South Africa – a new innovator and manufacturer of wind turbines?

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INTRODUCTION

The GEF-funded South Africa Wind Energy Programme (SAWEP) was designed to reduce greenhouse gas emissions generated from thermal power in the national inter-connected system. The objective of SAWEP is the removal of barriers towards wind energy development in South Africa. These barriers include regulatory, institutional, financial, and information, knowledge and capacity barriers.

SAWEP also aims to achieve key strategic outputs that will guide South Africa on wind energy development. One of these outputs is the Wind Atlas for South Africa (WASA), which will play a significant role in providing information for potential investors in the wind energy sector. Another output is the development of a Wind Energy Industrial Strategy for South Africa. The Wind Energy Industrial Strategy project aims to play a strategic role in paving the way for the gradual phasing in of wind energy in South Africa.

This poster presents an overview of the Wind Energy Industrial Strategy that was developed by the CSIR and DTU Wind Energy of Denmark (formerly Risø-DTU).

OBJECTIVE

The South African Department of Trade and Industry (the dti) has a methodology for developing Customised Sector Programmes (CSPs) to guide well-formulated strategies, which are developed to support the Industrial Policy and Action Plan (MP) of the dti.

IPAP is a formal policy in support of the up-scaling of efforts to promote long-term diversification beyond South Africa’s current reliance on traditional commodities and non-tradable services.

The objective of the Wind Energy Industrial Strategy is to research the establishment of a local wind turbine and component manufacturing and services industry in support of IPAP.

This report has been structured to have three parts:

Part 1: Global wind energy market and industry

Part 2: South African wind energy market and industry

Part 3: Strategic analysis (emphasis of this poster).

CONCLUSIONS

The wind energy industrial strategy recommended the following:

• The South African government continues developing and implementing policies that support a sizeable and stable market for wind power, in conjunction with policies that specifically provide support mechanisms for wind turbines and components to be manufactured locally so as to result in a competitive wind industry.

• Current public funding programmes for innovation in South Africa should be intensified and better publicised.

• A dedicated model should be developed so that the potential job opportunities for a South African industry can be more accurately quantified.

• An expert output of such an analysis would be to establish what the job opportunities are for the range of skills that will be required.

• Knowing the type of skills required will enable the education and training facilities to develop relevant curricula.

• To develop a globally competitive wind industry, a coherent national certification and testing facility should be established.

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A preliminary external macro-environment (big picture) analysis was done on the South African wind energy research, development and demonstration community.

Analysing the data and information gathered, it is recommended that a South African Wind Energy Technology Platform be established in support of a wind energy industrial strategy. The applied technology, or themes, that could form the basis of this platform are:

• Lifecycle evaluation and prediction

• Component design and manufacturing

• Wind farm design optimisation

• Condition monitoring and fault prediction

• Policy development and decision support

STRATEGIC ANALYSIS

South Africa has an active, small turbine industry that not only supplies wind turbines to the local market, but is achieving success through exports.

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South African innovation and ingenuity has resulted in a totally indigenous 300 kW wind turbine that has been designed and manufactured to withstand the rigours of the African continent.

Preliminary South African Wind Energy Technology Platform

**Needs**

- Innovative wind turbine system designs
- Local manufacture of components
- Job creation
- Energy security

**Key solutions**

- Wind resource assessment and maps
- Advanced designs for next-generation wind turbines
- Advanced materials selection and development
- Advanced and cost-effective manufacturing technologies

- High quality manufactured components
- Certification and testing procedures
- Advanced techniques for wind turbine/grid integration
- Human capacity development

**Platform**

South African Wind Energy Technology Platform

**Applied technology**

- Lifecycle evaluation and prediction
- Wind farm design optimisation
- Condition monitoring and fault prediction
- Data and information evaluation techniques

**Base technology**

- Constitutive equations
- Numerical failure identification methods
- Database of new materials
- New design standards
- Numerical failure identification methods
- Power electronics
- Manufacturing processes
- Quality assurance
- Increased accuracy of wind resource database
- Wind turbine evaluation system
- Extreme wind condition evaluation techniques
- Complex terrain and offshore evaluation techniques
- Monitoring and evaluation
- Supervisory Control and Data Acquisition (SCADA) systems
- Grid technologies
- Extreme wind condition evaluation techniques
- Computer-aided design
- Geographic information systems
- Science and engineering know-how
- Supply chain linkages
- Indigenous knowledge

**Infrastructure**

- Wind measurement equipment
- Computational fluid dynamics
- Extreme wind condition evaluation techniques
- Remote data collection
- Data store back-up
- Generator test facilities
- Blade test facilities
- Dune top test facilities
- Natural resource databases
- Geographic information systems
- Science and engineering know-how
- Supply chain linkages
- Indigenous knowledge

**Preliminary Technology Tree**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Assumptions</th>
<th>% value</th>
<th>Local spend/ MW</th>
<th>Dates achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Small</td>
<td>Grid connection, civil works, other capital works, offshore costs</td>
<td>29</td>
<td>84.64 million</td>
<td>2015</td>
</tr>
<tr>
<td>2. Medium</td>
<td>Grid connection, civil works, other capital works, offshore costs</td>
<td>47</td>
<td>87.52 million</td>
<td>2015</td>
</tr>
<tr>
<td>3. Medium</td>
<td>Grid connection, civil works, other capital works, offshore costs</td>
<td>66</td>
<td>10.16 million</td>
<td>2020</td>
</tr>
<tr>
<td>4. High</td>
<td>Grid connection, civil works, other capital works, offshore costs</td>
<td>87</td>
<td>13.9 million</td>
<td>2020</td>
</tr>
</tbody>
</table>

**Scenarios for the localisation of wind-energy project spend**

**Wind to watt**

(Picture courtesy of Adventure Power Pty (Ltd))