South Africa Industrial Energy Efficiency Project

IEA Energy Efficiency Training for Sub-Saharan Africa
Pretoria - 14 October 2019

Alf Hartzenburg - NCPC-SA
Presentation Content

- Project Context and Framework
- Project Results and Outcomes
- South Africa Energy Efficiency Policy Cover
- Lessons Learnt
- Key Next Steps
Project Context and Framework
Strengthen energy planning, including emissions reduction target setting, through improved data and energy reporting.

Support strengthened policy and regulatory frameworks, and promote the uptake of standards for energy efficiency.

Expand the capacity of the South African industrial sector to implement EnMS and ESO through skills development.

Promote increased investment in EnMS and ESO through the demonstration of energy savings in industrial plants.

Raise awareness of the benefits and opportunities through EnMS and ESO.

Funding, oversight, monitoring and evaluation, reporting.
The NCPC-SA services are highly subsidised, and are aimed at stimulating and supporting the uptake of RECP by industry:

- **ESO Assessments & EnMS Implementation**
  - Demonstration Plants

- **Skills Development**
  - ESO / EnMS Training

- **Technical & Financial Support**
  - Online tools, sector guides, financial matchmaking

- **Advocacy**
  - Workshops, case studies & policy advice
30 Countries

Armenia
Belarus
Burkina Faso
Chad
Chile
China
Colombia
Ecuador
Egypt
Georgia
Kazakhstan
India
Indonesia
Iran
Macedonia
Malaysia
Maldives
Mexico
Moldova
Myanmar
Pakistan
Philippines
Russia
South Africa
Thailand
Tunisia
Turkey
UAE
Ukraine
Viet Nam

Ongoing projects

Planned activities
Primary Driver: Electricity Tariffs

Eskom average tariff vs. inflation (CPI)

- 2007 - 2015 (excluding additional increase requested)
  - 300.7% Eskom tariff
  - 45.1% Inflation

- Additional 2015 - 2017 increases requested
- 2008 electricity crisis

Price index (2016 = 1.0)
GDP chain-type price index

Year:
- 1987
- 1992
- 1997
- 2002
- 2007
- 2012
- 2017

Normalized index (1988 = 100)

**Component 1**
Support and Guidance in Policy Development

**Component 2**
Promotion of Energy Management Standards

**Component 3**
Capacity Building

**Component 4**
Demonstration Plants and Awareness Raising
Capacity Building Modality

Elements, Participants and Modalities

- **EnMS Awareness Seminar** (½ day)
- **EnMS USER Training** (2 day)
- **EnMS EXPERT Training** (10 day)
- **Equipment Vendor Workshops** (1 day)

**Participants**
- National Experts
- National Trainees

**Modalities**
- Candidate Plant
- Host Plant
- Candidate Plant
Resources and Tools

Training Manual
2-Day User Industrial Steam System Optimization (SSO) Training

Training Manual
Industrial Steam System Optimization (SSO) Experts Training

February 2012

Steam System Assessment Tool
1 Header Model

Data Entry Form for Current System

Steam System Assessment Tool
1 Header Model for Methane/Gas Boiler

Quick Start

Resources and Tools

www.ncpc.co.za
The Energy Management Source Code

1. **Commit** to change
2. **kWh** (CO\(_2\) + Rands)
3. **Plan** the changes
4. **Check** the results
5. **Make** the changes
A Systems Approach

At each interface, there are inefficiencies. The goal should be to maximize the overall cost effectiveness of the pumping, or how much flow is delivered per unit of input energy.
Energy Performance Measurement
Project Results and Outcomes
EnMS Implementation Case Study

Johnson Matthey South Africa

- Automotive OEM
- Implementation EnMS in 2012
  - Target ISO 50001 certification

Johnson Matthey 2012-2013

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Annual Electricity Savings</td>
<td>9.4 GWh</td>
</tr>
<tr>
<td>Annual Monetary Savings</td>
<td></td>
</tr>
<tr>
<td>- Cost savings from projects</td>
<td>R 7.7 M</td>
</tr>
<tr>
<td>- Cost savings from behavior changes &amp; operational efficiencies</td>
<td>R 5.5 M</td>
</tr>
<tr>
<td>&amp; operational efficiencies</td>
<td>R 3.2 M</td>
</tr>
<tr>
<td>Total Investment</td>
<td>R 620 000</td>
</tr>
<tr>
<td>Payback Period (years)</td>
<td>0.8</td>
</tr>
<tr>
<td>ISO 50001 Certified</td>
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<tr>
<td>2014 - 2016 Savings</td>
<td>16.3 GWh</td>
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- Completed implementation in 9 months
- 4 large projects implemented
  - Compressors optimisation; optimising chillers; production related projects

Success Factors

- Full support and resources from top management
- Strong Energy Manager leadership
- Weekly meetings of Energy Team
- Adjusting existing structures to energy specifics (policies, procedures & reporting)
Solomon Coatings:
The company implemented the IEE Project SME energy assessment findings which turned the company back to profitability. The company saved around R 6,500 per month over a period 10 months in electricity costs with a resultant increase in production output of 40%.

Sockit Manufacturing:
The IEE Project identified four energy system optimisation opportunities and a fuel switch, all of which the Company implemented. The Company installed a paraffin boiler which allowed it to increased its machine pool by 30%.

Willard Batteries:
By implementing an EnMs, supported by the IEE Project, the Plant has saved over R 3 million between 2012 and 2013. As a result of the energy savings the Plant has been expanded with 20% in production capacity.

ArcelorMittal Saldanha:
The IEE Project has directly assisted Mittal Saldanha to improve its energy efficiency and reduce production costs. It has facilitated the company saving approximately R 89 million in 2011 in energy costs, helping them to remain in business.

SA IEE Project Outcomes

<table>
<thead>
<tr>
<th>SA IEE Project</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
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</table>

<table>
<thead>
<tr>
<th>SA IEE Project</th>
<th>Outcomes</th>
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</thead>
<tbody>
<tr>
<td>416</td>
<td>66</td>
</tr>
<tr>
<td>482</td>
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</table>

<table>
<thead>
<tr>
<th>SA IEE Project</th>
<th>Outcomes</th>
</tr>
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<tbody>
<tr>
<td>1 237</td>
<td>Direct Jobs retained</td>
</tr>
<tr>
<td>0</td>
<td>Direct Jobs created</td>
</tr>
<tr>
<td>1 237</td>
<td>Total Direct Jobs</td>
</tr>
</tbody>
</table>

*Outcomes largely attributed to the IEE Project’s interventions, but acknowledging that other variables would have influenced the outcomes to varying degrees across the study sites.

Total Direct Jobs retained = 1 654
Total Direct Jobs created = 90
Overall Direct Jobs = 1 744
Behaviour change can offer unique and hard to replicate competitive advantages and is necessary in a world of ubiquitous technology which can no longer be relied on to maintain a cutting edge.”

Industrial Energy Project Manager
Is it easy to improve?

- No thanks!
- We are too busy
### Actual Project Savings (Apr 2010 - Mar 2019)

<table>
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<tr>
<th>Energy</th>
<th>CO(_2)e Emissions</th>
<th>Rand Value</th>
</tr>
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<tbody>
<tr>
<td>5.7 terrawatt hour</td>
<td>5.6 Million tonnes</td>
<td>R4.6 Billion</td>
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Equivalent to the electricity required to power 790,000 middle income South African homes for 12 months

i.e. 18% of all middle income South African households!
Continental Footprint

SADC Region (2017/18)
Proposal to domesticate IEE Technologies.

Ghana (2017/18)
Steel sector demonstration plant and EnMS / EnPMI training.

Uganda (2017/18)
Green Chemistry Project Initiative – Cooperation with Uganda NCPC and over arching measures for establishing the national/regional initiative.

Mauritius (2016/17)
IEEP technical evaluation of thermal power plants and EnMS & SSO training.

Namibia (2015/17)
NCPC-SA IEEP support for Namibian NCPC

Mozambique (2015/16)
IEEP EnMS training and conducted ESO assessments.
South Africa Energy Efficiency Policy Cover
SA Policy and Regulatory Landscape

- National Energy Act No. 34 of 2008
- Biofuels Industrial Strategy - 2007
- Electricity Basic Services Support Tariff Policy - 2003
- Integrated Resource Plan for Electricity 2010-2030 (IRP2)
- National Climate Change Response Strategy (NCCRS)
- Income Tax Act Amendments (12i/k/l…) – Tax incentives for EE savings
- SANS 941 – MEPS for Electrical and Electronic Appliances and EE Labelling
- National Environmental Management: Air Quality Notice 275 of 2017
- Carbon Tax Act No. 15 of 2019
- Energy Efficient Leadership Network (EELN)
Policy coverage of different sectors in South Africa

Source: IEA
Policy Coverage

• If successfully implemented, the policies outlined in South Africa’s National Energy Efficiency Strategy would increase policy coverage in South Africa, which is currently the lowest among the 7 major emerging economies.

• Only 3% of South Africa’s total energy use was covered by mandatory energy efficiency policies in 2017, with potential coverage only at 13%.

• At 7%, coverage was highest in the non-residential buildings due to presence of building standards, which are planned for successive tightening.

• MEPS for consumer appliances including refrigerators and air conditioning units contribute to policy coverage in the residential sector, which is currently around 5%.

• However, potential coverage around 24% indicates that this will grow in future as existing energy using appliances are replaced by new stock.
### Post-2015 NEES of South Africa

<table>
<thead>
<tr>
<th>Sector</th>
<th>Target</th>
<th>Planned policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry and mining</td>
<td>15%</td>
<td>• Increase adoption of energy management systems to those not reached by the IEEE program and not covered by regulation.</td>
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<tr>
<td></td>
<td></td>
<td>• Introduction of MEPS for industrial electric motors as a package that includes tighter regulation of motor rewinding and differential import duties to reduce price difference between standard and premium efficiency motors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Minimum design standards for industrial boilers (addition of economiser, combustion controls, variable speed drive on the blower)</td>
</tr>
<tr>
<td>Commercial and public</td>
<td>37%</td>
<td>• Successive tightening of building standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mandatory display of energy performance certificates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Green leases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Municipal energy efficiency strategies</td>
</tr>
<tr>
<td>Residential</td>
<td>33%</td>
<td>• Successive tightening of MEPs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Endorsement labelling</td>
</tr>
<tr>
<td>Agriculture</td>
<td>30%</td>
<td>• Awareness raising campaigns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Grants to support energy efficiency improvement expenditures</td>
</tr>
<tr>
<td>Transport</td>
<td>39%</td>
<td>• Vehicle efficiency standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Corrective tax schemes to favour more efficient vehicles by taxation of low efficiency vehicles, as well as incentive schemes to trade in old inefficient vehicles for efficient and modern ones.</td>
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<tr>
<td></td>
<td></td>
<td>• Eco-driving as part of the curriculum of driving schools</td>
</tr>
<tr>
<td>Economy-wide</td>
<td>29%</td>
<td></td>
</tr>
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Post-2015 National Energy Efficiency Standards (NEES) of South Africa outline planned strategies for various sectors to achieve energy efficiency targets.
Policy Support, Advice and Commentary

- Funded the second review of the 2005 NEES
- Provided input to the energy consumption data reporting white paper
- Submitted commentary on the Post 2015 NEES draft
- Submitted commentary on the Integrated Resource Plan (IRP)
- Presented suggestions on qualifying criteria for dti manufacturing incentives eg. Black Industrialist Scheme
- Training to SANAS and lead auditor groups on ISO 50001
- ...

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Energy Efficiency Frameworks in African Countries

- **Ethiopia**: Climate-Resilient Green Economy Strategy.
- **Mozambique**: Roadmap for a Green Economy in Mozambique.
- **Tunisia**: Energy Efficiency Policy and AMME EE finance
Key EnMS Lessons…

• Savings can be achieved through purely **behaviour change** and **operational controls**
• It is a critical factor to have an **EnMS in place** to support systematic implementation
• **Integrate ISO/SANS 50001 requirements** into the existing certificated ISO 9001/14001 Management Systems
• Great benefit will be derived from meaningful **energy consumption baselines** and appropriate **energy performance indicators**.
Industrial Energy Efficiency needs….

- Better management & low cost initiatives
- Resource savings: -57%
- Capital investment: -43%

Average efficiency

Best performance
“...energy efficiency initiatives that are not monitored and maintained typically have a six-month half-life of their benefits. That is, they lose half of their economic benefits every six months if left largely untouched.”

Emerson’s James Beall, a principal process control consultant who helps manufacturers optimize their processes
Energy Productivity...the new benefits language

- The total value created by the energy deployed
- Customers do not buy ‘energy efficiency’. They buy what they value.
- Encourages a focus on supply chains.
- Delivers immense commercial and environmental benefits.
Non Energy Benefits

Any real or perceived financial or intangible benefit received from an energy efficiency activity.
An IEA analysis has shown that if energy efficiency investments were scaled up in South Africa, it would have the potential to reduce the country’s need for additional electricity generation capacity by 18% in 2030.
Key Next Steps
Key Next Steps

- Identify policy gaps not covered by the NEES.
- Industry is where actions should be targeted in South Africa.
- The implementation of MEPS for electric motors is an important first step, which will increase policy coverage.
- Measures that mandate the implementation of energy management systems should be considered.
- Policy and standards encouraging improved cyber hygiene and coordination with other governments and industry in designing digital resilient technologies.
- In implementing the proposed policy measures, South Africa will be able to benefit from the experiences in the other major emerging economies.
THANK YOU

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