

# LESSONS FOR THE 2010 FIFA WORLD CUP SOUTH AFRICA FROM THE 2009 FIFA CONFEDERATIONS CUP EXPERIENCE



**Presenters:** Sicelo Xulu – Director – Engineering Services, City Power  
Sanjay Bhana - 2010 Project Manager- Special projects – 2010, Eskom

**Co-authors:** Sicelo Xulu – Director – Engineering Services, City Power  
Sanjay Bhana - 2010 Project Manager- Special projects – 2010, Eskom  
Xolani Lembede – Planning Manager, City Power  
Adam Pobe – 2010 Co-ordinator, Centlec  
Gert Booysen – Director Technical Services, Tshwane Electricity

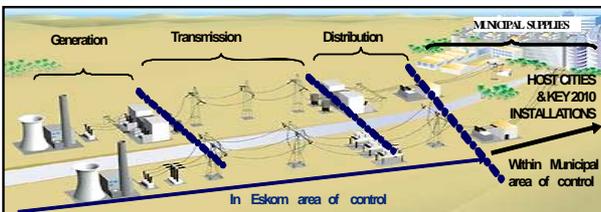
## 1. Introduction

With the exception of the first democratic election in South Africa (SA) in 1994, the 2010 FIFA World Cup South Africa™ (2010FWC) is arguably the most important event in the evolving history of this nation.

The 2010 FIFA World Cup South Africa™ is scheduled to take place from 11 June 2010 to 11 July 2010. The only test run in preparation for the 2010FWC was the 2009 FIFA Confederations Cup South Africa (2009FCC) which took place from 14 to 28 June 2009.

As an essential service that underpins economic growth in SA, the Electricity Supply Industry (ESI) has a significant contribution to make in the form of **a reliable supply of electricity** for the 2010 FWC.

In terms of the South African ESI, as shown in the electricity supply chain below, it must be noted that the majority of the country's power stations and bulk electricity infrastructure backbone is within the control of the National utility Eskom, whilst the majority of the key installations for the 2010FWC lie within the host cities and are supplied by the municipal electricity infrastructure.



The ESI took a decision to establish a 2010 ESI forum consisting of all the role-players in the supply chain above as well as the 2010 Organising

Committee, Department of Minerals and Energy (now called Dept of Energy) and the National Energy Regulator of SA (NERSA) to ensure that all activities for the 2009FCC and 2010FWC are co-ordinated and learnings are shared across the industry to ensure a successful event in SA.

It must be noted that the games are played at night and to ensure the masses can view each and every game makes broadcasting one of the most important components of the event.

This paper focuses on the lessons learnt nationally and across 4 host cities over the 2009FCC that need to be incorporated into the Electricity Supply Industry (ESI) preparations for the 2010FWC as a whole.

## 2. Background

The 2009FCC occurred in the following host cities:

- Johannesburg
- Bloemfontein/Mangaung
- Tshwane
- Rustenburg

A total of 16 matches were played over the 14 days

This event was important for the 2010FWC for the following reasons:

- It was the test run in preparation for the 2010FWC
- Creating an understanding of the event electricity requirements
- Defining the stadium power requirements and supply side configurations
- Training and developing staff for the 2010FWC

- Reviewing our level of communication and security alignment across the ESI

### 3. National lessons

As the national electricity provider for SA, Eskom objectives over the 2009FCC were as follows:

1. Test Eskom readiness:
  - Technical readiness
  - Communication
  - Security
  - Collaborative efforts with identified stakeholders (2010 Organising Committee (OC), Host Cities and electricity municipal depts.)
2. Enhance understanding of the events and related electricity considerations.
3. Train and develop staff

The Eskom 2009FCC preparations went live on Friday 12 June 2009 and the following is a summary of the Eskom 2009FCC Experiences:

#### a. Risk identification and treatment

The top risks associated with the 2009FCC were as follows:

- i. Loss of electricity supply to a stadium or key installation during an event
- ii. Reliability of electricity supplies at risk due to security breach
- iii. Reputation risks for Eskom and SA
- iv. Strikes and related risks.

Five (5) Eskom situational awareness centres (SAC) [1 national and 4 focussed on each of the host cities] were implemented for the event as one of the key treatments for the above risks. The purpose of a SAC was to know, analyse, share the status of, and progress on, electricity matters for the event (the situation). These SAC were used to ensure the ability of the organisation to make tactical and strategic decisions in order to influence the way the organisation would want to respond to a particular event or situation and by all accounts served this purpose very well over the period.

The treatment plans put in place for the above risks were tested for adequacy and effectiveness over the 2009FCC. Whilst the treatment plans put in place for the above proved to be adequate and effective over match days, on non-match days various gaps and inadequacies were identified in terms of the treatment plans implemented. Furthermore, the amount of labour related

issues and number of strikes in SA as a whole in the run up to the 2009FCC, highlighted the need for a more pro-active treatment plan to be implemented for the 2010FWC.

#### b. Reliability of supply

Eskom preparations for the 2009FCC went live on 12 June 09 and were in place post the 2009FCC until 3 July 09.

Over this period there were no national reliability of supply issues that affected the 2009FCC. There were however incidents resulting in loss of supplies to 2 sites on non-match days and 1 reduction in contingency level (n-3 to n-2) to a site.

The 2009FCC assisted in understanding the event electricity requirements, operational considerations (resources, security, etc.) and communication considerations

#### c. Resources

In the final 2 weeks to the 2009FCC, OC electrical representatives indicated that they required staff to be available 24 hours a day at key sites 4 days prior to the event and 4 days post the event,

Given the fact that Eskom transmission sub-stations have remote switching and the key sub-stations are manned during working hours, a decision was taken that these sites would only be manned from an hour before a match to an hour after the match.

Dedicated resources (SAC, field, operations, security and communication) were put in place for the event. Whilst this was a great initiative to ensure quick turnaround times to ensure the reliability of supply for the event, given the current shortage of skills globally as well as financial constraints, this impacted the day to day business operations in some areas.

The event served as a great training and development opportunity, facilitating the following training:

- Communication staff across Eskom were trained on event and emergency communication
- Technical staff trained on event monitoring, reporting and co-ordination

- o Security staff were given exposure to real time electricity operations and this has created an opportunity to further enhance the alignment of the reliability of supply and security related initiatives.

d. Security

Security plans implemented over the period were focussed on addressing security risks identified. Whilst these security plans proved to be adequate for the 2009FCC key supply points, areas of enhancement were identified in terms of securing infrastructure beyond key sites. Furthermore, areas of enhancement were also identified in terms of intelligence gathering and the alignment with the key event security structures established.

e. Collaborative efforts

In the run-up to and over the period of the 2009FCC, the levels of collaboration with the OC electricity representatives as well as the various key stakeholders such as host cities and municipal electricity departments were continuously improving and this facilitated greater alignment of activities focussed on ensuring reliability of supply. The level of information exchanged in some areas was however a concern given that very minimal information was available on network status and incidents pre, during and posts events

There was however a lack of alignment of emergency and media communications with the OC and FIFA in terms of electricity supplies and is an area requiring considerable attention for the 2010FWC.

f. Lessons for 2010FWC:

- i. A risk management approach is to be used as the basis for rolling out the Eskom preparations.
- ii. Key information sets that would enhance electricity readiness must be sourced at least 6 months prior to the event so as to enhance and improve electricity readiness to cater for the 2010FWC, e.g. key site information together with team and people movement and periods of use.
- iii. Resource requirements need to be quantified and an optimal solution determined so as to deliver on OC and stakeholder expectations whilst giving due consideration to the resource shortages and financial constraints.

- iv. Pro-active treatment plans need to be investigated and implemented for the treatment of labour risks.
- v. Alignment of emergency and media communications with the OC and FIFA in terms of electricity supplies
- vi. Alignment of all intelligence gathering activities so as to enhance decision making and responses to incidents and issues that may arise.
- vii. Need for detailed simulations (people, processes and systems) and trial runs to train staff and test and enhance the adequacy and effectiveness of the various risk treatment plans implemented.
- viii. Defining and agreeing on the levels of information exchange with the various stakeholders.

## 4. Host city lessons

### 4.1 Mangaung/Bloemfontein

Mangaung/Bloemfontein was one of the four cities for the 2009FCC. Feedback is provided below on the performance of the Centlec electrical network and the stadium generators that were the main supply during the 2009FCC matches. The report will cover the entire event and the testing work done during the period leading to the start of the event.

The following were the key objectives of the city in hosting the FCC matches:

1. Rehearsal and testing of the systems and processes put in place for the 2010 FWC
2. Testing the generators under conditions similar or close enough to 2010FWC conditions
3. Highlighting the city's readiness as a 2010FWC host city

The Mangaung/Bloemfontein preparations went live on 14 June 2009 and the following is a summary of their 2009FCC Experiences:

a. Risk identification and treatment

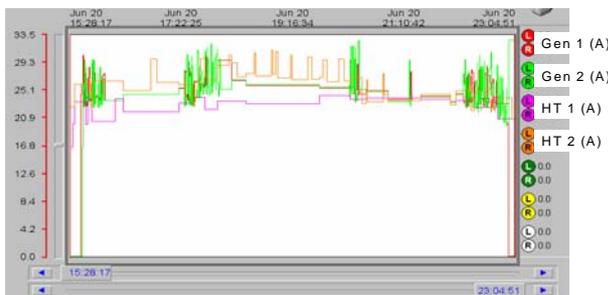
- i. Risk: loss of lighting at stadium due to a network fault.
- ii. Treatment; Testing performed to determine:
  - o How the stadium lights would respond to the voltage dip on Centlec's grid due to faults elsewhere in the Centlec grid.
  - o Impact of a voltage dip on the stadium lighting

- o How the stadium generators would perform under various faults conditions in the Centlec network.
- iii. Risk: single generator incapable of meeting complete stadium load.
- iv. Treatment; Stadium loading limited to a maximum of 1100kVA and some of the stadium load moved to overlay. Furthermore, stadium loading over the match was managed by switching off the air conditioners and boilers if necessary.
- v. General risk management:  
The risk of supply to the stadium was generally managed in the following manner:
  - o The stadium was solely supplied from generators
  - o The load was shared between the two generators. Each generator was capable of supplying the whole load, hence backing-up each other
  - o Back-up to generators – Centlec grid
  - o Dedicated busbar at Park West DC to supply Willows DC and the stadium
  - o Some of stadium load supplied from the overlay

b. Reliability of supply

There were no municipal reliability of supply issues that affected the 2009FCC matches. There were however moments of concern when supply to the stadium was lost one afternoon and the instability of the generators.

The picture below shows the fluctuations that occurred during the 3<sup>rd</sup> match.



The supplier of the generators was called in to assist in resolving the problems with fluctuations on the generators.

c. Resources:

The staffing of the team for the event was arranged as follows:

- i. Inside the stadium precinct
  - o The Venue Operating Centre (VOC)
  - o Generator operating Technicians and Electricians
  - o Generator refuelling Electricians
  - o Consultants
- ii. Outside the stadium precinct
  - o Electricians with a test truck
- iii. Away from the stadium precinct
  - o Standby Technicians per Distribution Centre
  - o Centlec control room coordinator

Generator fuel was another major resource which had to be taken into consideration and the following was planned in that regard:

- i. The generators have each a fuel capacity of 2000 litres.
- ii. The consumption of the generators is 200litres/hour when at 75% loading and 300litreshour at full loading. The above translates to 10 hours when 75% loaded and 6 hours 40 minutes when fully loaded.
- iii. Taking the above into account, a steady delivery of diesel to the site was required to cater for the 2009FCC needs. There were however limitations in terms of onsite diesel storage at the stadium for safety reasons and the refuelling schedule was modified to take this into account
- iv. Below is an example of a typical refuelling schedule that was implemented:
  - o Refuel Friday 12 June 09 for operations on Monday 15 June 09;
  - o Refuel on Monday 15 June 09 at 17h20 (20 minutes after half time) to ensure sufficient capacity to run the remainder of the game as well as 4 hours after the game;
  - o Refuel on Wednesday 17 June 09 at 07h00;
  - o Refuel again on Wednesday 17 June 09 at 17h20 (20 minutes after half time) to ensure sufficient capacity to run the remainder of the game as well as 4 hours after the game;
  - o Refuel on Thursday 18 June 09 to be ready for the match of 20 June 09;
  - o Refuel on 20 June 09 at 21h50 (20 minutes after half time) since the match commences at 20h30.
  - o Refuel on 23 June 09 at 10h00 to be ready for the match of 24 June 09;

- o Refuel on 24 June 09 at 21h50 (20 minutes after half time) since the match commences at 20h30.
- iv. To limit the fire hazard, it is essential that the tanker doing the refuelling should contain only diesel and no petrol at all.
- v. The maximum amount of fuel required for any refuelling would not exceed 4000 litres at any one refuelling action.
- vi. The driver of the fuel tanker needs to be accredited in order to be allowed in the stadium precinct. The vehicle registration number is required in advance to list it on the delivery schedule. Due to limited access control it was proposed that only two names be tabled by Engen to do all the refuelling.
- vii. In order to ensure timely delivery of the fuel, the tanker needed to report to site 90 minutes prior to delivery and then move to the offices of Parks until 10 minutes prior to the refuelling schedule.

d. Security

The only security threat that Centlec considered was a general blackout to parts of the city in the case of a major distribution centres being sabotaged. Technicians who could respond within minutes were put on standby and assigned distribution centres that they would be responsible for.

e. Lessons for 2010FWC:

i. Reliability of supply

Testing of the generators under controlled environment and with rugby matches was not sufficient to uncover the instability problems that were experienced. The following should have been done before the event:

- o Have the suppliers of the generators involved during the testing of the generators during events used to test the generator performance
- o Also have the supplier representatives on site with the team that operates the generators

ii. Resources

The decision to identify key installations and assign experienced technicians was important in restoring the outage experienced on the afternoon of 20 June 09. It is also important to remember that although you have to assign people to the event there is still the normal

business of maintenance that must continue and not be impacted in anyway.

Delivery of fuel to the stadium for refuelling of the generators posed specific logistical challenges. This is one area where we will need some creativity during 2010FWC. The pressure will be taken off by the plan to use grid as primary supply and the generators as backup.

## 4.2 City of Johannesburg

Upon receiving the venues for 2010FWC i.e. main stadia, training venues, fan parks, etc, City Power started a comprehensive study to fully understand the impact of additional loading and operational risks on all the affected areas. With 2009FCC serving as a dry run for 2010 FWC, City power has re-looked at the study concentrating on FCC impact only.

The Gauteng Regional Task Team formed five (5) working groups to workshop, consolidate, and deliver on the following:

1. Infrastructure assessment, planning and project implementation, i.e. capital programme
  - a. Scope: To assess and address power requirements to meet the demand related to the 2009FCC and 2010FWC
2. Maintenance Planning and Implementation
  - a. Scope: To develop and implement maintenance plans and also to identify 2009FCC and 2010FWC related events and implement contingency plans to ensure continuous supply of electricity
3. Integrated Emergency Response
  - a. Scope: develop and implement integrated emergency response and regional command centres to deal with possible emergencies and load shedding
4. Security of electrical infrastructure
  - a. Scope: Develop and implement an integrated anti theft and vandalism strategy for the 2009FCC and 2010FWC
5. Public Lighting
  - a. Scope: Identify public lighting requirements i.e. major 2010 routes, Fan Parks, Park and Ride etc and ensure that these areas are well lit during the events

The City objectives for the event were aligned to those of the mayoral priorities. Below are some of the city objectives:

1. To provide an interruption free event which complied with all the FIFA requirements as stipulated in the bid book.
2. Create a legacy that will help the city and its residents to realise the goal of becoming the sporting hub in the continent.
3. To provide job opportunities and stimulate economic activities through sport.

The City of Johannesburg preparations went live on 14 June 2009 and the following is a summary of their 2009FCC Experiences:

a. Reliability of supply – costs:

- i. Waiving of Ellis Park actual maximum demand
- ii. Due to OC decision that overlay is a host city responsibility, the costs for provision of overlay power consumed was carried by City Power.

b. Event Co-ordination

All activities were coordinated through the Joint Command Centre (JCC). Joint operations support and collaboration for the City of Johannesburg was achieved through participation of the following in the JCC:

- i. Emergency Management Services (EMS).
- ii. Johannesburg Metropolitan Police Department (JMPD).
- iii. Bus Rapid Transport (BRT).
- iv. Intelligent Traffic Systems (ITS).
- v. City Power/ Eskom.
- vi. Johannesburg Water.
- vii. Waste management (Pikitup)
- viii. 2010 OC

The operation of the JCC is based on a traditional command centre approach. The four key functions of the JCC are represented in figure 1 below.

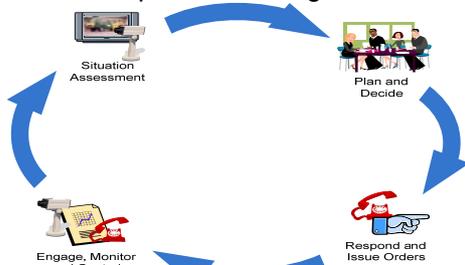


Figure 1 - Key Functions of the JCC

c. Accreditation

The FIFA rules specify that a radius of 1km will be kept as a traffic free zone (TFZ). Entry into this area required prior accreditation to be in place.

City Power implemented specific accreditation for their staff and access requirements into the TFZ.

The following are examples of what was implemented and what was experienced:

- i. Access to Services: City Power had to submit all the Siemert Rd Depot employees' names for accreditation. In addition to these employees, City Power had to request accreditation for the emergency response teams that would have needed to access this area. This access was requested in line with the two types of accreditation allowed by FIFA:
  - o Standby accreditation - All operational personnel
  - o Full house accreditation - One senior employee who will get unlimited access throughout the precinct
- ii. Experiences:
  - o Sixteen (16) applications made for accreditation and only six (6) were approved.
  - o Access denied for accredited personnel to repair faulty lights on match day – 1

d. Communication

To avoid network congestion and to maintain system security, City Power opted to use the TETRA system as the medium of communication

Below is the list of TETRA base station sites that were operational for the FCC and each site had a +/-15km radius coverage.

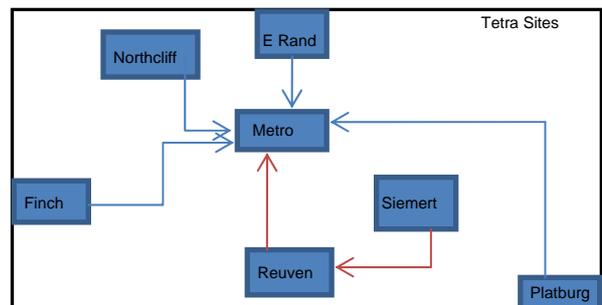
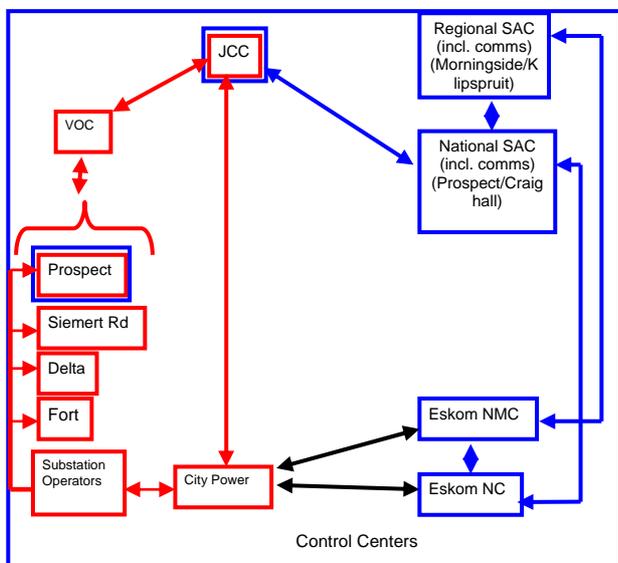


Figure 2: Tetra Installation sites

e. Resources

Standby Teams were deployed at major substations for the duration of the event to reduce response and where possible restoration times.

City Power and Eskom Personnel deployed at VOC and JCC. The diagram below illustrates the information flows between the various operations/command centre's in place over the 2009FCC.



f. Lessons for 2010FWC:

- i. Voltage regulation at key sites needs to be reviewed and appropriate measures implemented to ensure voltage stability. E.g. high voltage levels were experienced at the overlay (on the load side), due to the Transformer fixed tap design. As a result the overlay load was supplied from generators and the grid utilised as back up supply. It is critical the OC electricity representatives provide clarity on the stadium internal supply arrangements at least 6 months prior to the event to prevent a repeat of this type of incident.
- ii. Redundant supplies to the stadium are to be implemented prior to the 2010FWC
- iii. Clarity needs to be sought from the OC and Host City directorate on accountabilities for payment of electricity consumed at Stadia and key event sites.

### 4.3 City of Tshwane

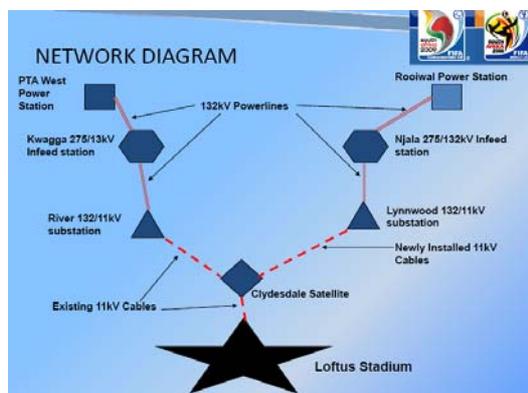
Tshwane is a metropolis and was established on 5 December 2000 in terms of the new local government structure. Since it incorporates

Pretoria, Tshwane is now the seat of government administration and the capital of South Africa. It is also one of the host cities for the 2009FCC and the 2010FWC.

The City of Tshwane preparations went live on 14 June 2009 and the following is a summary of their 2009FCC Experiences:

- a. Risk identification and treatment
  - i. Risk: During the early stages of the planning for the FCC and 2010FWC the likelihood of a loss of supply due to capacity constraints at the River substation was identified as a risk in terms of supply for the area surrounding Loftus stadium. To create spare capacity at River, 18MVA was transferred to Lynwood substation.
  - ii. Treatment: load was moved away from River substation and various surrounding infrastructure was upgraded in the run up to the 2009FCC. This improved the reliability of the supply to Loftus and local area around Loftus tremendously.

The network diagram below highlights the network configuration from the Eskom points of supply to the stadium precinct.



b. Resources

Necessary resources such as vehicles, equipment, spares etc. were stored inside the TFZ which was closed on match days-1.

Additional standby personnel dedicated to maintenance and network operations were available on site four hours before the start of matches and two hours after matches. Standby personnel on site ( inside the TFZ ) during the 4 hours before up to 2 hours after the match included maintenance teams for LV and MV equipment, 132kV maintenance personnel, network operators for 11kV and 132kV switching actions , Test and protection technicians.

The cellular telephone networks were not considered reliable enough and temporary trunked radio systems were used as communication medium between the VOC and the City of Tshwane electrical network control room.

c. Security

Security and protection of the network was identified as a critical risk during the 2009FCC period. For the period of the FCC additional guards were placed at infeed stations and high risk areas along the 132kV lines.

d. Lessons for 2010FWC

The modifications to the Clydesdale supply area implemented at an approximate cost of R23m proved to be successful for the stability and quick automated restoration of power failures which could occur in the immediate area surrounding the stadium. The stadium however preferred to operate disconnected from the mains supply four hours before and 2 hours after match events.

The operational philosophy for the stadium and precinct power supply, i.e. grid vs. onsite generators needs to be clarified for the 2010FWC.

The same procedures and preparations regarding dedicated additional maintenance and operational personnel before and during matches to be on site will be followed for the 2010FWC.

e. Summary:

The Loftus venue proved to be successful in presenting the 2009FCC Except for some minor issues the electricity supply network was stable and functioned without any problems during match days. The extensive maintenance actions to replace risky older oil filled switchgear, do preventive maintenance on public lighting and stopping all planned excavation work in the vicinity of the supply network to Loftus resulted in a successful hosting of the 2009FCC at Loftus as well as the official public viewing areas.

## 4.4 Rustenburg

The Royal Bafokeng Stadium in Rustenburg is directly supplied by Eskom.

The Eskom objectives in Rustenburg over the 2009FCC were the same as the Eskom national objectives stated earlier.

a. Risk identification and treatment

Whilst the risks identified for Rustenburg were the same as the national risks identified by Eskom, the treatment of these risks were tailored for Rustenburg. These included:

- i. The installation and commissioning of a second cable feeder to the stadium
- ii. Combining the Rustenburg SAC with the Rustenburg JOC as both of these are operated by Eskom.
- iii. A radio link with the Stadium VOC and OC electrical representatives.

b. Reliability of supply

No incidents were experienced in terms of loss of supply to the Royal Bafokeng Stadium over match times.

c. Resources

Dedicated technical resources were accredited and posted at the Phokeng substation as per the OC requirements.

The Rustenburg SAC was also manned from 7am daily to 24hours with technical, communications and security personnel.

d. Security

Given that Phokeng substation is within the stadium precinct, the security for the substation was catered for through the OC security measures put in place for the precinct.

e. Collaborative efforts

Continuous communication and collaborative efforts were put in place for Rustenburg as a whole with the Rustenburg electricity department.

f. Lessons for 2010FWC:

As per those stated in the national and host city lessons earlier.

## 5. Recommended action

The following recommendations are made to all the ESI members involved in the 2010FWC:

1. Based on the experiences over the 2009FCC, it is recommended that a risk based approach be utilised to direct the ESI actions for the 2010FWC as opposed to the current approach which is focussed purely on technical delivery.
2. Adequate security and storage measures need to be put in place to store and safeguard equipment in the run up to and during the 2010FWC.
3. Safety considerations need to be identified and adequately addressed at all sites for the 2010FWC.
4. Accreditation requirements (people, vehicles and equipment – this includes any suppliers) must be quantified and the relevant access requirements finalised as far in advance of the event as possible.
5. Appropriate fuel supply considerations need to be implemented to take into account any restrictions that could affect fuel delivery.
6. Resource planning for the 2010FWC must be implemented timeously and give due consideration to risks such as labour action over the period.
7. Emergency communication and media information dissemination needs to be simulated across the ESI to enhance this and prepare for the 2010FWC. This includes the critical alignment with FIFA and OC.
8. Clarity must be sought from the respective parties, e.g. OC, host city directorates or relevant government department on issues such as costs incurred over the 2010FWC and re-imburement for such.

## 6. Conclusions

The 2009FCC as stated earlier was the only test run in preparation for the 2010FWC. As such the event served its purpose in:

1. Providing the ESI with an opportunity to test its event specific readiness, assumptions and real time operations.
2. Providing the ESI with an opportunity to test the adequacy and effectiveness of the risk treatment plans implemented.
3. Creating an understanding of the magnitude of the 2010FWC which will be upon us shortly and the necessary actions to be taken to ensure success for this event, i.e. incorporating lessons learnt into our final preparations so as to have more robust and complete plan of action for the 2010FWC.

## 9. Acknowledgements

The authors would like to acknowledge the contributions made by:

1. The 2010 ESI forum