Southern African Power Pool

SAPP AND ISSUES OF STANDARDISATION

By Eng. Sydney Zimba
Sandton, RSA
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A. About SAPP
1. SAPP KEY FACTS

- **12 SADC Member Countries**
- **280 Million people**
- **Average Electricity demand growth rate 3.2% p.a.**
- **Consumption 321 TWh**
- **Installed Capacity 59539 MW**
- **Available Capacity 52589 MW**
- **Peak Demand 46748 MW**
## 2. SAPP DEMAND SUPPLY SITUATION

<table>
<thead>
<tr>
<th>No. Country</th>
<th>Utility</th>
<th>Installed capacity (MW)</th>
<th>Operating Capacity (MW)</th>
<th>Current Peak Demand (MW)</th>
<th>Peak Demand Plus Reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>RNT</td>
<td>3,129</td>
<td>2,500</td>
<td>1,869</td>
<td>2,130</td>
</tr>
<tr>
<td>Botswana</td>
<td>BPC</td>
<td>927</td>
<td>459</td>
<td>610</td>
<td>698</td>
</tr>
<tr>
<td>DRC</td>
<td>SNEL</td>
<td>2,442</td>
<td>1,066</td>
<td>1,317</td>
<td>1,507</td>
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<tr>
<td>Lesotho</td>
<td>LEC</td>
<td>74</td>
<td>70</td>
<td>150</td>
<td>172</td>
</tr>
<tr>
<td>Malawi</td>
<td>ESCOM</td>
<td>352</td>
<td>351</td>
<td>326</td>
<td>373</td>
</tr>
<tr>
<td>Mozambique</td>
<td>EDM/HCB/ MOTRACO</td>
<td>2,724</td>
<td>2,279</td>
<td>1,780</td>
<td>2,036</td>
</tr>
<tr>
<td>Namibia</td>
<td>Nampower</td>
<td>501</td>
<td>354</td>
<td>629</td>
<td>720</td>
</tr>
<tr>
<td>South Africa</td>
<td>Eskom</td>
<td>43,703</td>
<td>42,710</td>
<td>34,913</td>
<td>36,913</td>
</tr>
<tr>
<td>Swaziland</td>
<td>SEC</td>
<td>70</td>
<td>55</td>
<td>227</td>
<td>260</td>
</tr>
<tr>
<td>Tanzania</td>
<td>TANESCO</td>
<td>1,366</td>
<td>823</td>
<td>1,051</td>
<td>1,202</td>
</tr>
<tr>
<td>Zambia</td>
<td>ZESCO/CEC/ LHPC</td>
<td>2,206</td>
<td>2,175</td>
<td>2,287</td>
<td>2,616</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>ZESA</td>
<td>2,045</td>
<td>1,555</td>
<td>1,589</td>
<td>1,818</td>
</tr>
<tr>
<td><strong>TOTAL ALL</strong></td>
<td></td>
<td>59,539</td>
<td>54,397</td>
<td>46,748</td>
<td>53,478</td>
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<tr>
<td><strong>TOTAL Operating Members Only</strong></td>
<td></td>
<td>54,692</td>
<td>50,723</td>
<td>43,502</td>
<td>49,773</td>
</tr>
</tbody>
</table>
3. ELECTRICITY ACCESS

Electricity Access in SADC, %

- Angola
- Botswana
- DRC
- Lesotho
- Malawi
- Mozambique
- Namibia
- South Africa
- Swaziland
- Tanzania
- Zambia
- Zimbabwe

Electrification Access, %
SADC Average Electricity Access, %

36% SADC Region Average
Figure 6: Figures depict 20015 ‘N-1-contingency-criterion’ power transfer capability limits in MW.

NOTE:
There are radial distribution feeders among both operating and non-operating members. These are NOT regarded as SAPP interconnectors.
5. SAPP COMPETITIVE MARKET

Summary of Revenues on the Market for Period
April 2016 to January 2017
Total USD68,988,935

- 2,580,381 MWh was matched only 865,545 MWh (34%) traded due to transmission constraints

- Market share in MWh
  - FPM-M 8%, DAM 74%, FPM-W 11%, IDM 7%

- Average prices:
  - Off-peak: 3-6 USc/kWh
  - Standard: 4-10 USc/kWh
  - Peak: 10-14 USc/kWh
6. SAPP TRANSMISSION PROJECTS

- **2021**: ZIZABONA - 330 kV
- **2020**: Mozambique – Malawi 400 kV
- **2019**: Zambia-Tanzania-Kenya 400 kV
- **2018**: Morupule – Maun 400 kV (Botswana)
- **2022**: MOZISA 400 kV
- **2022**: Botswana-RSA 400 kV
- **2020**: Namibia – Angola 400 kV
- **2020**: Orapa – Pandamatenga 400 kV (Botswana)
- **2024**: Mozambique STE – HVDC/AC
- **2024**: Grand Inga Transmission – HVDC/AC
B. SAPP and Standardisation
1. TECH COMMITTEES OF INTEREST

- TC8: System Aspects of Electricity Supply
- TC 57: Power System Data Management

- Working Groups of Interest:
  - TC8 WG2 – HV Transmission Systems (Designs, PMUs)
  - TC8 WG6 – Smartgrid Requirements
  - TC8 PT 62749 - Power quality aspects
  - TC8 PT 62786 - Distributed Energy Resources
## 2. IEC Standards of interest

<table>
<thead>
<tr>
<th>No.</th>
<th>IEC Standard</th>
<th>Subject</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>IEC TR 62511:2014</td>
<td>Guidelines for the design of interconnected power systems</td>
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<tr>
<td>2</td>
<td>IEC/ IEEE PAS 63547:2011</td>
<td>Interconnecting distributed resources with electric power systems</td>
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<tr>
<td>3</td>
<td>IEC 60038:2009</td>
<td>IEC standard voltages</td>
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<tr>
<td>4</td>
<td>IEC TS 62749</td>
<td>Assessment of power quality - Characteristics of electricity supplied by public networks</td>
</tr>
<tr>
<td>5</td>
<td>IEC TR 62510:2014</td>
<td>Standardising the characteristics of electricity</td>
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<tr>
<td>6</td>
<td>IEC 60059:1999</td>
<td>IEC standard current ratings</td>
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</tbody>
</table>
3. Power Quality in SAPP

- SAPP QOS Standard
- QOS meters on tie lines
- Utility Central QOS Database

- PQ Monitoring and Reporting
- PQ Correction and mitigation
- SAPP QOS Database
4. About Grid Codes

- Almost all SAPP member countries have own grid codes
  - Jurisdiction of Regulators
  - Interconnection requires harmonisation of some codes, as was done in EAPP
- SAPP Operating Guidelines
  - Inferior to grid codes, revised in 2014
  - Has penalties for non-compliance
  - Includes requirements for connection of IPPs
5. CONNECTION OF IPPs

- System Studies
- Connection agreement
- Connection facilities
- Voltage support

- Frequency support
- Telemetry
- Regular forecasts to NCC
- SAPP rules
6. EXAMPLES OF DESIGN DIVERSITY

<table>
<thead>
<tr>
<th>Country</th>
<th>PLUG, SOCKET</th>
</tr>
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<tbody>
<tr>
<td>1. Botswana</td>
<td></td>
</tr>
<tr>
<td>2. Lesotho</td>
<td></td>
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<tr>
<td>3. Namibia</td>
<td></td>
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<tr>
<td>4. South Africa</td>
<td></td>
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<tr>
<td>5. Swaziland</td>
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<tr>
<td>1. Malawi</td>
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<tr>
<td>2. Seychelles</td>
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<td>3. Tanzania</td>
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<td>4. Zambia</td>
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<td>5. Zimbabwe</td>
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<td>1. Angola</td>
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<td>2. DRC</td>
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<tr>
<td>3. Madagascar</td>
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<tr>
<td>4. Mauritius</td>
<td></td>
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<tr>
<td>5. Mozambique</td>
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</tr>
</tbody>
</table>
7. Standardisation, harmonisation

- Equipment specification and procurement
  - Competitive bids, impact on tariffs
- Equipment performance
  - Failure affects energy interchange
  - Standardisation, speedy replacement
- High voltage switching
  - Equipment identification
- Quest for single African pool
  - SAPP connecting to EAPP in 2019
8. SAPP System Viewer
End of Presentation
Thank You