CSIR Energy Autonomous Campus Programme

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CSIR PRETORIA CAMPUS OVERVIEW

- 150 ha
- 52 Buildings
- 30 GWh/yr electricity consumption
- 3 MW Base Load
- 6-7 MW Peak Load
PROGRAMME OVERVIEW

• Recognizing the importance of long-term strategic vision with respect to campus energy
• South Africa's endowment with world-class solar and wind resources combined
• Strong cost decreases for solar and wind technologies
• Demonstrate how a primarily renewables-based energy system can be designed and operated
• Integrating energy generating and consuming systems
KEY REQUIREMENTS

• Distributed Generation
  ✓ Multiple generation sources (Eskom, solar, wind, biogas)
  ✓ Energy Efficiency
  ✓ Energy Storage (batteries, hydrogen)

• Reliability
  ✓ Provide a robust infrastructure

• System Intelligence
  ✓ Monitoring and control
  ✓ Integrated energy supply and demand control
  ✓ Demand Response
Potential CSIR’s energy supply mix

**Solar PV**: rooftops, ground-mounted plants
Total of 8 MWp → 13 GWh/yr

**Wind**: 3-4 MW-class wind turbines
Total of 3 MW → 7 GWh/yr

**Biogas**: Municipal solid waste and/or organic waste from surrounding supermarkets & restaurants
4-5 MW @ 800-1,000 hrs/yr → 4 GWh/yr
CSIR’s energy saving potential

Current consumption: 30 GWh/yr

20% reduction through energy efficiency to 24 GWh/yr)

Load management:
Flatten residual load, peak shaving, incl. EVs

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Potential energy storage technologies

Hydrogen: For long-term storage of excess electricity

Batteries: For short-term peak shaving

Heat storage: For flattening of heat/cold demand

Allow to extend generation capabilities
Integrated intelligent energy system

- Establishment of a control and visualization centre
- Deployment of Advanced Metering Infrastructure (AMI)
  - Enable the integration of the various technologies (EVs, Storage, etc)
  - Enable two-way communication for demand response, system monitoring
Vision: Real-world research platform for a future integrated energy system

[Diagram of energy system involving solar panels, wind turbines, electrolyser, hydrogen storage, biogas, mixing valve, gas engines, and a load chart for CSIR's campus over a week.]
# Highlights: Operational solar PV plants

<table>
<thead>
<tr>
<th>Project</th>
<th>Size</th>
<th>Commissio ned</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solar PV plant (1-axis)</td>
<td>558 kW</td>
<td>August 2015</td>
<td>R10.75 m</td>
</tr>
<tr>
<td>2. Solar PV plant (2-axes)</td>
<td>200 kW</td>
<td>November 2016</td>
<td>R7.0 m</td>
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<tr>
<td>3. Solar PV plant (rooftop)</td>
<td>250 kW</td>
<td>March 2017</td>
<td>R4.5 m</td>
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![Solar PV plants image](image-url)

![CSA electricity demand graph](image-url)
Thank you!

Ha Khensa

Siyathokoza

Re a leboha

Enkosi

Ro livhuha

Siyabonga

Re a leboga

Dankie

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