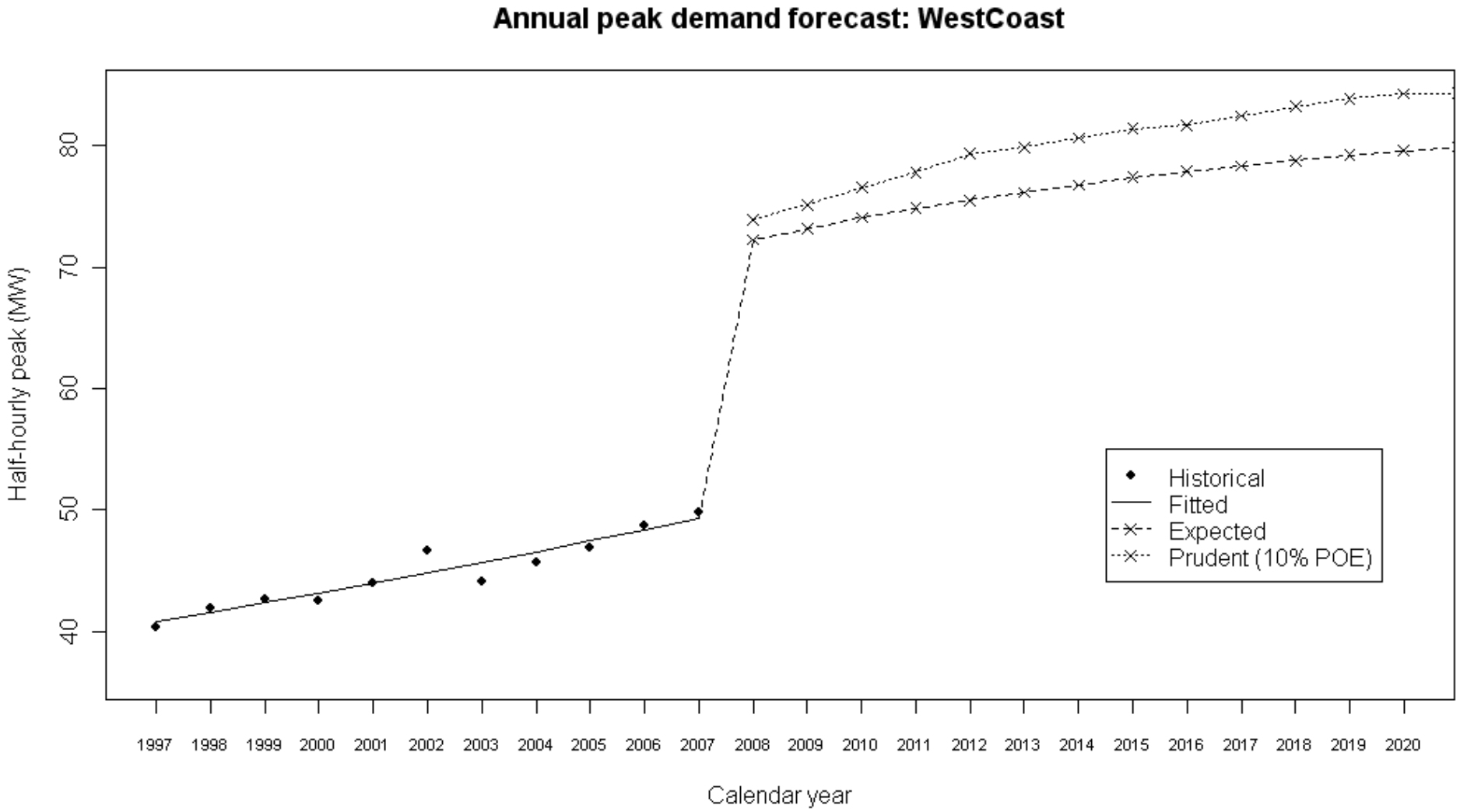



Annual peak demand forecast: NelsonMarlborough
Half-hourly peak (MW)
140
160
180
200
220
240
260
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)


Annual peak demand forecast: OtagoSouthland
Half-hourly peak (MW)
900
1000
1100
1200
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)

(Note: Value used for 2006 is artificial – real value was affected by outages)




Annual peak demand forecast: WestCoast
Half-hourly peak (MW)
40
50
60
70
80
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Calendar year
Historical
Fitted
Expected
Prudent (10% POE)

5. Conclusions

5.1 Summary of forecast growth rates

The expected forecast predicts approximately 1.9% annual growth in national peak from 2007 to 2012, 1.5% growth from 2012 to 2020, and 1.2% from 2020 to 2030.

The prudent (P10) forecast of national peak is initially 140 MW higher than the expected forecast (about 2% higher) and grows at a faster rate from that point on: 2.5% from 2008 to 2012, 1.7% from 2012 to 2020, and 1.5% from 2020 to 2030.

For the North Island, the expected forecast predicts approximately 2.0% annual growth from 2007 to 2012, continuing at 1.9% until 2020, and 1.5% from 2020 to 2030.

The prudent (P10) forecast of North Island peak is initially 120 MW higher than the expected forecast (or 2.8% higher) and grows at a faster rate from that point on: 2.6% from 2007 to 2012, then 2.2% until 2020, and 1.8% from 2020 to 2030.

For the South Island, the expected forecast predicts approximately 1.6% annual growth from 2007 to 2012, down to 0.7% from 2012 until 2020, and continuing at 0.6% from 2020 to 2030.

The prudent (P10) forecast of South Island peak is initially just 30 MW higher than the expected forecast (or 1.3% higher) and grows at a faster rate from that point on: 2.3% from 2007 to 2012, down to 0.9% from 2012 until 2020, and continuing at 0.7% from 2020 to 2030.

5.2 Observed 2007 peak demands

Unexpectedly high or low demand peaks occurred in some regions in 2007:

- the Bay of Plenty peak was about 40 MW lower than expected (due to reduced demand at Norske Skog's pulp and paper plant at Kawerau);
- the Otago/Southland peak was about 30 MW higher than expected (due to a higher coincident peak at the NZAS smelter and various other GXPs in the region, and despite the introduction of the new White Hill wind farm); and
- the Nelson/Marlborough peak was about 20 MW higher than expected (apparently due to high organic growth in Nelson and Blenheim).

5.3 West Coast forecast

West Coast demand growth over the next few years is expected to be high, driven primarily by new industrial loads from the mining and dairy industries. An attempt has been made to reflect these changes in the forecast. However, uncertainty as to the timing, size and diversity of the new loads is not really represented adequately.

The Commission understands that Transpower has proposed a different forecast for their West Coast Grid Upgrade proposal.

5.4 Comparison with the May 2007 regional peak demand forecast

The Commission released a long-term regional peak demand forecast in May 2007[4], as part of the draft Grid Planning Assumptions. The forecasts in this document are updates of the May 2007 forecasts. Key differences are:

- the new forecast includes data from winter 2007;
- the new forecast is based on a revised regional energy demand forecast[5];
- the new forecast uses a different method for trending between historical growth rates and energy-based growth rates;
- the new forecast treats the demand of the Tiwai aluminium smelter differently.

In terms of predicted growth rates, the key differences are driven mainly by 2007 data:

- forecast growth in the Bay of Plenty is slower than before;
- forecast growth in Nelson/Marlborough is faster than before;
- forecast growth in Otago/Southland is faster than before;

5.5 Comparison with the 2007 Security of Supply medium-term peak demand forecast

The Commission released a medium-term demand forecast in October 2007[6], for use in the Security of Supply workstream's annual Reserve Energy Needs Assessment. This forecast included both peak and energy projections, covering the period to 2012.

The Security of Supply forecast has a number of methodological differences:

- it uses historical temperature data to normalise the historical peak demand series;
- it is based on historical trends and expected step changes, whereas the forecasts in this document also incorporate energy growth rates which are driven by projections of population and GDP growth;
- the Security of Supply prudent forecasts are P5 rather than P10;
- it treats embedded generation differently, with some grid-connected generation netted off and some embedded generation grossed on – so the absolute forecast numbers presented are *not directly comparable* with those in this forecast.

Nonetheless, the expected growth rates in peak demand are quite similar to those presented in this forecast, over the period from 2008 to 2012. The Security of Supply expected growth rates are slightly lower (1.8% nationally, as opposed to 1.9% in this forecast).

[4] http://www.electricitycommission.govt.nz/opdev/modelling/gpas/May2007/Demand/index.html
[5] http://www.electricitycommission.govt.nz/pdfs/opdev/modelling/pdfconsultation/GPA/Demand-Forecast-Review.pdf
[6] http://www.electricitycommission.govt.nz/opdev/modelling/demand/security/index.html