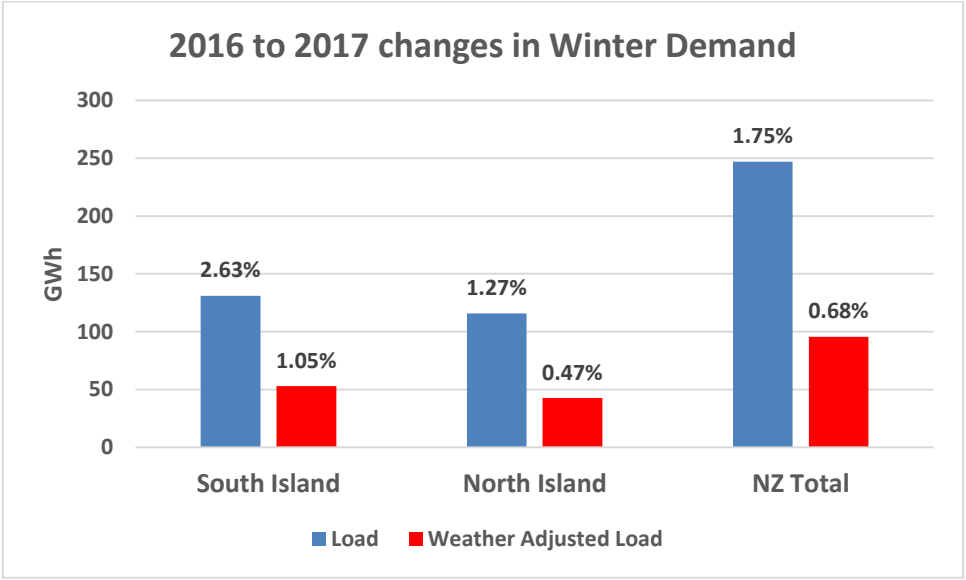
TESLA
Forecasting Solutions

**TESLA Asia Pacific Limited**
3/34 Te Pai Place, Henderson, Auckland, 0610,
New Zealand
+64 (0) 9 551 5039
www.teslaforecast.com
Registered in NZ. No. 3233094

# New Zealand's underlying 2017 winter power growth far higher than 2016's

Controlling for weather effects, TESLA Asia Pacific Ltd observed 0.68% growth in New Zealand power demand this winter.[1] This is an uptick from the slight 0.07% increase we saw last year.[2] Observed total winter power demand increased by 1.75% from 2016 to 2017, this growth is mainly due to 2017's winter being cooler than 2016's.[3] We observed weather adjusted load growth in both the North and South islands with the North growing by 0.47% and the South growing by 1.05%. The graphs below show the changes in total GWh from 2016 to 2017, along with their percentages.




[1] Winter is defined as May through August.
[2] http://www.teslaforecast.com/casestudy/new-zealands-underlying-electricity-load-is-growing/
[3] Total power demand is defined as the sum of GWh from May through August for all GXPs within New Zealand.

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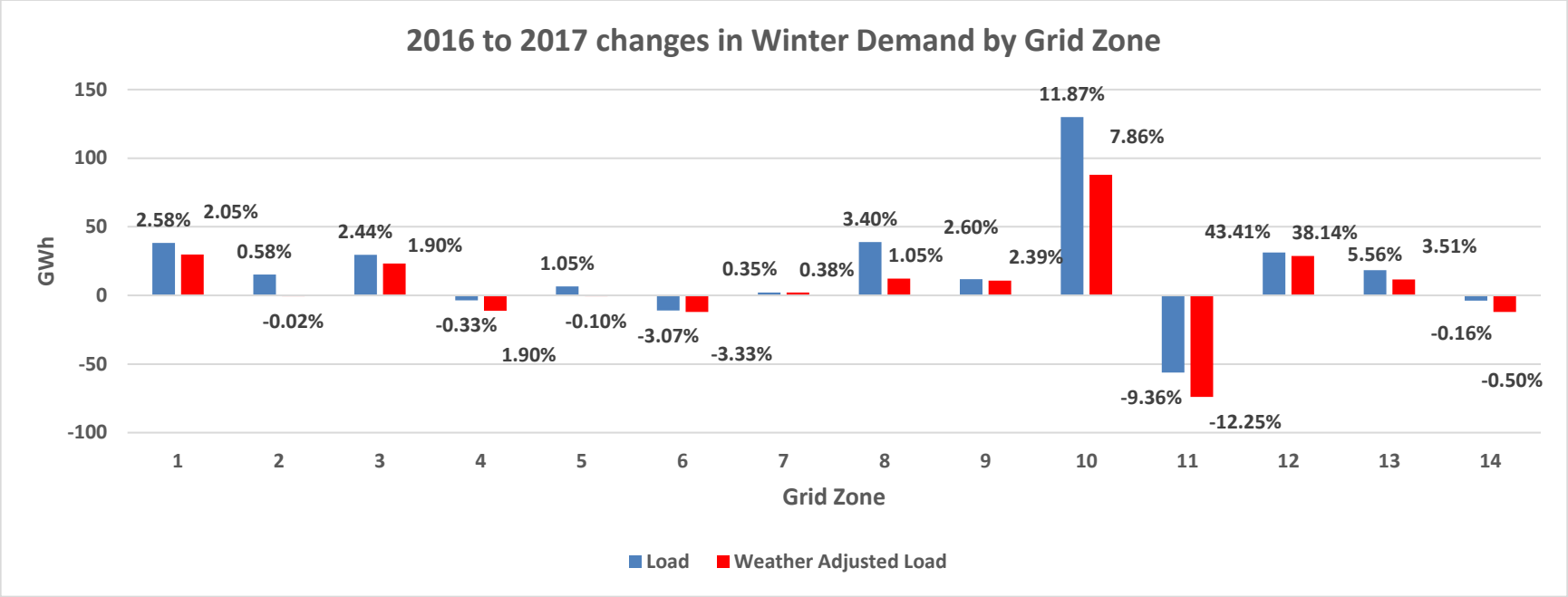


Note that the large percentage increase in Grid Zone 12 is primarily due to more positive load values in Kumara (KUM0661), which was largely negative due to elevated levels of embedded generation in 2016.

The vagaries of weather can often distort the underlying rates of growth or contraction of electricity demand. Extreme or unseasonable heat or cold can spike demand at any given time. Similarly, a warmer winter than usual (e.g. 2016) will result in lower demand across the season. However, this plunge in demand is only temporary, and does not represent contraction. TESLA's estimates of Weather Adjusted Load cuts through these distortions to give a clearer picture of the growth or contraction of electricity demand independent of weather effects.

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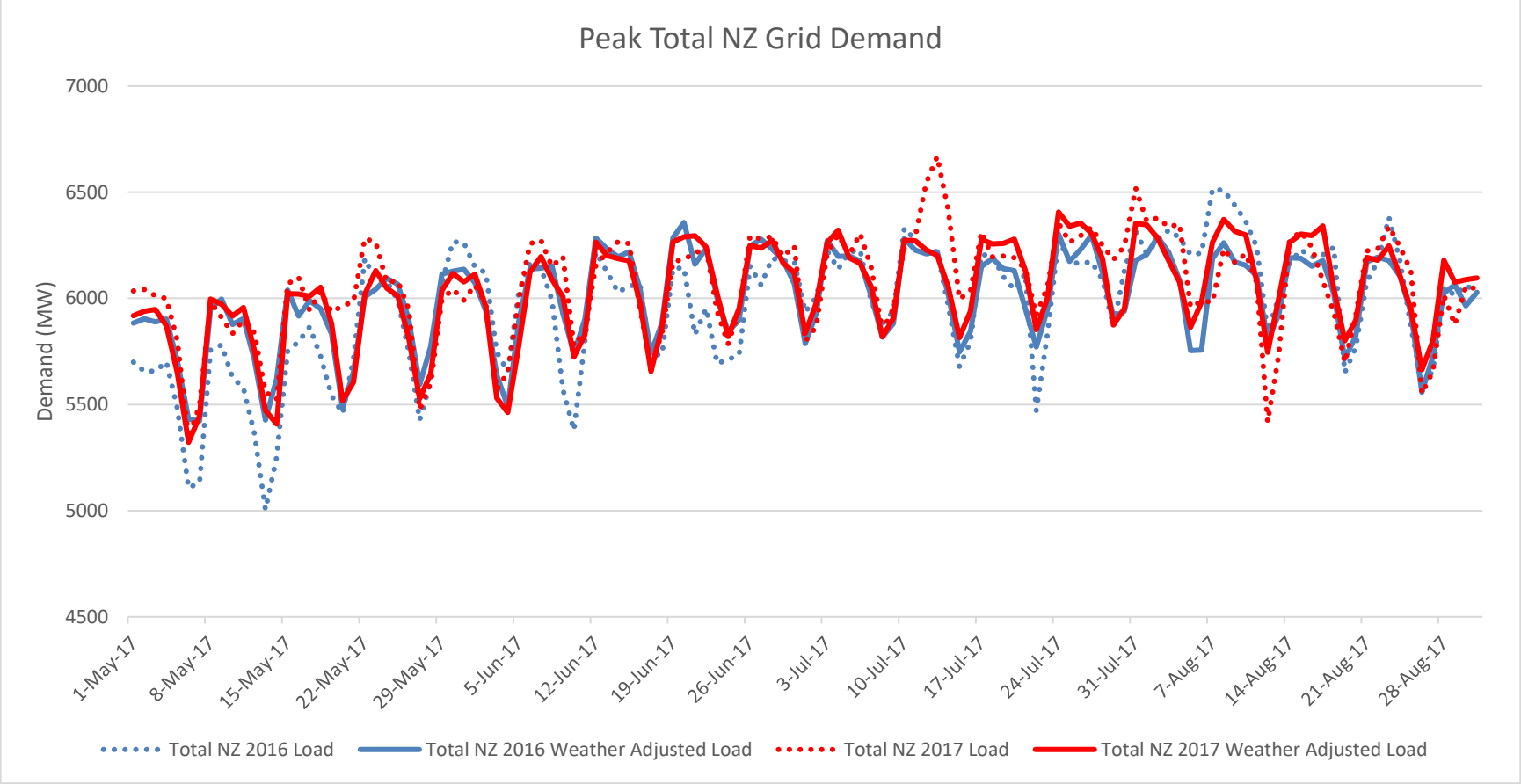
The graph below shows the 2016 and 2017 daily peaks alongside their Weather Adjusted Load.[4] Graphs displaying the North and South Island individually can be found at the end of this document. The effect from the country wide cold snap over the 12th to 15th of July 2017 is clearly visible.




[4] 2016 data was shifted back 1 day to align weekends and weekdays. The load data was sourced from aggregating all GXP SCADA data from EMS' em6, including embedded generation and load management. The Weather Adjusted Load was calculated by TESLA via the methodology described in this document.

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The use of the extremely accurate GXP level load forecasts available via Energy Market Services' em$^6$ is not restricted only to short and medium term forecasting, but can also be utilized for powerful industry insight as they make up the basis for Weather Adjusted Load. These models are designed to capture the complex relationships between weather, clock, and calendar variables and demand for electricity. By design, the models make no explicit assumptions about the future of economic growth, population growth, energy efficiency, etc. Instead, a latent variable is used to econometrically estimate the slow-moving trend in historical data caused by the aggregation of these factors. Effectively modelling the effects of weather on electricity demand not only allows for the prediction of their effects *ex ante*, but also allows for controlling their effects *ex post*.

In calculating Weather Adjusted Load, TESLA uses seasonal normal values of weather derived by averaging values over long historical samples by hour and by month. TESLA's GXP level models are then solved for a historical backcast solution using these seasonal normal weather values.

The models are then solved for a second time over the same backcast horizon using the weather that actually occurred. The difference between this backcast and the observed load represents the forecasting error inherent in the model. As TESLA models account for weather effects explicitly and extensively, this error is far less representative of any weather effect than of unknown variables that are absent from the model and from unavoidable and uncontrollable randomness. This model error is added to the backcast using seasonal normal weather. The resulting backcast represents the part of observed load that is independent of variations in weather from seasonal normal values, or the Weather Adjusted Load.

Weather Adjusted Load, along with detailed GXP level weather decomposition showing the effects of each weather variable, is available to subscribers of the em$^6$ Load Forecast service. For additional enquiries, please contact TESLA Asia Pacific at +64 (0) 9 551 5039 or asiapacific@teslaforecast.com

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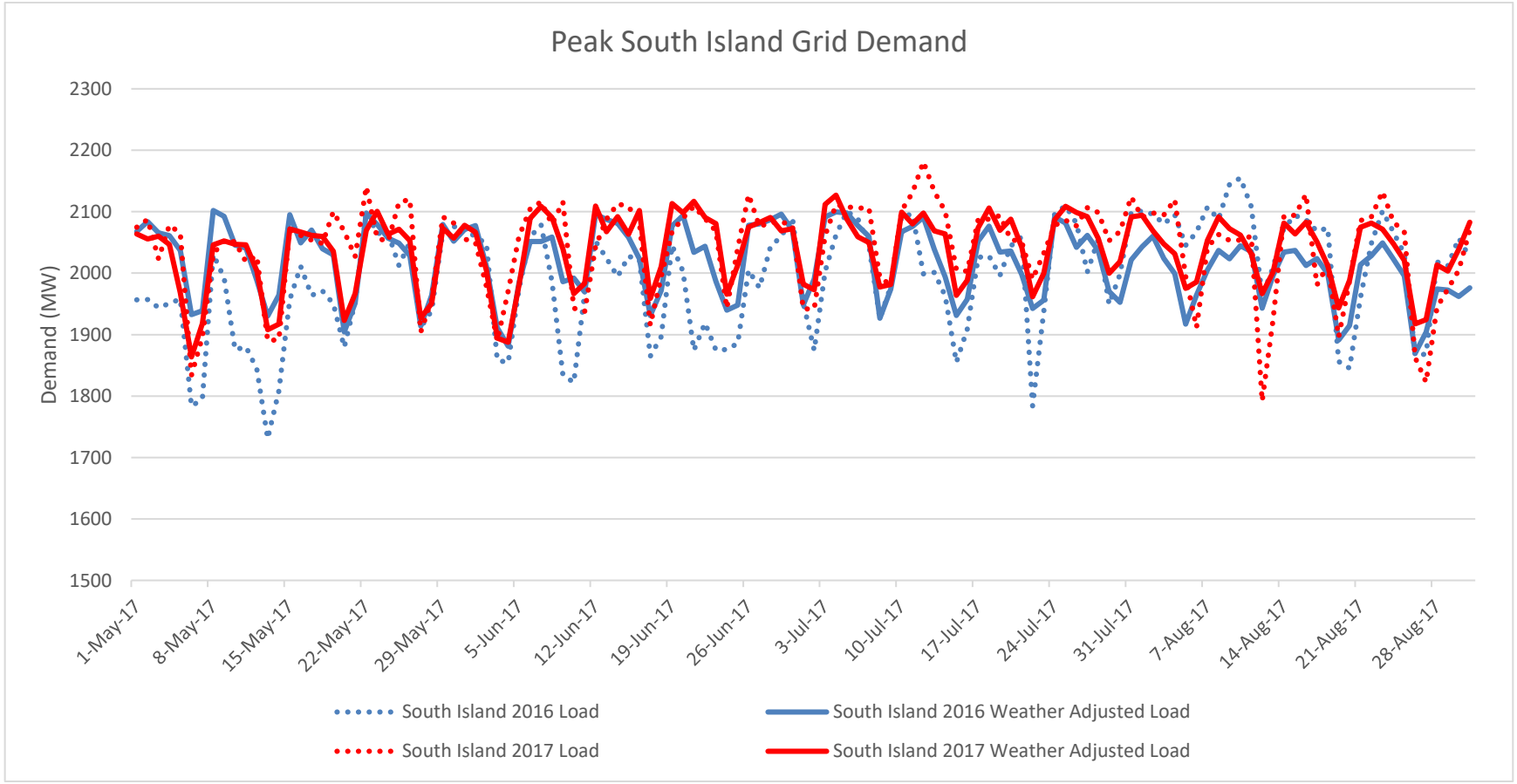

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