# Risk analysis for World Cups 2015

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# Abstract

New Zealand is hosting two major international sporting events in 2015:

1. The International Cricket Council Cricket World Cup (ICC CWC) from 14th February to 29th March 2015 and;
2. The FIFA U-20 World Cup from 30th May to 20th June 2015.

The New Zealand electricity industry is coordinating efforts, similar to that carried out for the 2011 Rugby World Cup (RWC), to ensure that there will be no electricity supply issues to the relevant sites over the period of the two events.

Hosting the World Cups incites much international attention on New Zealand. Therefore, it is important to ensure the provision of safe and reliable electricity, gas, communication services. Necessary steps should be taken by Transpower and the distribution companies to ensure certainty relating to the security of supply during the games and thereby preserving the reputation of New Zealand and the electricity industry. Any wide spread outage during this period would disrupt the influx of people into an area affecting planes, trains, accommodation, consumer spending and other activities and attract significant adverse media attention.

As a part of preparing for the two World Cups in 2015, Transpower has undertaken a risk analysis to ensure a secure electricity infrastructure with sufficient supply to meet expected demand. Transpower working along with the distribution companies identified and assessed the risks associated with the security of supply at Grid Exit Points (GXPs), from which the stadiums or match venues are supplied, and the mitigation measures that should be taken to overcome this.

This paper details the co-operative approach taken by Transpower and distribution companies along with the local organising committees for the ICC Cricket and FIFA U-20 World Cups, to provide a reliable electricity infrastructure from sources of generation to key sites throughout the World Cups, when the eyes of the world will be on New Zealand.


# 1 Introduction

New Zealand will attract international attention as the host country for the two World Cups in 2015. The ICC Cricket World Cup will be held from 14th February to 29th March 2015 and FIFA under 20 World Cup (U-20 World Cup) from 30th May to 20th June 2015.

The ICC Cricket World Cup 2015 is jointly hosted by Australia and New Zealand with 14 international teams playing 23 matches at 7 different stadiums throughout the North and South Islands. This includes the semi-finals and quarter finals.

The FIFA U-20 games are played in different stadiums in both the North and South Islands. FIFA under 20 games will have a total of 52 matches at 7 different stadiums.

The World Cups are expected to attract an influx of overseas visitors, media and VIP guests to New Zealand. In addition to the actual games, other events will be hosted throughout the country. Hosting cities and regions will be organising their own attractions for fans and visitors and this will include the addition of temporary infrastructure for the duration or part duration of the World Cups.

A number of incidents have affected local power supplies over the past few years including a lights failure at[1] North Harbour Stadium on the North Shore during a Super 14 match on 2009 April 25, and Westpac stadium on 2012 September 8 during an All Blacks test match. Because of this, the CWC2015 and FIFA U-20 local organising committees are seeking reassurance that the electricity infrastructure and supply throughout the World Cups will be robust.

# 2 Electricity Infrastructure and Industry Group

In late 2013, Transpower received a request from New Zealand Police about the existing and likely planning in terms of keeping the Transpower network(s) up and running during both events. Subsequently in early 2014, Transpower met with the Local Organising Committee of the ICC Cricket World Cup 2015 –"CWC 2015" to discuss the approach required to assess and manage the risks associated with electricity infrastructure and supply in New Zealand for CWC 2015. As a result, Transpower has taken the initiative to undertake a security assessment and bring together the rest of the electricity industry to determine the risks associated with the supply of electricity to all match venues and key infrastructure involved in and around the two World Cups.

Figure 1 shows the match venues for ICC CWC 2015 and FIFA U-20 2015 and the distribution companies with infrastructure serving the venues.

Industry meetings will be centred around: the distribution companies with match venues in their region(s), Transpower, and the local committees of the cricket and FIFA World Cups. The distribution companies involved for these World Cups are Northpower, Vector, WEL

1 A tree branch which had struck a high-voltage line (Vector's Network), knocking out power to more than 750 homes as well as the stadium

Networks, Unison, Powerco, Wellington Electricity, Network Tasman, Delta (Aurora Energy) and Orion. Figure 2 shows the different members of the industry meetings.

Transpower will ensure the security of supply to the respective GXPs. The distribution companies are responsible for leading on infrastructure and supply issues downstream within their areas. The latter part of this paper explains the work carried out by Transpower and the distribution companies for managing the security of supply.

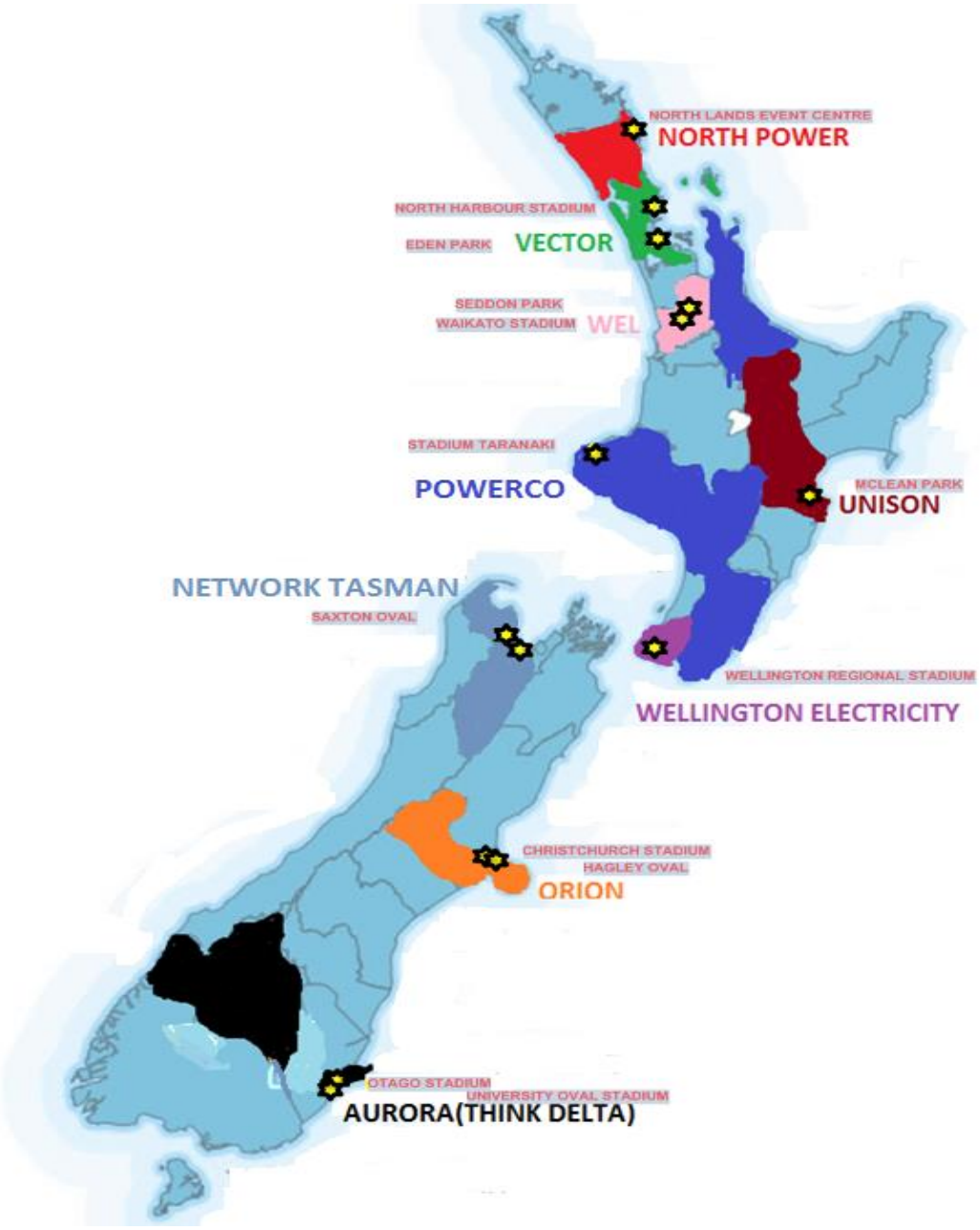


**Figure 1: Match venues & associated distribution companies for the Cricket World Cup and FIFA Under 20 2015.**

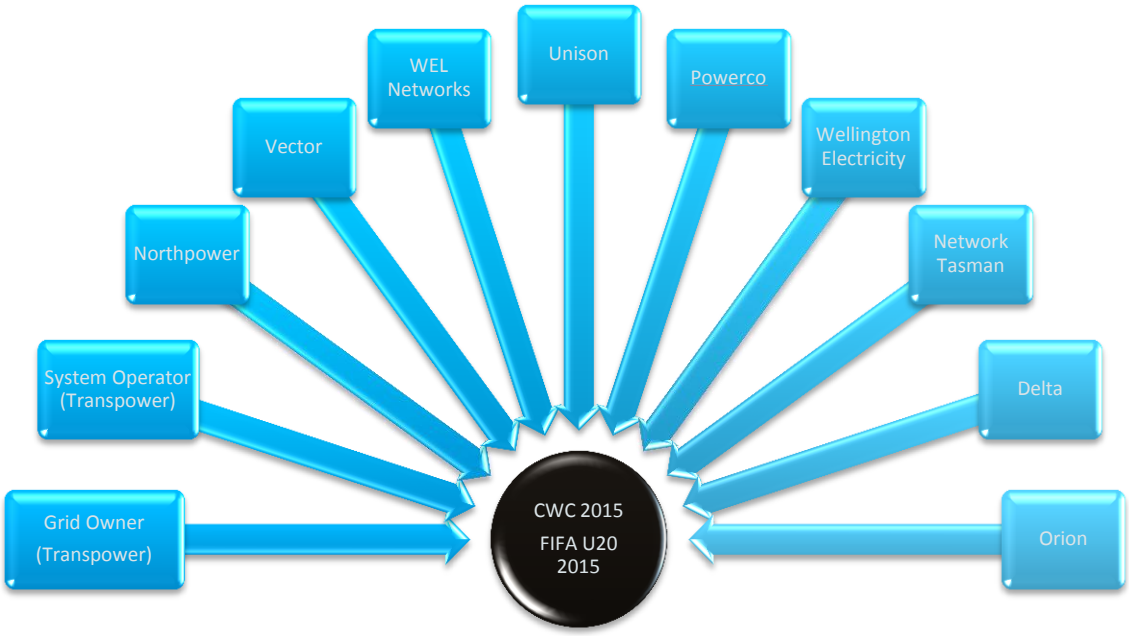


**Figure 2: Composition of the Industry Meeting**

# 3 Transpower Planning for World Cups 2015

## 3.1 Risk and Security Assessment

Preparations for how Transpower is planning to operate the grid during the two World Cups in 2015 have been underway since late 2013. This early assessment identified the first iteration of what would become our World Cups' maintenance strategy. All match venues were investigated by identifying the substations and subsequent feeders with the help of the relevant distribution companies.

In early 2014 a risk assessment document was prepared which focussed on the GXPs. The risk assessment looked at the different GXPs from which the match venues are supplied and checked for the N-1 security of all the equipment within each relevant substation. This was to make sure that the supply will not be affected with the loss of any particular equipment in the substation. Wherever N-1 security was not guaranteed, the report identified the areas of concern or points of failure that need to be addressed before the World Cups commence. The report also identified the Transpower alternative GXPs available to the distribution companies to restore supply in case of a failure and suggested backup generators for certain stadiums where N-1 security was lacking. In addition, a desktop study of recorded condition assessment for critical equipment was completed to ensure maintenance could be carried out in time if required.

## 3.2 Generation and Demand

One key aspect of maintaining security of supply is having sufficient generation made available to meet the expected demand during the World Cups. The approach taken by Transpower, as System Operator, in this regard would be to take a conservative approach for those months.

The Cricket World Cup falls during the summer months of February/March when demand is lower. Accordingly, sufficient generation is expected to cater for the extra demand from events associated with CWC 2015.

The period for the FIFA U-20 World Cup falls during the winter peak. Figure 3 and Figure 4 show the North Island Generation and demand forecast balance for winter 2014.[2] At the time of writing this report the information for 2015 winter is not available.

Peak winter demand can place the power system under some stress requiring all generating units on the power system and most grid assets to be available in order to deliver full consumer demand. The overall New Zealand wide peak on the power system usually occurs sometime between June and August at around 5:30 to 6:30 pm on a cold weekday evening. The current market arrangements focus on the delivery of generation to meet energy demand. Historically, the underlying assumption has been that the New Zealand power system has sufficient fast starting generation capacity available to cover peak system demand along with any sudden credible changes in generation availability.

The forecast for 2014 shows that when 95th[3] percentile peak demand is compared to 10th[4] percentile generation, with the reserve requirements accounted for, there is an expected capacity margin of 12 MW. This is quite low. However, this is in the context of the following assumptions:

- Peak load growth rate increases linearly from 2013, based on the average growth rate over the last 10 years. This gives a very conservative load figure considering we've had growth in recent years.
- Since the numbers on the graph are calculated from P95 demand and P10 supply, this adds to the conservatism (i.e.90% of the time supply will be greater than this and 95% of the time peak demand will be less).
- South Island generation is sufficient for full DC transfer northwards. This assumption is usually conservative because North Island and South Island peak demand rarely coincide over a typical winter.

Provided there is full availability of plant that is not covered by known outages, and it is not a dry year, the power system will be able to be run in a normal secure state over expected winter peaks. If there is an outage of a major thermal plant (possibly up to 400 MW) there are periods when the power system may be run in an emergency secure state. Load will only be shed if there is a further outage of a major thermal plant or of the HVDC. However further studies need to be conducted to confirm that there will be enough generation for the winter 2015.

The System Operator will produce a preliminary analysis for winter 2015 in November after all of the winter 2014 data is available. Similar to the 2011 Rugby World Cup, closer to the relevant event, generators will be contacted to get assurance that they make all possible generation available.

2 The data for winter 2015 will be available only after winter 2014.

3 The 95th percentile of demand is the level of demand that will be exceeded for 5% of the time.

4 The 10th percentile of generation is the minimum amount of generation that is available for 90% of the time.

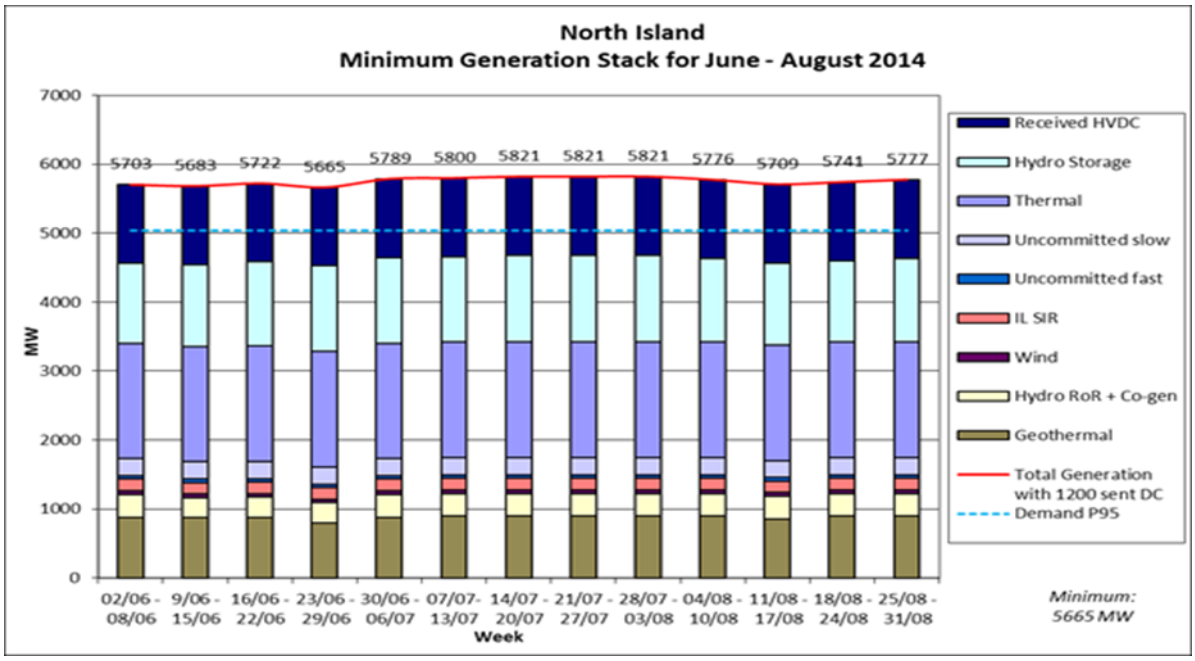


**Figure 3: Available NI generation + DC transfer compared to P95 peak demand forecast by week for winter 2014**

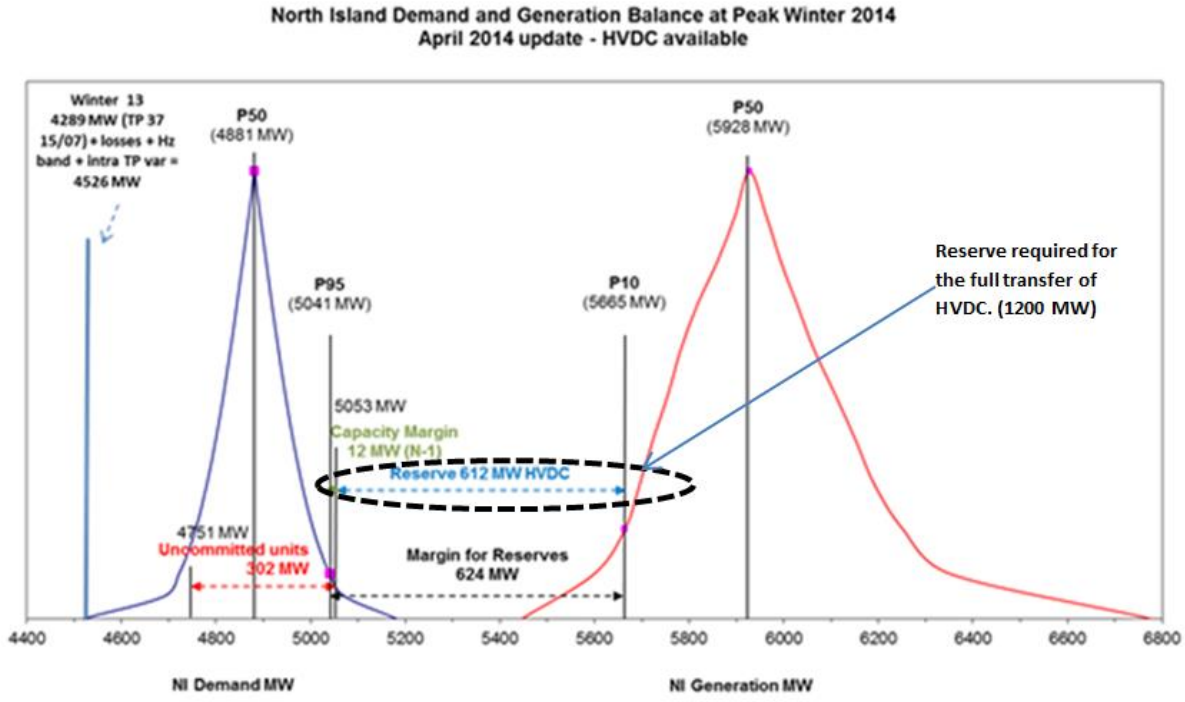


**Figure 4: North Island Generation and Demand Forecast Balance for 2014 winter**

## 3.3 Strategy plans

Transpower is planning to use similar strategies to that of the 2011 Rugby World Cup to manage the operations during the period of 2015 World Cup matches. The key strategies are as follows:

- Work restrictions are planned to be in place before and during World Cup games. The approach presumes a wide spread outage would disrupt the influx of people into an area affecting planes, trains, accommodation, consumer spending and other activities as well as attracting significant adverse media attention. This includes the risk that following a major event, the system will remain in a weakened state as remedial work is carried out.
- Remedial work following a fault during any work restriction period will require specific approval by senior staff.

Only minor maintenance or minor project work may be carried out. No commissioning or major outages will be carried out without the specific approval of GM Grid Performance. This also includes any work that requires load management or generation agreements or the loss of a transmission line and a generation unit (n-1-g).

This work restriction also applies to Transpower projects which may involve other infrastructure providers, like works involving trenching through major roads.

On each match day within the region where a match is being played the following prohibitions will also be in force:

- No work associated with in-service equipment e.g. within control rooms, relay rooms, switchgear rooms, switchyards, vegetation work, work closer than 4m of live conductors for the substation which is responsible for the supply to the Stadium.
- No work on any transformers in that particular substation.

### *3.3.1 Semi and Quarter Finals*

On the day of semi and quarter finals, regional restrictions are expected to be in place, meaning no work would be carried out at any substation, on any line, communications or protection equipment, SCADA or IST equipment in that region. Appendix A shows the dates and venue for the games.

On the day of Semi/Quarter finals:

- There would be no work on protection, SCADA (regional and national) or operations communication equipment. This would also include interruptible power supplies/emergency generators, security systems, external telecommunications (e.g. internet, internal phone network, phone lines coming in and out of Transpower) and key IT network and applications (e.g. Outlook, RAS). SCADA "failovers" will be specifically scheduled at lower risk periods (e.g. on the Monday after matches);
- All work (maintenance, project, communications or SCADA, outage or non-outage) must be specifically approved by the respective Grid Performance Stations or Lines Manager;

- Reclose blocks (RCB) will be permitted on n-1 supplies except where permanent loss would involve load management or generation to ensure n-1; and;
- Work carried out on non-Transpower assets (e.g. on leased circuit by service providers such as Chorus) will not be agreed to.

Transpower will review its Service Provider work plans over the period to assess the risk of work, which falls outside of the operational measures.

### 3.4 Regional Plans

Regional plans may be developed closer to the events which will include:

- the response required in addition to contracted response (including the escalation process for security deployment in the event of a terrorist threat);
- contractors at key sites during certain times;
- availability of key Transpower staff/senior managers and contractors; and
- additional system coordinators and ROC operators to help manage any occurrence of a major event.

### 3.5 Emergency plans/Security arrangements

If necessary, Transpower sites deemed critical during the games may be manned from two hours prior to the game and until two hours after the game to speed up the degree of rapid response and restoration, should an unforeseen event occur. Transpower will follow its safety and health emergency response instructions. If required, further emergency plans specific to the venues will be finalised in the industry meetings closer to the event.

### 3.6 Internal and External Communications

Transpower plans that all people receive the same message on our operation plans during the event.

## 4 Approach of distribution companies:

The combined effort of Transpower along with the distribution companies is to ensure that the World Cups are supported through the provision of safe and reliable electricity. Transpower will ensure the security of supply to the station. Distribution companies are responsible for the security of supply from the substations to the venues.

For achieving this, Transpower will work with lines/distribution companies to have

- alternative supply plans- feeding through alternative GXPs, feeders etc.,
- pre-tested set of contingency plans for stadium,
- restricting work prior to the events,
- carrying out substation inspections, and

- ensuring back up plans in place for the restoration of supply in case of failure of one feeder.

Distribution companies have already identified and documented risks and mitigation measures in risk registers. Security assessment of power supply to the venues, which was undertaken previously for the 2011 Rugby World Cup, has been updated by most of the distribution companies.

Wherever possible, distribution companies will make use of alternate Transpower GXPs available for their distribution networks, to restore the power supply. Provision of a backup generator by the stadiums is recommended by Transpower for most of the venues, similar to the 2011 Rugby World Cup, to cover the event of any failure of the electricity supply (whether of local distribution or national grid origin). This is yet to be confirmed with the different stadiums. These will be discussed and confirmed in the industry meetings closer to the events.

One of the key issues identified for the 2011 Rugby World Cup was the unidentified significant power consumption to localised areas during the final match. Distribution companies will be asked to work closely with local business communities to ensure any additional power requirement is either identified in advance, or the relevant business communities are aware of the restrictions imposed.

These will be discussed and confirmed in the industry meetings closer to the events. Wherever necessary, stand-by diesel generators will be used.

## 5 Summary

The industry combined approach taken by Transpower, Northpower, Vector, WEL Networks, Unison, Powerco, Wellington Electricity, Network Tasman, Delta, Orion, and consultants Beca in conjunction with local organising committees like CWC Ltd and FIFA U20 is expected to see the maximum electricity infrastructure capacity made available during the 2015 World Cups. This approach will ensure spare capacity and redundancy to cope with potential and possible faults and problems during the matches. This will not guarantee that problems will not occur but will mean being in the best position to tackle and resolve any issue with as little impact as possible.

Transpower as the Grid Owner and the System Operator will take all the necessary steps to ensure a secure electricity infrastructure to meet expected demand. The generators as well as the distribution companies also have an important part to play by making sufficient generation capacity available to the market so that the peak demands during the World Cups can be met. By working together, we can take the necessary steps to ensure certainty relating to security of supply and preserve the reputation of New Zealand's electricity industry.

## 6 Acknowledgements:

The author gratefully acknowledges the support of Bob Simpson, Chief Engineer and Tim Crownshaw, Market Services Analyst, Transpower Ltd.

**Appendix A**

| 2015 Cricket World Cup | |
|---|---|
| **Venue** | **Dates (2015)** |
| Auckland - Eden park | February 28th, March 7th, March 14th and March 24th |
| Christchurch - Hagley Oval | February 14th , February 21st , February 23rd |
| Dunedin - University Oval | February 17th, February 22nd, February 26th |
| Hamilton - Seddon park | February 15th, March 10th, March 13th |
| Napier - Mclean park | March 4th, March 8th, March 15th |
| Nelson - Saxton Oval | February 16th, February 19th, March 5th |
| Wellington - Wellington Regional Stadium | February 20th, March 1st, March 12th, March 21st |

**Table 1: Match venues and dates for 2015 Cricket World Cup**

| 2015 FIFA Under 20 World Cup | |
|---|---|
| **Venue** | **Dates (2015)** |
| Whangarei - Northland events Centre | May 30th, June 2nd, June 7th |
| Auckland - North Harbour Stadium | May-30th, June 2nd, June 5th |
| Hamilton - Waikato Stadium | May-31st, June 3rd, June 6th |
| New Plymouth - Stadium Taranaki | June 1st, June 4th, June 7th |
| Wellington-Wellington Regional Stadium | May 30th, June 2nd, June 5th |
| Christchurch - Christchurch Stadium | June 1st, June 4th, June 7th |
| Dunedin - Otago Stadium | May 31st, June 3rd, June 6th |

**Table 2: Match venues and dates for 2015 FIFA Under 20**