

**CIGRÉ 6th SOUTHERN AFRICA REGIONAL CONFERENCE
"ADDRESSING THE CHALLENGES FOR RELIABLE, EFFICIENT, AND
SUSTAINABLE SUPPLY OF ELECTRICITY - NOW AND INTO THE FUTURE"**

SOMERSET WEST 17 - 21 AUGUST 2009



International Council on Large Electric Systems

Call For Registration

For online registration: www.activecaptureonline.co.za/cigre2009

Cigré is a non-profit international organisation founded in 1921 as a forum for the exchange of information on experiences and developments in the field of generation, transmission, and distribution systems. It is comprised of specialist study committees and working groups, with membership of experienced engineers from all over the world.

AIM

The aim of the Regional Conference is to provide a forum for Cigré members and interested technical practitioners to participate in addressing the challenges in the region. It is also a forum for the developments in the international activities of the various Cigré Study Committees to be communicated in Southern Africa. This year, the general paper session will be preceded by tutorials, and a joint colloquium will be held on the Thursday by Study Committees A2 (Transformers), A3 (HV Equipment) and B3 (Substations).

LOCATION

Following the commendable success of the 5th Regional Conference, the 6th Cigré Southern Africa Regional Conference will again be held in the winelands of the Western Cape at the Lord Charles Hotel in Somerset West. In addition to accommodation at the Lord Charles. Hotel block bookings and shuttle services have been arranged for venues on the Strand and Gordon's Bay beachfronts.

KEY DATES

Monday 17 August will be devoted to half-day specialist tutorials. The regional conference will be held from Tuesday to Wednesday, followed by the colloquium on Thursday. Post-conference technical tours will be conducted on Friday 21 August.

The conference is scheduled to take place the week before the ISH Conference in Cape Town to enable delegates to attend both events.

6th Southern Africa Regional Conference

17 - 21 August 2009

**Somerset West
(Cape Town) South Africa**

Call for Registration

**"ADDRESSING THE CHALLENGES FOR RELIABLE, EFFICIENT & SUSTAINABLE
SUPPLY OF ELECTRICITY - NOW & INTO THE FUTURE"**

CONFERENCE THEME

The general session of this year's conference will address constraints and challenges facing the electricity supply industry, and propose innovative and new technologies that will be pivotal to finding solutions.

Topics will cover :-

- Transmission and Distribution.
- Generation options.
- Ageing infrastructure.
- Regulatory pressures.
- Planning.
- Skills and capacity shortages.

Papers that address these and other themes have been prioritised and selected from the large number of abstracts received by the committee:

For accreditation purposes, all papers accepted for the conference session are reviewed by a technical panel made up of Cigré Study Committee and Working Group members, and other recognised subject specialists.

LANGUAGE

The conference will be conducted in English.

CONTINUING PROFESSIONAL DEVELOPMENT POINTS

This event will be validated by the SAIEE and attendance at the conference will earn CPD credit.

TUTORIALS (MONDAY 17 AUGUST)

Four tutorials will be presented by international specialists - two parallel sessions in the morning and two in the afternoon:

Morning Session

- A 2 Transformers
 - (i) Short circuit forces
 - (ii) Corrosive sulphur in transformer oil

Afternoon Session

- B 3 Substations - (i) EHV Tubular busbar design
- (ii) Conversion of existing double busbar breaker to breaker-and-a-half

➤ A 3 HV Equipment

- The selection and application of surge arrestors

C 6 Dispersed generation

Cigré 6th Southern Africa Regional Conference & Joint A2, A3, B3 Study Committee Colloquium PROVISIONAL PROGRAMME 17-21 August 2009

| TUTORIALS - MONDAY 17 AUGUST | |
|------------------------------|---------------------------------------|
| MORNING SESSION | TUTORIAL A 2 - TRANSFORMERS |
| | TUTORIAL A 3 - HIGH VOLTAGE EQUIPMENT |
| AFTERNOON SESSION | TUTORIAL B 3 - SUBSTATIONS |
| | TUTORIAL C 6 - DISPERSED GENERATION |

| TIME | PAPER | TITLE | PRESENTER / AUTHOR |
|----------------------------|---|---|--------------------|
| TUESDAY 18 AUGUST | | | |
| CONFERENCE SESSIONS | | | |
| 08h30 | OPENING SESSION (Chairperson - R Koch) | | |
| 08h40 | | Cigré National Committee welcome & introduction | K King |
| 09h00 | | Keynote address by Chief Officer - Eskom Customer Network Business | E Johnson |
| 09h25 | P001 | Keynote paper - Eskom's recovery process | M Chettiar |
| 09h45 | | Conference logistics | R Koch |
| 09h50 | MORNING TEA | | |
| 10h20 | CONFERENCE SESSION 1 - ASSET MANAGEMENT (Chairperson - W Majola) | | |
| 10h20 | | Session introduction | |
| 10h25 | P101 | Asset management and the end-of-life issue | E Rijks |
| 10h35 | P102 | Expected life time and maintenance/replacement strategy for aged transformers | T Kobayashi |
| 10h45 | P103 | Monitoring the operational behaviour of installations from the electricity transmission grid - source of information for the TSO's re-investment strategies, master plan, and business plan | C Diaconu |
| 10h55 | P104 | Partial replacement technologies of aged GIS/MTS in Japan | H Okuyama |
| 11h05 | P105 | Maintenance decision for power transformers based on reliability simulation | L Shaoyu |
| 11h15 | P106 | Ageing aerial fibre infrastructure | T Gosai |
| 11h25 | P107 | Upgrade of the Apollo HVDC converter station | H Bjorklund |
| 11h35 | P108 | Management of the transmission spatial information infrastructure | L van der Merwe |
| 11h45 | P109 | Determining the accuracy of transformer oil certificates when evaluating uncertainty of measurement | P Le Roux |
| 11h55 | P110 | Morphological analysis of acoustic signals of discharge processes | S Tsvetayev |
| 12h05 | | Discussion | |

| TIME | PAPER | TITLE | PRESENTER / AUTHOR |
|--------------|---|--|--------------------|
| LUNCH | | | |
| 13h25 | CONFERENCE SESSION 2 - PLANNING & OPERATIONS 1 (Chairperson - T Carolin) | | |
| 13h25 | | Session introduction | |
| 13h30 | P201 | Challenges of achieving energy demand in Africa | E Kihara |
| 13h40 | P204 | Overview of the Eskom ancillary services market | J Dean |
| 13h50 | P205 | Willing-seller/willing-buyer model in South Africa | P Tuson |
| 14h00 | P206 | Overview of new SAPP transmission pricing methodology | G Chown |
| 14h10 | P207 | Case study into the application of time of use tariffs in the Eskom Western Region of South Africa in reducing peak loads | D Ramsbottom |
| 14h20 | P208 | Designing the SCADA system to deal with disturbances | R Candy |
| 14h30 | P209 | Migrating the energy management system at Eskom | R Ungerer |
| 14h40 | P210 | Real-time monitoring of the transmission system: watching-out for fires | A Momberg |
| 14h50 | P211 | Transmission system maintenance outage planning - the case for dynamic outage scheduling | N April |
| 15h00 | P212 | Eskom security constrained dispatch and automatic generation control | G Chown |
| 15h10 | | Discussion | |
| 15h30 | AFTERNOON TEA | | |
| 16h00 | CONFERENCE SESSION 3 - PROTECTION & QUALITY OF SUPPLY (Chairperson-R Matshidisa) | | |
| 16h00 | | Session introduction | |
| 16h05 | P301 | Managing dynamic performance using WAMS in the South African power grid | D Wilson |
| 16h15 | P302 | Fault levels: impacts for long-term system planning purposes | C Mushwana |
| 16h25 | P303 | HV and EHV network interruption performance measurement and reporting: development of the NRS048-8 standard | B Chatterton |
| 16h35 | P304 | Power quality assessment methods - A statistical analysis of measured data and considerations for planning, design, operation, and maintenance of the transmission network | E Venter |
| 16h45 | P305 | Impact of water-heating DSM on voltage conditions and load parameter choice for feeder design in South Africa | CT Gaunt |
| 16h55 | P306 | Monitoring power quality beyond EN 50160 and IEC 61000-4-30 | A Broshi |
| 17h05 | | Discussion | |

| TIME | PAPER | TITLE | PRESENTER / AUTHOR |
|------------|---|---|--------------------|
| 17h30 | EVENING COCKTAIL FUNCTION | | |
| Wed 19 Aug | Conference Sessions | | |
| 08h00 | CONFERENCE SESSION 4: SUBSTATIONS & HV PLANT (Chairperson-S Gourrah) | | |
| 08h00 | | Session introduction | |
| 08h05 | P401 | Comparison of UHV and 800kV specifications for substation equipment | H Ito |
| 08h15 | P402 | Verification of lifetime arcing stress withstand of circuit breakers through testing | R Smeets |
| 08h25 | P403 | Voltage and temperature dependent dynamic pre-insertion resistor model | R Hopkins |
| 08h35 | P404 | Phase-to-phase influence - a design challenge for current transformers in gas insulated switchgear | M Schumacher |
| 08h45 | P405 | Dead tank based compact switchgear - modular high-voltage substation equipment | P Stenzel |
| 08h55 | P406 | Conversion of existing 'double busbar single breaker' arrangement substations to a 'breaker and a half' configuration | S Chibba |
| 09h05 | P407 | IEC61850: Utilizing GOOSE messages for a fully automated test and commissioning procedure for the new breaker-and-a-half schemes implemented in the Eskom 765 kV transmission network | A Dierks |
| 09h15 | P408 | Development of substation earthmat design methodology for varying fault levels | M Peffer |
| 09h25 | P409 | The role of transformer and fire safety - in management of availability and reliability of supply | A Petersen |
| 09h35 | P410 | 400 kV and 500 kV extruded underground cable systems installed in inclined tunnels or shafts for generating power stations | P Argaut |
| 09h45 | P411 | Electromagnetic compatibility (EMC) considerations in high temperature nuclear reactors | P Pretorius |
| 09h55 | P412 | Multiple use of gas-insulated transmission lines (GIL) | H Koch |
| 10h05 | | Discussion | |
| 10h25 | MORNING TEA | | |
| 10h55 | CONFERENCE SESSION 5: TRANSFORMERS (Chairperson - R Cormack) | | |
| 11h00 | P501 | Twelve years test experience with short-circuit withstand capability of large power transformers | R Smeets |
| 11h10 | P502 | Predicting transmission transformer condition status using DGA signatures | A Singh |
| 11h20 | P503 | Interpretation of frequency response analysis (FRA) Results for diagnosing transformer winding deformation | A Darwin |
| 11h30 | P504 | Aspects of the practical application of sweep frequency response analysis (SFRA) on power transformers | A Kraetge |
| 11h40 | P505 | Determining of pole-zero representation of FRA measurement data for interpretation of power transformer transfer function deviations | M Heindl |

| TIME | PAPER | TITLE | PRESENTER / AUTHOR |
|-------|--|---|--------------------|
| 11h50 | P506 | Protection of oil-filled transformer against explosion | G Périgaud |
| 12h00 | P507 | Quality assurance of insulating oil for use in new transformers | A Lombard |
| 12h10 | P508 | Determining the accuracy of transformer oil certificates when evaluating uncertainty of measurement | P le Roux |
| 12h20 | P509 | Comparing various moisture determination methods for power transformers | M Koch |
| 12h30 | P510 | Environmental friendly insulating liquids - a challenge for power transformers | G Pukel |
| 12h40 | | Discussion | |
| 13h00 | LUNCH | | |
| 14h00 | CONFERENCE SESSION 6: LINES (Chairperson - S Makaleng) | | |
| 14h00 | | Session introduction | |
| 14h05 | P601 | On the earthing of overhead power lines - a case study | P Pretorius |
| 14h15 | P602 | On the surge impedance of 800 kV double circuit towers - empirical validation | P Pretorius |
| 14h25 | P603 | Electric field design limits in overhead power line design - a perspective in view of possible regulation in South Africa | A Burger |
| 14h35 | P604 | Electrical design considerations in Eskom's new 765 kV double circuit power lines | P Pretorius |
| 14h45 | P605 | Electromagnetic coupling from overhead power lines to fences - an experimental evaluation and case study | P Pretorius |
| 14h55 | P606 | Adapting electric power utility insulation co-ordination procedures to incorporate accurate lightning data | R Evert |
| 15h05 | P607 | Lightning performance analysis of a 765 kV double circuit power line | L Peter |
| 15h15 | P608 | Review of lightning performance improvement project results: a case study from South Africa | L Peter |
| 15h25 | AFTERNOON TEA | | |
| 15h55 | CONFERENCE SESSION 7: LINES (continued...) | | |
| 16h05 | P609 | The susceptibility of 400 kV transmission lines to bird streamers and bush fires: a definitive case study | H Vosloo |
| 16h15 | P610 | Special hardware for cross-ropes cable | P Borges |
| 16h25 | P611 | Investigation into the development of standing waves on long distance HVDC transmission lines | B Duncan |
| 16h35 | P612 | Torque balance of bare composite overhead conductor connected with helical formed fittings | A Duckham |
| 16h45 | P613 | Comparison of damper evaluation techniques | D Sunkle |

| TIME | PAPER | TITLE | PRESENTER / AUTHOR |
|--------------|--|--|----------------------|
| 16h55 | P614 | The design and construction of overhead lines in environmentally highly sensitive areas | B Jacobs |
| | | Discussion | |
| Thurs 20 Aug | Joint Study Committee A2, A3, B3 Colloquium | | |
| 08h00 | | OPENING | |
| 08h00 | | Cigré National Committee welcome & introduction | K King |
| 08h15 | STUDY COMMITTEE A2: Transformers (Chairperson - R Cormack) | | |
| 08h15 | | Introduction by Cigré Study Committee A2 Chairperson | P Boss |
| 08h30 | C101 | Short-circuit resistant power transformers - prerequisite for reliable supply of electrical energy | C Krause |
| 08h40 | C102 | Addressing the requirements of an ageing fleet of transmission transformers on the Eskom transmission network | S Mtetwa |
| 08h50 | C103 | Eskom Transmission experience in procuring system transformers outside South Africa | N Buthelezi |
| 09h00 | C104 | Different approaches for the acquisition and evaluation of transformer failure data | J Jagers |
| 09h10 | C105 | End-of-life modeling for power transformers and reliability of aged power system networks | Z. Wang |
| 09h20 | C106 | Evaluating and managing transformer factory acceptance test statistics as performance criteria | J Koen |
| 09h30 | C107 | Gassing and oxidation behaviour of insulating fluids under thermal stress | I Atanasova-Hoehlein |
| 09h40 | C108 | Managing a large and ageing transformer fleet | E Figueroa |
| 09h50 | C109 | Effects of on-line reclaiming on the corrosive sulphur content of transformer oil | M Dahlund |
| 10h00 | C110 | A path-way to cope with the dilemma of ageing assets, limited capital expenditure, reduced budgets for maintenance and the remaining need to supply electricity at unchanged quality | B Schmitz |
| 10h10 | C111 | Development of methods of evaluation of power transformer insulation ageing taking into account random exploitation factors | V Vasin |
| 10h20 | C112 | Discussion | |
| 10h40 | MORNING TEA | | |
| 11h10 | STUDY COMMITTEE A3: HV Equipment (Chairperson - C van der Merwe) | | |
| 11h10 | | Introduction by Cigré Study Committee A3 Chairperson | M Waldron |
| 11h25 | C201 | Optimized asset management of high voltage substations and power network operation based on equipment performance | F Endo |
| 11h35 | C202 | Residual life concepts applied to HV gas-insulated switchgear | P Glaubitz |
| 11h45 | C203 | Gas-insulated switchgear for 1100 kV- challenges in development and testing | U Riechert |

| TIME | PAPER | TITLE | PRESENTER / AUTHOR |
|-------|-------|--|--------------------|
| 11h55 | C204 | Condition monitoring of high-voltage AC circuit-breakers | A Bosma |
| 12h05 | C205 | Analytical maintenance optimization for HV circuit breakers | T Krontiris |
| 12h15 | C206 | Residual life assessment and asset management decision support by hazard rate functions | A Janssen |
| 12h25 | C207 | Use of data from Cigré high voltage equipment reliability survey | F Waite |
| 12h35 | | Discussion | |
| 12h55 | | LUNCH | |
| 13h55 | | STUDY COMMITTEE B3: Substations (Chairperson - A Amod) | |
| 13h55 | | Introduction by Cigré Study Committee B3 Chairperson | F Besold |
| 14h10 | C301 | Assessment of electric field exposure in a 765 kV open air substation - A case study | P Pretorius |
| 14h20 | C302 | Presentation of the SF6 tightness guide | J Biasse |
| 14h30 | C303 | Simplification and integration of HV AIS switchgear gives operational and environmental benefits | C Solver |
| 14h40 | C304 | The breaker and half circuit configuration of the Eskom 765kV AIS network | E Naicker |
| 14h50 | C305 | Gas insulated switchgear - seismic qualification | P Glaubitz |
| 15h00 | C306 | 800 KV-AC and 600 KV-DC Brazilian transmission systems - experience and future trends | J Filho |
| 15h10 | C307 | Hydro mechanical spring drive - the ultimate solution to operate HV circuit breakers | D Fuechste |
| 15h20 | C308 | Increased availability of a GIS by the combination of the disconnector and earthing switch | D Fuechste |
| 15h30 | C309 | Optimal opportunity to reduce the sulfur hexafluoride gas emissions | Z Zhangkui |
| 15h40 | C310 | Substation planning for large-scale onshore wind integration | S Yu |
| 15h50 | | Discussion | |
| 16h10 | | AFTERNOON TEA | |
| 16h40 | | STUDY COMMITTEE PANEL OPEN SESSION (Chairperson - Rob Stephen) | |
| 16h40 | | Open Discussion | |
| 17h00 | | Closing remarks A2 | P Boss |
| 17h10 | | Closing remarks A3 | M Waldron |
| 17h30 | | Closing remarks B3 | F Besold |
| 17h40 | | Cigré National Committee Awards and Closing Comments | K King |

TECHNICAL TOURS (FRIDAY 21 AUGUST)

Tour 1: Palmiet Pumped Storage System and “The Invisible Tower”:

A visit to Palmiet Visitors Centre and hydro-electric power station reveals the story behind the storage of electrical energy. The power station is located in the Western Cape near Grabouw - in South Africa's first Biosphere Reserve - heart of the Fynbos Plant Kingdom. It has been recognised as a forerunner in environmental engineering and demonstrates the Biosphere philosophy of conserving nature while meeting the needs of development. Because of South Africa's limited water resources, water is stored in a closed system comprising two reservoirs. Water from the upper reservoir is used to generate electricity during peak demands. During off-peak periods, the water is pumped back for use the following day. The scheme is a joint venture between Eskom and the Department of Water Affairs and Forestry. The reversible pump/turbines not only generate electricity for the Eskom National Grid, but also pump much needed water for transfer to Cape Town. In 2003 Palmiet was awarded the Blue Planet Prize for excellent technical, environmental and socioeconomic performance by the International Hydro Power Association (IHA).

There will be an opportunity to view the “Invisible Tower”, a low visibility 400kV structure that was designed for use in an environmentally sensitive area and along a scenic route to provide the minimum visual impact. The design was in response to the environmental concerns of the area and was successfully completed in 2007.

After the technical tour lunch will be provided at Hermanus. Hermanus is a popular site for whale watching along the Cape coast and is famous for its beautiful views of the mountains and the sea. The scenic coastal route will be taken on the return drive to the hotel in the afternoon.

Tour 2: Ankerlig OCGT power station:

The Ankerlig power station is one of the sites where Open Cycle Gas Turbines were installed on the Eskom system. The construction of these OCGTs began during 2006 and the first four units were successfully completed in record time during 2007. They have already been used extensively to help meet the demand for electricity. The 4 X 148 MW (a total of 592 MW) units use diesel as their fuel source, which is trucked in from a supplier in the Cape Town area. Plans are in place to install a pipeline in the future. The units have been developed in such a manner that they can be converted to Combined Cycle Gas Turbines (CCGT) should natural gas be found in any major quantities on the West Coast. Work is under way for the addition of five more 148 MW units to the Ankerlig Power Station site. This will take the plant's capacity to 1 332 MW by the winter of 2009.

The Ankerlig power station is close to the Koeberg nuclear power station and the tour will start at the Koeberg Visitors Centre where there are auditorium facilities for the presentations. The Koeberg power station and Visitors Centre are surrounded by a proclaimed nature reserve where a number of environmental projects are under way. It is a 10 minute drive from Koeberg to Ankerlig for the actual site visit.

After the technical visit the tour will go to a wine farm for lunch where there will be the opportunity to sample some of the local specialities. There are a number of world famous wine farms in the area and the return journey will take one of the many scenic wine routes back to the hotel in the afternoon.

CONFERENCE EXHIBITION

The Exhibition plays an important role in the conference and, as in the past, functions will focus around the Exhibition areas. Some 900 square metres of space has been secured for this purpose. Companies that will be exhibiting at the conference include: Mace Technologies, Doble Engineering, Preformed Line Products, ABB, Areva, Powertech, Siemens, Merz & McLellan, Iso-Tech, Nu-lec, Japan AE Power Systems, National Cables, Martec, Kelman Distributors, Reinhausen, Megger, Eberhardt Martin, Alectrix, Power Planning Associates, Schneider Electric, Trans-Africa Projects & CBI Electric Cables

For more details please contact the Exhibition Organiser noted below.

CONFERENCE SECRETARIAT

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