Ocean Energy Network of South Africa

OCEAN ENERGY WORKING GROUP

RESEARCH PROGRAMME

June 2008

Vision Statement of the Ocean Energy Network of South Africa

To promote the development of ocean energy power so that it contributes to the share of renewable energy in the national electricity generation mix contributing at least 100 GWh by 2015. The aim is to achieve this by:

- Demonstrating through awareness programmes that ocean energy is viable and can contribute significantly to meeting energy demand as a renewable energy source in South Africa;
- Lobbying Government, NERSA, Eskom and other role-players to facilitate an enabling regulatory environment;
- Developing a base and network of expertise to advise the public and private sector on various aspects of ocean energy;
- Establishing a common, public repository of all ocean energy data of South Africa; and
- To raise funds for flagship projects such as demonstration projects and a Wave Energy Test Centre.

Problem Statement

The technology needed to harvest ocean energy currently is still under development with only a few commercial installations worldwide. There are still many barriers to overcome, such as, high costs, limited field experience, limited technical development facilities and limited investment. A well structured research programme is required to address the different areas of concern in order to facilitate the introduction of ocean energy power plants in South Africa.

Ocean Energy Network of South Africa

At the same time there is a severe skills shortage in South Africa, especially in the engineering and technology sectors. There is presently not any established research group in South Africa dedicated to investigate the challenges facing ocean energy harvesting at this time. The expertise that does exist is spread over a number of organisations, the CSIR, Stellenbosch University, Marine and Coastal Management of the DEAT, and private consultancies. Any research activity should therefore also include a component to develop suitable human skills for the sector.

Research Strategy

In order to ensure that the limited resources available are optimally used it will be required to ensure that the network that is currently being developed plays an important role to disseminate information and coordinate research activities. At the same time the limited resources, funding and people, should be applied in a coordinated way so that we can ensure the maximum impact.

It is therefore proposed that:

1. An Ocean Energy Research Advisory Committee (OERAC) is formed with representation from SANERI, Eskom, universities and science councils, Government, and the private sector to advise on research priorities.
2. The available resource information, funding opportunities, skills and facilities be collated and documented for easy accessibility.
3. A number of flagship projects be developed, promoted and funded to increase the skills and knowledge generation in the field.

Specific Projects

1. Wave Energy Test Site

A wave energy test facility is being considered for South Africa. The main aim is to assist the development of wave energy converters suited for application in South Africa.

The high costs of site preparations, onshore infrastructure and licensing are a major draw back in the current development of these wave farms. SANERI and Eskom will together investigate the costs of such a test facility. This will include costs in performing the EIA study, the siting study, the infrastructure that will be needed and the necessary licenses. The position for the test facility will determined by the site selection study Eskom is currently undertaking. The study will indicate which part of the coastline can be practically considered for wave energy converters to be installed and where. The study aims to map all criteria that cannot be changed when considering a site for a wave power farm viz . marine protected areas, shipping and merchant vessel routes, sensitive coastline, river mouths, off-shore gas lines and communication cables, etc.

The test facility will allow both international and local developers to test their wave energy converters in South African waters. Possible testing standards could be developed by the South African Bureau of Standards and the wave energy converters could get certification once tested at the facility.

2. Wave Energy Converter Assessment

There are a number of wave energy converters (WECs) available world-wide that can be used to convert wave energy to either electricity or for pumping water. In this project work done to date by Eskom and Stellenbosch University will be reviewed and updated. A methodology to conduct a proper techno-economic assessment on WECs in the South African context will be developed. This will include matching the characteristics of the WEC with that of the wave energy resource in specific areas along the South African coast.

3. International Wave Energy Converters

There are probably hundreds of wave energy converters being developed world-wide. One of the technologies is currently being funded by SANERI as part of a study with Investec and PelamisWave to do a wave energy resource assessment along the south

coast of South Africa. As public money is being used for this study the results will be in the public domain.

4. Characterising the Agulhas Ocean Current

Eskom is currently measuring and mapping the resource of the Agulhas Ocean current. In addition to the resource assessment Eskom has embarked on a study to determine the sustainability of the currents. Global and regional models are being development to help us understand the driving force behind the currents. Various theories suggest winds, coriolis effects, the thermo cline, gravity etc. is responsible for the currents and this study will attempt to answer the question of where the current originates and how sustainable it is as an energy resource. In line with this, a study will be conducted to determine the current strength down-stream of a possible ocean current farm, the possible diversion and weakening of the current, or diversion into deeper waters will also be addressed through measurements and modelling.

These studies will be completed in 2010.

5. Local developers

A database of local developers will be created and kept up to date. Once the concepts have been assessed by both local and international experts, the ocean devices will/could be included in a local research program. Funding and experts will be made available to fast track the development of such devices to full scale units if they are found to be technically and economically feasible.

5.1 Stellenbosch Wave Energy Converter

The SWEC or Stellenbosch Wave Energy Converter is a device that was developed in concept and patented by Stellenbosch University in the eighties. Stellenbosch University has an established record of research in ocean energy since, as a result of the world oil crisis in the early 1970's and the ensuing global quest for viable alternative

energy sources, the privately funded Ocean Energy Research Group (OERG) was established in the Department of Civil Engineering, with the sole aim to study the harvesting of ocean energy in South Africa. The Stellenbosch Wave Energy Converter (SWEC) was developed and patented as a technically feasible and economically viable converter of wave energy, optimally developed and designed for the conditions along South Africa's southwest coast.

In the early nineties, after the price of energy significantly decreased, a feasibility study indicated that the project was no longer economically viable and the project was shelved and the Ocean Energy Research Group dispersed. With the recent renewed interest in renewable energy, driven by Climate Change and Energy Security concerns, a group consisting of Stellenbosch University, Prestedge Retief Dresner Wijnberg (Pty) Ltd and the Oelsner Group (Pty) Ltd decided to revisit this device and explore the possibility to implement this indigenous design as a cost effective way to harvest wave energy. In this project a pre-feasibility study to conduct a technical and economical pre-feasibility study on the SWEC, in particular those components which have not been researched extensively to date, is the first step in the design and implementation of a full-scale demonstration unit.

Funding for this project has been applied for at the Eskom/WWF Renewable Energy Research Fund.

Conclusion

The success of the proposed strategy will be determined by the effort that the various partners in the OEN will put into leveraging funding for the work and then the quality of the work that will be done.

10 June 2008