Status of Ocean Energy in South Africa

Offshore Oil and Gas Environmental Research Collaboration Project
Kick Start Meeting

CENTRE FOR RENEWABLE AND SUSTAINABLE ENERGY STUDIES

Imke Meyer
Prof JL (Wikus) van Niekerk
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Kirstenbosch, Cape Town

UNIVERSITEIT STELLENBOSCH UNIVERSITY

science & technology
Department:
Science and Technology
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RENEWABLE & SUSTAINABLE ENERGY STUDIES

UNIVERSITEIT STELLENBOSCH UNIVERSITY

The Centre for Renewable and Sustainable Energy Studies was established in 2007 to facilitate and stimulate activities in renewable energy study and research at Stellenbosch University.

The Department of Science and Technology has been funding the Renewable and Sustainable Energy (RSE) Hub at Stellenbosch University since its establishment in August 2006. The aims of the RSE Hub are to develop human capital, deepen knowledge, and stimulate innovation and enterprise in the field of RSE. Currently the DST is still sponsoring the work of the Centre with an annual grant administrated by the National Research Foundation.

Stellenbosch University was designated as the Specialisation Centre in Renewable Energy Technology as part of the Eskom Power Plant Engineering Institute (EPPEI). The research and teaching activities sponsored by Eskom focus on concentrating solar power (CSP) and wind energy and also includes the Eskom Chair in Concentrating Solar Power.

The Sasol Technology group sponsored the new facilities for the Centre for Renewable and Sustainable Energy Studies as well as the work and facilities of the Solar Thermal Energy Research Group at Stellenbosch University.

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- Activities:
  - Ocean Energy Resources
    - **Wave Energy**
    - Tidal Currents
    - **Ocean Currents**
    - Temperature Gradients (OTEC)
    - Salinity Gradients
  - Ocean Energy Conversion Technologies
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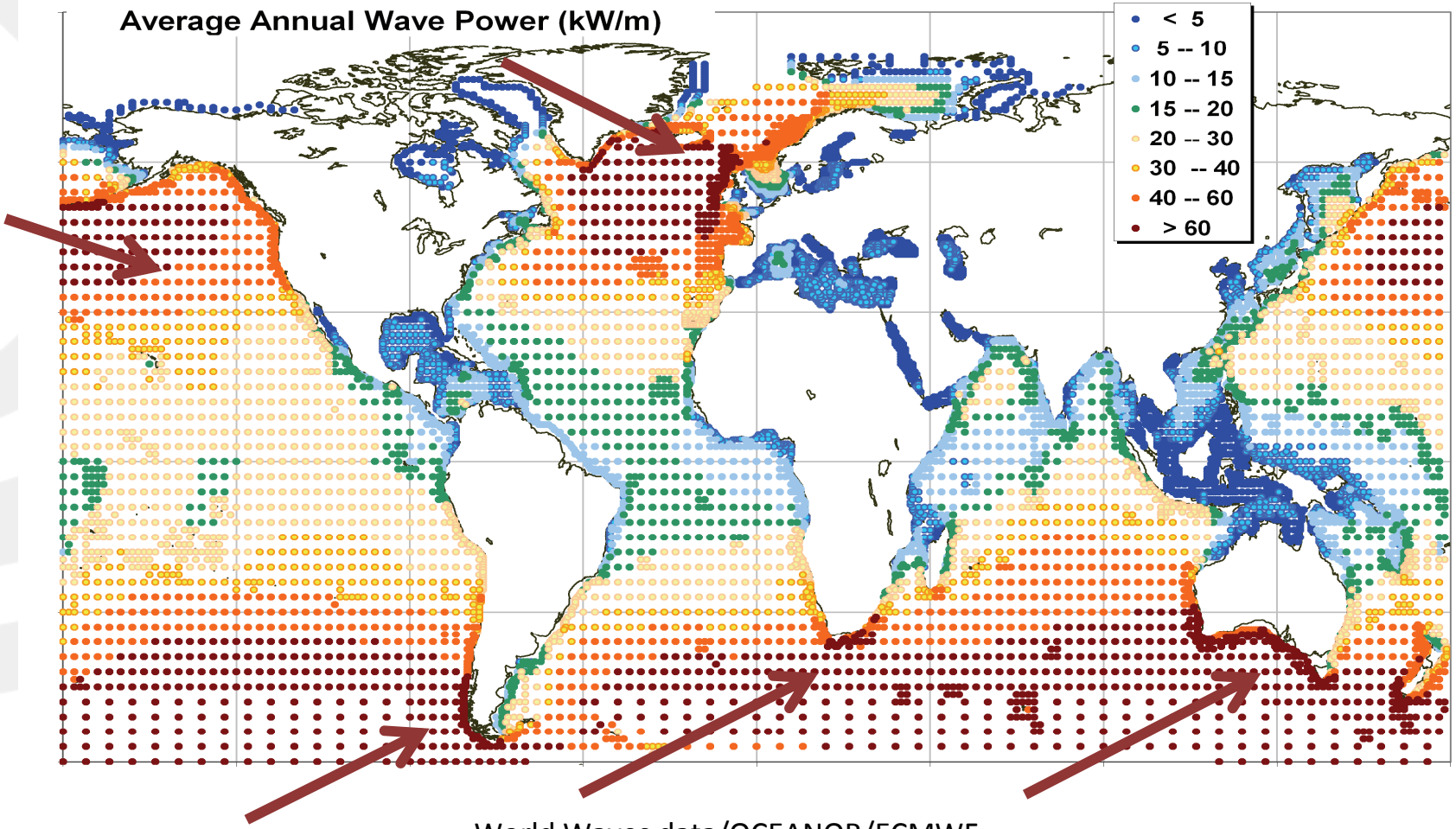
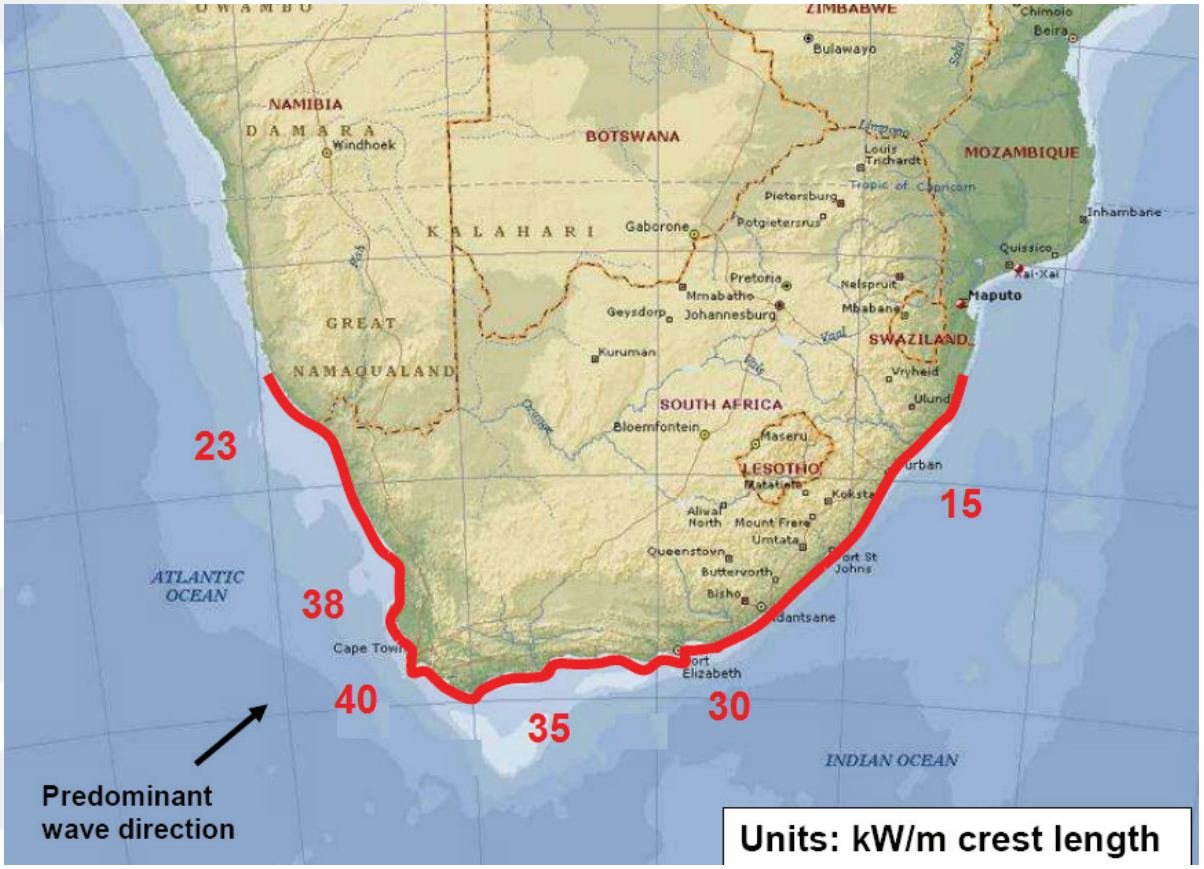
    - Tidal Energy
    - Ocean Current Energy
- Opportunities
- Constraints
- Way Forward

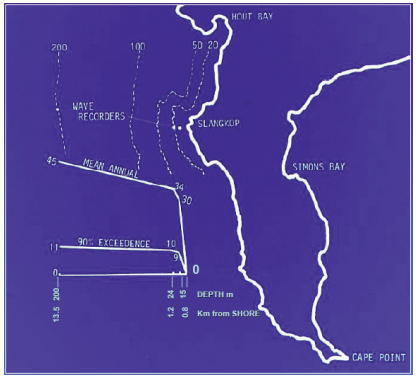
Wave Energy Resource in the World



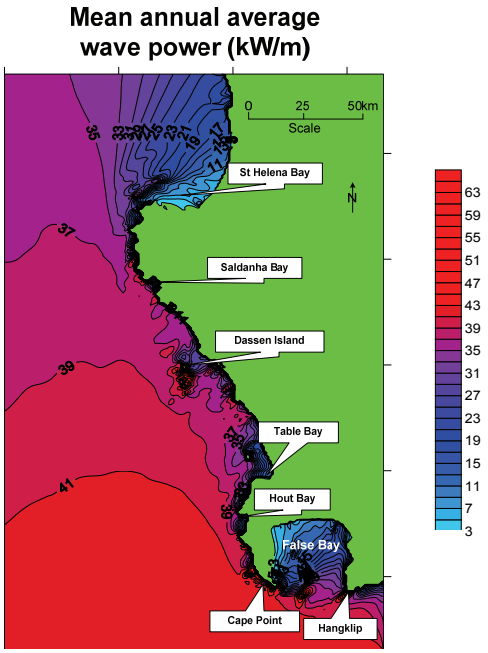
World Waves data/OCEANOR/ECMWF

Wave Energy Resource in SA



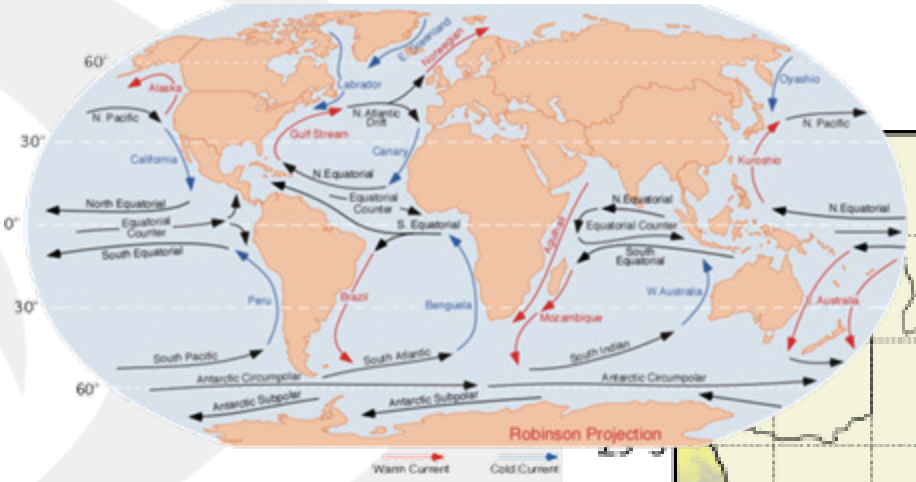


(Geustyn, 1983)

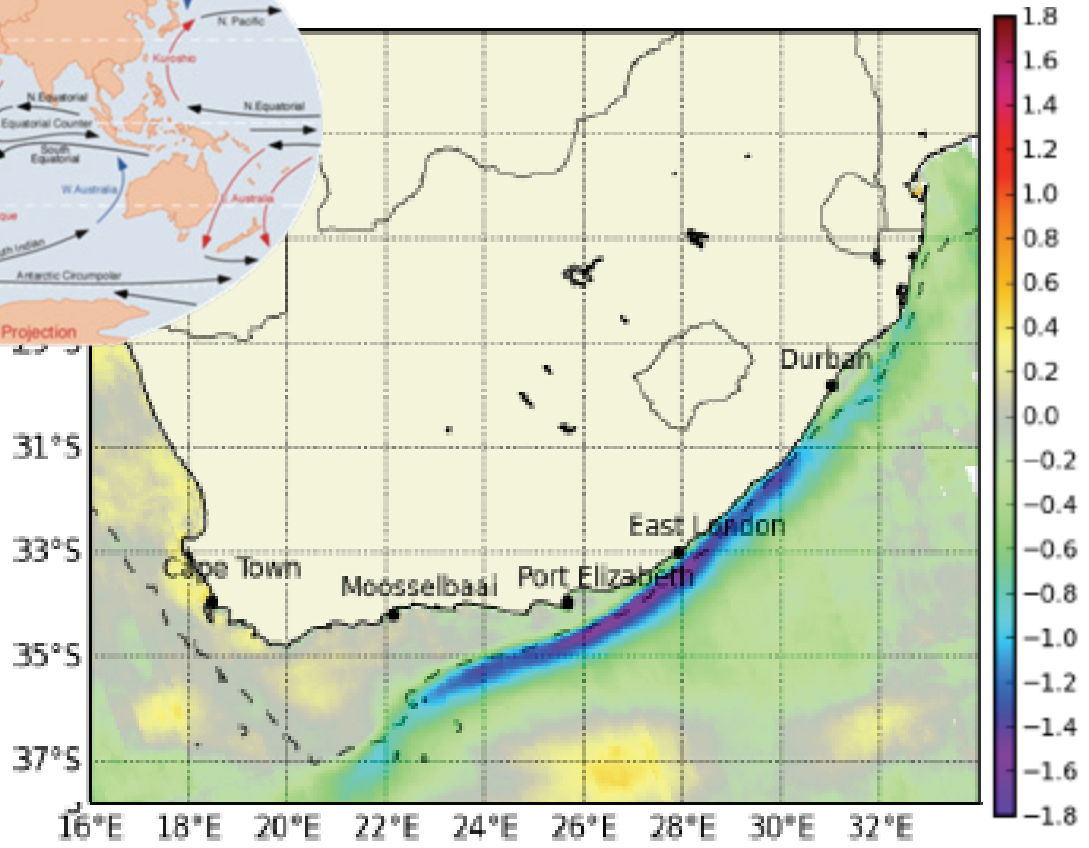


(Joubert 2007)

Ocean Current Energy in SA



Agulhas Current



Others: Gulf Stream, Kuroshio

Resource Assessment of the Agulhas Current
OE Research Group

- Stellenbosch University, UCT and CSIR formed a research consortium in 2014 with the goal to better understand the Agulhas Current
- Eskom deployed ADCP's along the SA coast intermittently from 2006 to 2012
- Compare to tidal velocities?
  - Tidal sites: usually 2.5 m/s or greater
  - Ocean current 1 -2 m/s thus technology will have to be adapted

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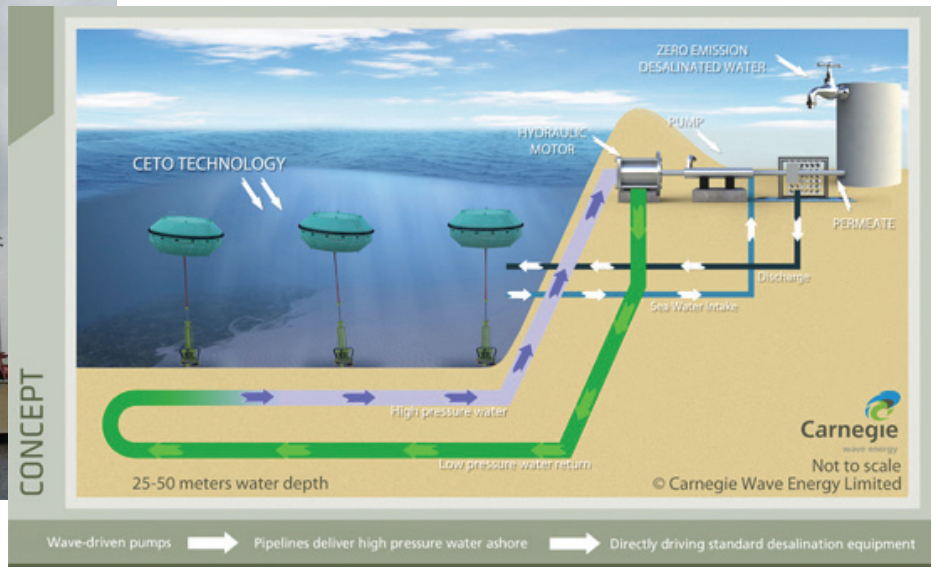
Wave Energy Converter Devices

OWC: Wavegen's Limpet (no longer in operation)

Attenuators: Pelamis Wave Power (went into financial administration in 2015)

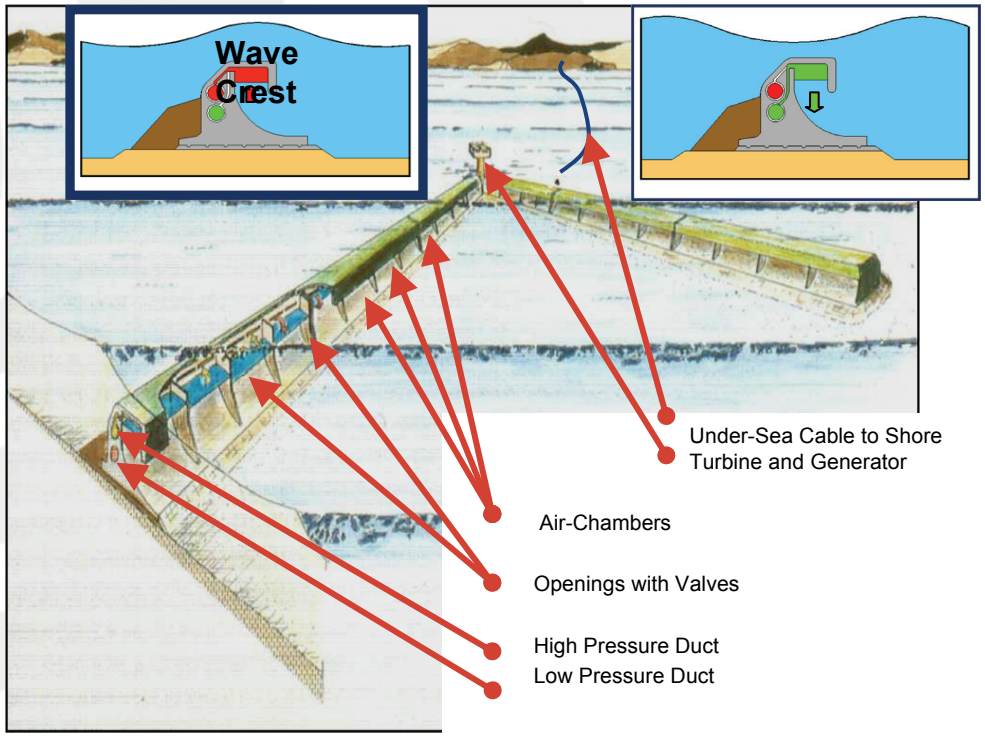
Wave Energy Converter Devices

Carnegie Corporation (CETO) in Australia

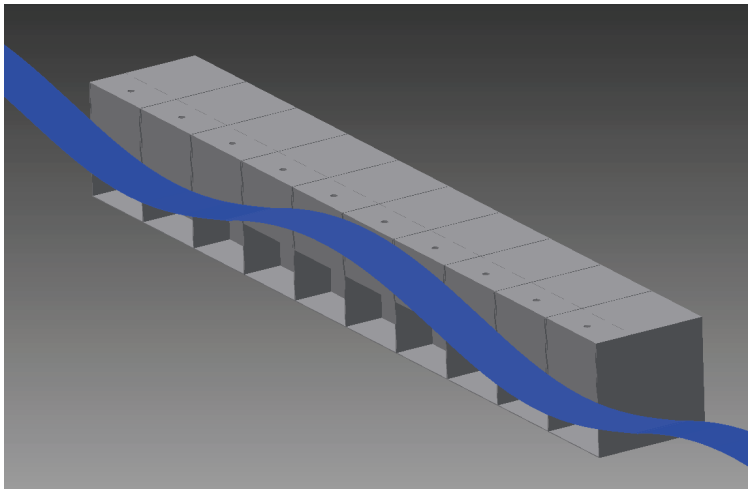


Current Wave Energy Projects in SA

Stellenbosch Wave Energy Converter

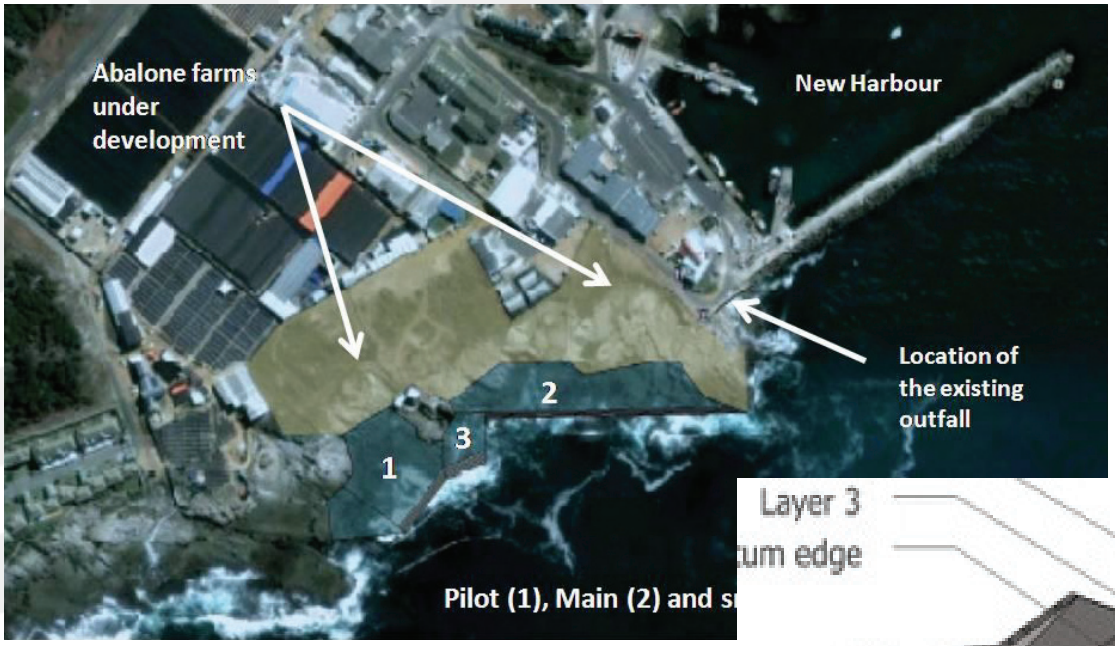


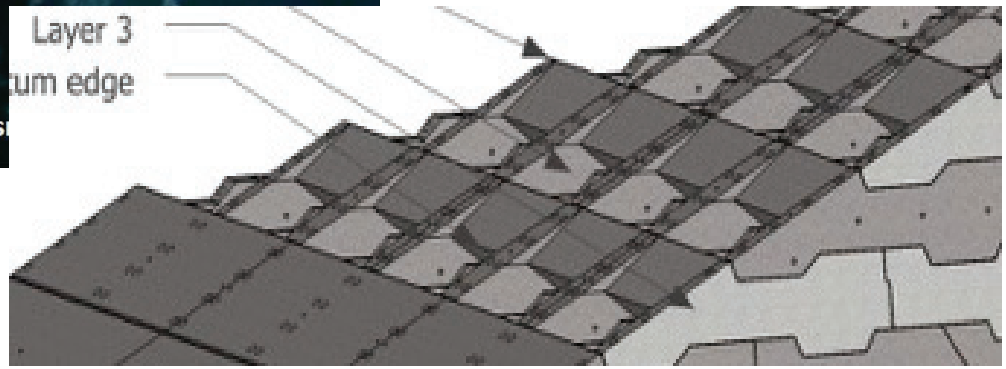
ShoreSWEC



Hermanus Overtopping Device

- Overtopping device(s), up to 5.25 MW (?) from low-head turbines by Mean Sea Level (Pty) Ltd to power abalone farm
- First project 1 MW @ R 1,20/kWh?





Tidal Currents:

Marine Current Turbines Ltd (MCT) : SeaGen

Atlantis, Andritz Hydro Hammerfest

Minesto: Deep Green turbine

Commercial Arrays:

Environmental consent achieved with deployment plans within the next 5 years

MeyGen Array
Swansea Tidal Lagoon

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Constraints:

- Current cost of ocean energy conversion technology is too high
- Level of funding for R&D in SA OE research is too low
- Small research community with limited resources

→*Need for support both in funding and knowledge sharing in SA*

Opportunities:

- SA has an exploitable ocean energy resource, wave and current
- Technology development:
  - Work being done by other countries is positive and possibly transferable to the SA OE environment
  - Scope for local technology development for our specific resources
- Established marine engineering (mechanical, electrical and hydraulic) industry in Cape Town that currently supports the offshore diamond mining and the O&G industries
- Three coastal engineering (civil) consulting firms based in Cape Town with an international reputation and footprint

→*SA has the required expertise and skills to develop a successful ocean energy industry (engineers, oceanographers, marine biologists, environmental specialists etc.), but we must collaborate*

Way forward

- Support collaboration between all the stakeholders in the ocean energy environment
  - Share data, resources, knowledge, facilities, lessons learnt
- Mobilise funding for R&D activities in the ocean energy sector
- Expand international collaboration

Questions?

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