Agenda

- Substation Configuration Options
- Substation Technology Options
- Defining Mixed Technology Switchgear (MTS)
- Examples of Mixed Technology Switchgear (MTS)
- Substation examples using Mixed Technology Switchgear
- Conclusions
Substation Bay
Switchgear Assemblies

Configurations

- Conventional Single Bus
- Conventional Main & Transfer
- Conventional Double Bus
- Conventional Double bus with by pass
- Conventional Ring, 11/2 or Double Breaker

Reliability → Availability → Price →
Substation Bay
Switchgear Assemblies

Insulation Considerations

AIS
Substation Bay
Switchgear Assemblies

Insulation Considerations

GIS
Substation Bay
Switchgear Assemblies

Insulation Considerations

- AIS
- GIS
- Hybrid IS

Installation and functionality considerations

- Conventional
- Compact
Mixed technology switchgear (MTS) can thus made up one of the following combinations:

- AIS in compact and/or combined design
- GIS in combined design
- Hybrid IS in compact and/or combined design

assembled together and using a common structure in order to minimize the installation time.
Examples of Mixed Technology Switchgear (MTS)

- Disconnecting Circuit Breaker
- Combined AIS
- Withdrawable Circuit Breaker
- Compact AIS
- COMPASS Unit
- Compact AIS
- PASS Unit
- Hybrid IS
Gull 132 kV Substation  MTS transformer bay using a COMPASS unit
Newton Park Substation 66 kV Substation Layout
Newton Park Substation 132 kV Bus Section Bay
Briers 132 kV DBB and 66 kV DBB Substation

132 kV Incomer Bay for Substation DBB layout
132 kV Incomer Bay for Substation DBB layout
Briers 132 kV DBB and 66 kV DBB Substation

132 kV Bus Coupler Bay using ABB Pass M0 Unit
132 kV Bus Coupler Bay using ABB Pass M0 Unit
Briers 132 kV DBB and 66 kV DBB Substation

66 kV Bus Coupler Bay using ABB Pass M00 Unit
66 kV Bus Coupler Bay using ABB Pass M00 Unit
Bloemendal 132 kV Substation Retrofit Project
Bloemendal 132 kV Substation Retrofit Project

MTS Incomer Bay: consisting of CT’s, GIS DS/ES and CB

MTS Transformer: consisting of CT’s and GIS DS/ES

MTS Bus Section Bay: consisting of CT’s and GIS DS/ES on either side of an AIS CB.

Note: Earthing is always done through the circuit breaker
Bloemendal 132 kV Substation Retrofit Project
Installed base of MTS Bays

- **Eskom Athol Substation**
  - 6 x 145 kV Compass - 2006
- **Eskom Mobile Substations**
  - 6 x 145 kV SBB – 2000/2004
- **Brand se Baai Substation**
  - 1 x 145 kV SBB - 2006
- **Worcester Substation**
  - 2 x 72.5 kV SBB - 2007
- **Eskom Rietvlei Substation**
  - 1 x 145 kV SBB - 2004
- **Eskom Moderkuil Substation**
  - 1 x 72.5 kV SBB - 2006
- **Eskom Hermanus Substation**
  - 2 x 72.5 kV SBB – 2005
- **Eskom Briers Substation**
  - 1 x 72.5 kV SBB - 2007
  - 6 x 72.5 kV DBB - 2007
- **Caledon Substation**
  - 1 x 145 kV SBB - 2006
- **Sir Lowry’s Substation**
  - 1 x 145 kV SBB - 2007
  - 4 x 145 kV DBB - 2007
- **Eskom Gull Substation**
  - 3 x 145 kV Compass 2006
- **City Power Orlando Substation**
  - 3 x 100 kV SBB - 2005
  - 4 x 100 kV DBB - 2005
- **Caledon Substation**
  - 1 x 145 kV SBB - 2006
- **NMMM Newton Park Substation**
  - 3 x 145 kV SBB - 2006
- **NMMM Bethalsdorp Substation**
  - 4 x 145 kV SBB - 2006
- **NMMM Coega Substation**
  - 1 x 145 kV SBB – 2007
  - 4 x 145 kV DBB - 2007
- **eThekwini Municipality Quarry Substation**
  - 6 x 145 kV Compass
- **City Power Alexander Substation**
  - 3 x 100 kV SBB - 2005
  - 4 x 100 kV DBB - 2005
- **City Power Siemert Substation**
  - 7 x 100 kV SBB - 2007
- **City Power Hursthill Substation**
  - 3 x 145 kV SBB - 2007
- **Eerste Fabrieke Substation**
  - 4 x 145 kV SBB - 2005
- **Karee Plats Substation**
  - 2 x 100 kV SBB - 2008
- **Hennops Substation**
  - 4 x 100 kV SBB - 2008
- **Middleburg Substation**
  - 1 x 145 kV SBB - 2008
- **Hillside Aluminum**
  - 6 x 170 kV SBB - 2001
- **City Power Orlando Substation**
  - 3 x 100 kV SBB - 2005
  - 4 x 100 kV DBB - 2005
- **City Power Alexander Substation**
  - 3 x 100 kV SBB - 2005
  - 4 x 100 kV DBB - 2005
- **City Power Hursthill Substation**
  - 3 x 145 kV SBB - 2007
- **Hillside Aluminum**
  - 6 x 170 kV SBB - 2001
Conclusions

- Compact Substations using Mixed Technology Switchgear (MTS) is not a new concept.
- MTS shows clear advantages in less space required for the same SLD, extended SLD in the same space, higher flexibility of layout, easier engineering and integration with the secondary systems and reduced maintenance efforts and costs.
- There are different applications for AIS, GIS and MTS.
- Cigre Working Group B3–20 is compiling a brochure evaluating the different technologies giving users guidelines in their application.
- IEC 62271–205 on compact switchgear assemblies has been developed to cater for the new arrangement possibilities that have been developed by manufacturers and to ensure that the complete switchgear assemblies are covered by a single standard.
Power and productivity for a better world™