

Stadium electricity supplies – an assessment of the specification and readiness 2010 FIFA SOCCER WORLD CUP

Author & Presenter: T R Edmondson – Eskom & member 2010 ESI forum
Co-author: Dr. C G Carter-Brown – Eskom & chairperson 2010 ESI forum

1. Introduction

In a little over 250 Days the world's largest and most anticipated sporting event will take place in South Africa.

South Africa and the African continent will be showcased. Millions of viewers will tune in to matches, the broadcast of which will be critically dependent on the provision of uninterrupted high quality electrical power.

The South African Electrical Supply Industry is critical in the preparation and execution of this historical event.

2. Background

The main electrical loads associated with the 2010 tournament include:

- **Stadiums:** The 10 stadiums in 9 Host Cities at which the matches will be played.
- **Base camps:** Each of the 32 teams will have a "base camp", and are expected to arrive at base camp up to 2 months prior to the start of the tournament. Base camps could be located anywhere in South Africa.
- **Training venues:** Before each match (typically 5 days beforehand) teams will move from their base camps to the training venues within the Host Cities.
- **Fan parks:** FIFA fan parks will be located in Host Cities.
- **Public viewing venues:** Non-FIFA accredited viewing venues that will be set up by municipalities and private enterprise.
- **FIFA hotels:** Hotels at which FIFA will establish their local offices and command centre.

- **Media centres:** Journalists will be hosted at the International Broadcast Centre which will form the hub for broadcasting and reporting.
- **Supporters:** The accommodation, tourism and transport needs of visitors.

In relation to the South African peak demand, the magnitude of the additional electrical load is expected to be relatively small. Complexity and risk arise due to the uncertain nature of this load, including its location. Certain loads, such as stadium lighting and broadcasting, have onerous power quality requirements. A momentary interruption or voltage dip could disrupt broadcast to millions of viewers.

A problem in the supply chain (Eskom Generation, Eskom Transmission, Eskom Distribution, Municipal distribution or stadium distribution) will reflect poorly on the entire ESI, South Africa and Africa.

It is critical that all role players in the ESI work together to minimise risks and optimise approaches. Role players include:

- Host Cities and municipalities.
- Eskom.
- Owners of the 2010 event stadiums.
- 2010 Local Organising Committee (LOC).
- Association of Municipal Electrical Undertakings (AMEU).
- Department of Energy (DoE).
- National Energy Regulator of South Africa (NERSA).
- South African Local Government Association (SALGA)

The 2009 Confederations Cup was a successful tournament for the country and the electrical industry, but the real value was gained in the lessons learnt during and leading up to the event.

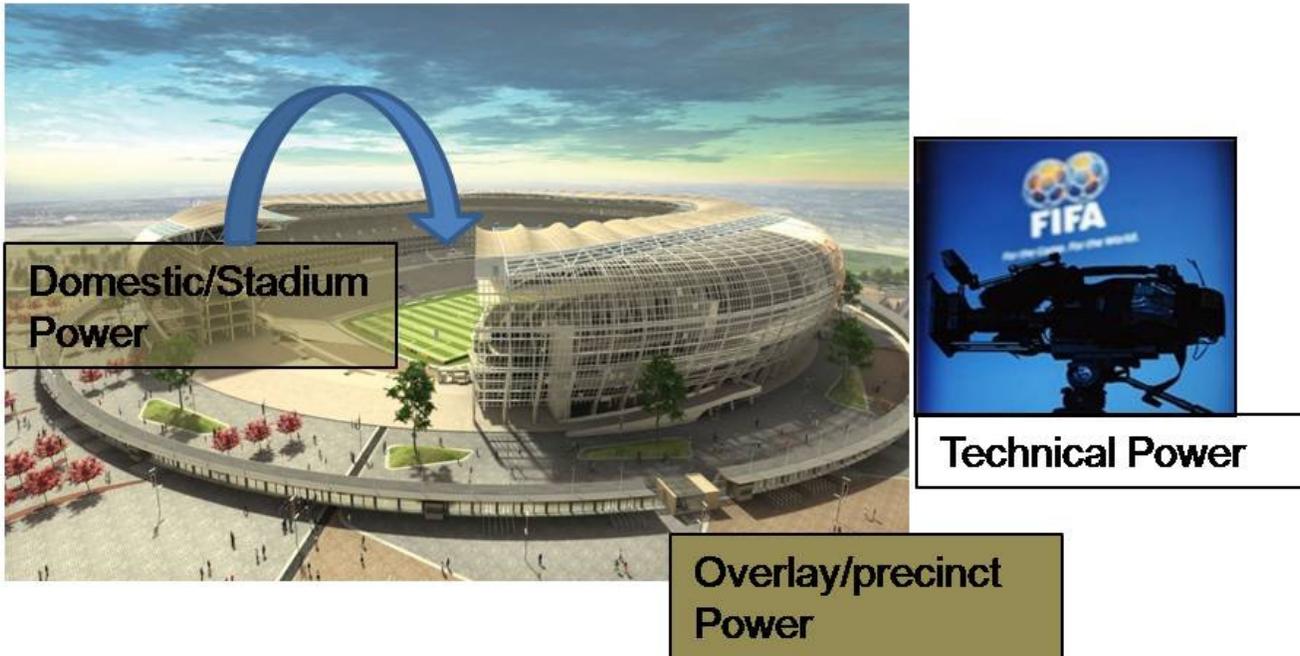


Figure 1 - Stadium electrical supply 1

3. Stadium electrical supply

The Stadium and surrounding areas are fundamentally broken down into three (3) main focus areas, namely:

- Domestic / Stadium Power (Stadium itself)
- Technical Power (Media and Broadcasting)
- Overlay or Precinct (Area immediately surround the stadium including ticketing offices, hospitality, Accreditation etc)

3.1 Domestic/Stadium Power

The agreements signed by the host cities and FIFA in the delivery of “**sufficient back-up power grids to deal with any power failure at the Stadium and elsewhere in the Host City which may arise during a Match, and that appropriate power management systems are in place**”- FIFA 2007 Specification – Host City Agreement

Below is what is expected with regards to this statement:

Pitch Lighting:

“The primary goal of the event lighting system is to illuminate the event to digital video quality for the media without creating nuisance glare for the

players/officials and adding spill light/glare to the spectators and surrounding environment. Permanent lighting, temporary lighting and a combination of both systems should be considered” – FIFA Football Stadiums – Technical recommendations and requirements 4th Edition

- Host City is responsible for pitch lighting.
- Lighting intensity of 2400Lux (Fixed camera lighting) with 1800Lux at pitch level (Field Camera) is required at all times.
- Available and functioning 100% during a match.
- Zero switch time tolerance. I.e. switching between electrical supplies must have no impact on the pitch lighting.
- Recommendation to have some sort of uninterruptable power supply (UPS) to ensure that any anomaly (Dips, surges etc) on the network (grid or generator) has no influence on the pitch lighting. Having a UPS would also ensure that the potential impact on pitch lighting during switching between electrical supplies will be mitigated.
- Generators or alternate power supply capable of sustaining the pitch lighting for a minimum of three (3) hours.
- Maintenance and refuelling are the responsibility of the Host City.

- Configuration of the power supply is at the discretion of the Host City but must have a minimum n-1 redundancy.



Figure 2: Pitch Lighting 1

Stadium building power

Stadium building power is the required supply within the stadium to power appliances, facilities and lighting within the stadium i.e. General stand lighting, administration offices and suites.

- Backup power requirement in the event of a power failure is limited to that of the Occupational health and safety act (OHSACT)
- This power excludes any broadcast or media provisioning.
- Configuration of the MV power supply is at the discretion of the Host City and is recommended to have minimum n-1 redundancy.

3.2 Technical Power

This is power for the broadcasting and television requirements

- NO HOST CITY INVOLVEMENT. This is the responsibility of the LOC.
- NO GRID SUPPLY. Islanded from the grid power supply. Supply is provided via diesel generators supplied by the LOC.
- Covers all broadcasting mediums.
- Total of three 500Kva generators each capable of taking the full load. Two generators run in parallel with the third being a backup. A fourth generator will be required for the venue hosting the final game.

- Zero supply switching tolerance.

3.3 Overlay/precinct Power

Area immediately surrounding the stadium including ticketing offices, hospitality, accreditation

• Host City responsible to supply a medium voltage (11kV) point/s of supply. For 2010 there may be as many as four required per stadium and the number and location of these bulk supply points will be stadium dependent.

• The requested capacity for the confederations cup was around 2MVA. 2010 is expected to require greater capacity.

• The LOC will install and operate the temporary distribution network linking the MV bulk supply point with the individual loads.

• The LOC will install and operate backup diesel generation for the overlay supply.

• Approximate 1 minute switch time tolerance between grid supply and and the backup generation.



Figure 3: Nelson Mandela Stadium 1

4. Preparation

The 2010 FWC is the event of events, a once in a life time experience, and the number of role players and stakeholders involved in the preparation and execution bears witness to this.

Action plans and programs have been put in place to help in the preparation for 2010 FWC and minimise risk. The information found in the points below is relevant and applicable to the stadia preparation and other 2010 critical loads.

4.1 Generation & Transmission

The mitigation of risks for these components is primarily an Eskom responsibility and includes:

- Ensuring adequate primary energy supply prior to the event.
- The management of plans for the taking of generation and transmission plant out of service

for planned maintenance or refuelling [Koeberg] in order that the risk to the tournament is minimised.

- The identification and assessment of Infrastructure providing supply to municipal distributor areas, which could directly or indirectly influence the supply to any of the stadiums, for condition and maintenance or refurbishment plans.
- Detailed emergency planning and simulation of these plans prior to the event.
- Plans for obtaining and storing of strategic spares, as well as logistic constraints such as communications and transport are in place.
- Inspection of networks will take place earlier than normal practice for those networks identified as critical for reliability and quality of supply.

4.2 Distribution

The establishment of regional task teams (RTT) in all the host cities has enabled the preparation to be tracked and understood. The suggested actions that are being carried out (many have been completed) by the relevant Host Cities include:

- Identify and assess the condition of the electrical infrastructure that could directly or indirectly influence the supply to the stadium[s], training venues and key loads in their area of responsibility.
- Replacement, refurbishment or maintenance of these networks to be scheduled to be completed well before the commencement of the tournament.
- Evaluate the requirement and availability of strategic spares for their network.
- Assess loads connected to load shedding relays and revise existing plans to ensure that there is no impact on identified tournament critical loads should the need for load shedding arise.
- Arrange networks so that no abnormal conditions are maintained during the period of the tournament.
- Prepare contingency plans for supplies to the critical loads and ensure all control and operations personnel are thoroughly familiar with switching requirements.
- Plan leave and standby rosters well in advance to ensure the availability of an adequate level of competent staff.
- Optimise security measures for the protection of critical infrastructure.

4.3 Stadia

Each of the host cities have achieved the requirements for stadium supplies differently considering legacy requirements and historical infrastructure and layout, namely;

- Ellis Park (Johannesburg)
 - Primary power – Generators
 - 2 x 700 KVA
 - 2 x 800 KVA
 - 1 x 500 KVA
 - Backup power – Grid (n-1)
 - Prospect
 - Delta
 - Uninterruptable power supply (UPS).
- Free State Stadium (Bloemfontein)
 - Primary power – Generators
 - 2 x 1250 KVA
 - Backup power – Grid (n-1)
 - Configured to run parallel.
- Royal Bafokeng Sports Palace (Rustenburg)
 - Primary power – Generators
 - 2 x 2200 KVA
 - Backup power – Grid (n-1)
 - Uninterruptable power supply (UPS).
- Loftus Versveld (Pretoria)
 - Primary power – Generators
 - 8 x 300 KVA
 - Backup power – Grid (n-1)
 - Uninterruptable power supply (UPS) per light mast.
- Green Point (Cape Town)
 - Primary Power
 - Grid Supply (n-1)
 - Backup Power
 - Two Sources of power. 2 X 2 MVA fixed generator supply supplemented by 4 x 500KVA generators.
 - Uninterruptable power supply (UPS)
- Moses Mabhida Stadium (Durban)
 - Primary Power - Generators
 - 3 x 800 KVA
 - Backup Power – Grid
 - 2 x 11kv sources from separate locations.
 - There is currently no allowance made for any UPS supplies at the Moses Mabhida Stadium, albeit that the Consultants have made physical arrangements to incorporate as such.

- Soccer City (Johannesburg)
 - Primary power – Generators
 - Backup power – Grid (n-1)
 - Uninterruptable power supply (UPS).
- Mbombela Stadium (Nelspruit)
 - Primary power – Generators
 - Backup power – Grid (n-1)
 - Uninterruptable power supply (UPS).
- Peter Mokaba Stadium (Polokwane)
 - Primary power – Generators
 - Backup power – Grid (n-1)
 - Uninterruptable power supply (UPS).
- Nelson Mandela Stadium (Port Elizabeth)
 - Primary Supply - Grid supply (Mount Rd Substation @ 66/22kV)
 - Backup Power - Gas Turbine
 - There are rotary UPS's which are installed in each of the 4 stadium substations which will be dedicated for pitch lighting and emergency supplies.

Note: The above configurations are not final and may change leading up to the final preparation for the 2010 FIFA World Cup event.

4.4 Human Resources

The human factor in the preparation for 2010 FWC cannot and must not be underestimated. Below are a few points to note during these preparations:

- 2010 FWC coincides with a period synonymous with wage negotiations and labour action.
- Staff still taking care of “business as usual” whilst also supporting the event with priority response.
- Man power to support and be involved in event specific structures (Venue Operation Centres, Joint Operational Centres etc)
- Staff on site match day -1 at key supply points.

4.5 General Preparation

These are other significant items that should be noted during the preparation for 2010 FWC;

- Heightened electrical fault response and restoration is required to be in place +/- 2 week prior to the first game.
- Fuel supplies and spares to be sent to site at least 48 hours before match and if used replaced within 24 hours.

- FIFA Exclusive use period is 15 business days before first game at stadium and 5 Business days after last game at stadium. - Electricity readiness needs to mirror this.

5. Conclusions

A large amount of effort has gone and is going into the preparation of the 2010 FIFA World Cup with a large portion of these preparations dependant on the electrical supply and availability thereof.

With only a few months to go, final preparations for this event are at the forefront of Host City and Eskom priorities.

“In every aspect of life, progress is constantly being made.” -Joseph S. Blatter - FIFA President

6. References

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7. Acknowledgements

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