

ENERGY OF CHANGE

offer solutions able to mitigate and reverse climate change caused by burning fossil fuels, promote ways of generating power that emit little to no greenhouse gases or pollutants.



CONTEXT

South Africa heavily relies on **coal for its energy production**, with coal-fired power plants accounting for a significant portion of the country's electricity generation.

Despite possessing **abundant renewable energy potential**, including favourable conditions for solar and wind power, the country has fail to successfully implement

AIM

- Conduct research into the current state of South Africa's power grid infrastructure.
- Conduct research into existing global renewable energy solutions in order to aid the current state of energy and power production in South Africa.
- Increase the potential number of available systems that generate renewable energy in South Africa.
- Speculate a potential Future for South Africa where existing renewable energy solutions are implemented.

PROBLEM

The use of **renewable energy sources**, such as wind and solar, has been **relatively underutilised compared to traditional power production in South Africa**.

the country has faced challenges in transitioning to cleaner energy due to factors like **policy uncertainties, financial constraints, and the existing infrastructure heavily invested in fossil fuels**.

Related SGD's



Affordable and Clean energy



Sustainable Cities and Communities



Climate action

RESEARCH

THE CURRENT STATE OF ENERGY IN
SOUTH AFRICA

- Close to 90% of South Africa's is still generated using coal as a primary resource
- South Africa's wind and solar resources **surpass** those of other nations aiming for 100% renewable electricity, **making the goal seemingly attainable.**
- South Africa has a low proportion of electricity generated from renewable sources. This limited adoption encounters **notable resistance**, particularly from sectors within the country that have vested **interests in maintaining the current dominance of coal in the energy sector.**
- Despite the government establishing awareness regarding the implementation of Renewable Energy **more than 2 decades ago** and pledging to reduce the country's carbon emission – **very little has been done** in terms of implanting systems to achieve these goals.

AFRICA **VS** EUROPE

- Africa, with **17%** of the global population, consumes only **3.4%** of global energy and emits **4%** of global carbon emissions

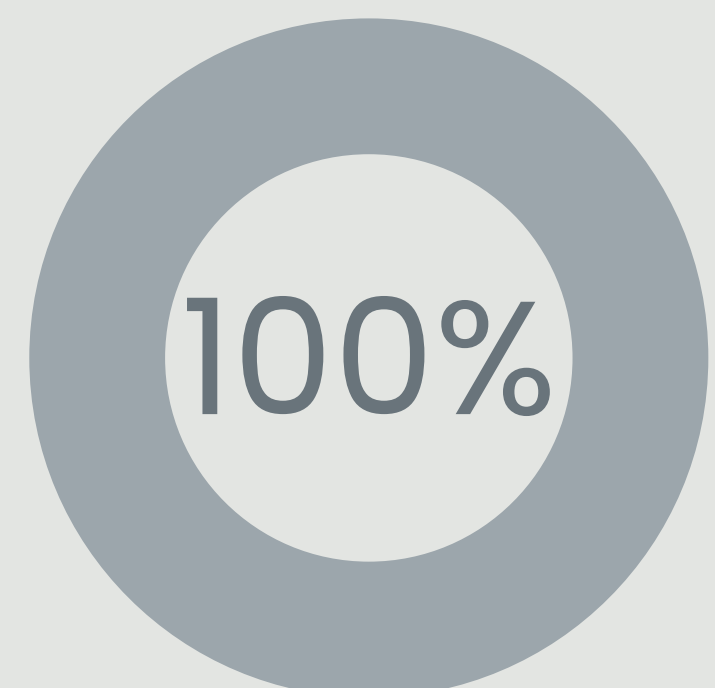
- The EU, with **5.8%** of the global population, consumes **10.4%** of global energy and emits **8.2%** of global carbon emissions.

Historically, the **EU** has had a much **larger carbon emissions footprint** compared to Africa.

Fossil fuels dominate energy provision in **both regions**, however renewables are growing, particularly in solar and wind energy.

PROOF OF CONCEPT

- This was facilitated by **decades of preparation**, including the development of hydropower in the 1970s, wind farms in the 1990s, and ongoing construction of solar and offshore wind farms.
- the country demonstrated a **seamless transition from fossil fuels to hydro, solar, and wind power.**
- The **diversification of renewable resources**, such as wind, hydro, solar, and biomass, contributed to the reliability of the grid.



in **November 2023 Portugal** successfully **tested** its grid's ability to handle **100% renewable energy**

RENEWABLE ENERGY POLICIES IN SOUTH AFRICA

INTEGRATED RESOURCE PLAN

The South African government annually reviews and updates its integrated Resource Plan (IRP). The IRP **establishes targets for renewable energy capacity**, emphasising wind, solar, and other clean energy sources.

CARBON TAX

South Africa has introduced a **carbon tax** to incentivise businesses to **reduce** their **carbon emissions**. While not exclusively a renewable energy policy, it **indirectly promotes cleaner and more sustainable energy practices**.

RENEWABLE ENERGY DEVELOPMENT ZONES

The South African government has identified **specific areas** as **Renewable Energy Development Zones (REDZs)**, where renewable energy **projects** are **encouraged**. These zones are chosen based on their **renewable energy potential** and aim to streamline the development process.

RENEWABLE INDEPENDANT PRODUCTION PROGRAM

South Africa has implemented the **Renewable independent Production Programme**, which is a **competitive bidding process** for **private renewable energy developers** to provide grid-connected renewable energy.

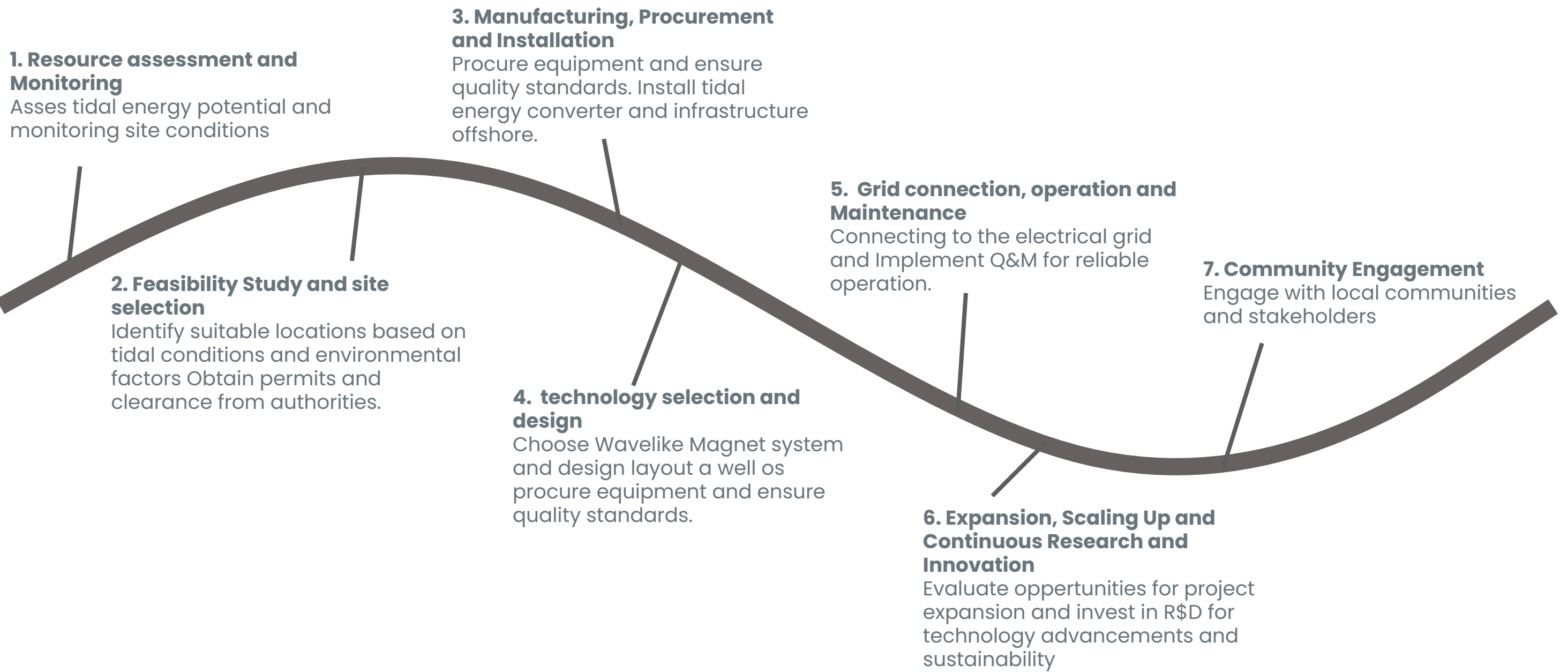
BUT!

South Africa's renewable energy sector faces **challenges** from **policy uncertainty, financial constraints, grid integration issues, and problems with Eskom, the state-owned utility**.

- Policy instability affects investor confidence
- financial limitations impede large-scale projects
 - technical challenges require grid upgrades
- Eskom's struggles hinder effective renewable energy integration and policy implementation

THE SOLUTION

IMPLEMENTATION PLAN



1. RESOURCE ASSESSMENT AND MONITORING

In order to begin, an oceanographic survey conducted by the Oceanography Department from the University of Cape Town will take place between Port Nolloth and Hondeklip Bay (144km) in order to grasp an understanding of the Benguella Current, the weather surrounding it and the potential energy it holds.

2. FEASIBILITY STUDY AND SITE SELECTION

After receiving a permit from the Namaqua National Park to conduct supervised expeditions along the coast, a suitable launch location will be chosen based off of swell conditions, accessible terrain and a power cable within close proximity of the device.

3. MANUFACTURING, PROCUREMENT AND INSTALLATION

Once a location has been chosen and authorised to be used by the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), an offshore electricity converter and upgraded power grid will be installed at the nearest settlement, which in this case would be the small town of Kleinsee due to its direct link to the NeusBerg Hydro Power Station. Here, the station shall act as a midway point to distribute the power back to the national grid.

4. TECHNOLOGY SELECTION AND DESIGN

After receiving funding from private sector investors and the REIPPPP, Sea Wave Energy Ltd will commence the selection, assembly and installation of the unit, as well as establishing all necessary connections to the onshore converters.

5. GRID CONNECTION OPERATION AND MAINTENANCE

Once the unit has been fully installed, a stable connection to the NeusBerg Hydro Power Station will be made to commence the initial trial runs. Once the device is operating at full capacity without flaw, the REIPPPP will consult Eskom for authorisation to distribute the wielded energy to the national grid. Employed personnel will also be required to monitor and maintain the device.

6. EXPANSION AND INNOVATION

After a successful trial run and adequate study of the device's reliability, only then can the REIPPPP, SWEL and Eskom start considering implementing more units and the necessary upgrades to the national grid to support this new supply. This slow but steady shift could possibly reverse our heavy reliance on coal and diesel as a source of power, curbing the production of greenhouse gasses.

7. COMMUNITY ENGAGEMENT

Although the idea of transitioning from one power source to the other puts the livelihood of former employees at risk, the introduction of newer technologies creates job opportunity via training courses and skill development. This could not only assist in South Africa's crippling unemployment rate but help spread awareness about climate change and what we can do to avoid it.



South Africa's 8th REDZ's zone is located in Springbok in the Northern Cape. Situated on the country's western coast.

TIDAL WAVE ENERGY

- Tidal energy captures the potential energy from the difference in height between high and low tides using barrages or dams, driving turbines to generate electricity.
- Tidal energy harnesses the kinetic energy of tidal currents through underwater turbines or tidal stream generators, similar to underwater wind turbines to generate electricity.

PROS VS CONS

- | | |
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| <ul style="list-style-type: none"> • Environmentally friendly: no air, water, or thermal pollution. • Free energy production: Once infrastructure is in place, tidal energy harnesses natural power of tides. • Predictable output: Accurate tide predictions. • Sustainability: Energy derived from lunar and solar cycles. | <ul style="list-style-type: none"> • limited viable locations: Few places globally with large enough tidal ranges. • Cost and site specificity: Development is currently costly and site-specific. • Ecological impacts: Hinders fish migration. alters tidal basin ecosystems, disrupts habitats. |
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SOLVING GOVERNMENT RELATED ISSUES

POLICY STABILITY

Ensure a stable and consistent policy framework to build investor confidence and encourage long-term commitments to renewable energy projects. Avoid frequent changes in government priorities and regulatory frameworks..

FINANCIAL SUPPORT AND INCENTIVES

Explore financial mechanisms such as subsidies and tax breaks to attract investment in renewable energy projects, making them economically more viable.

INFRASTRUCTURE UPGRADES

Invest in upgrading and modernising the power grid to accommodate the intermittent nature of renewable energy sources, facilitating better integration into the existing infrastructure.

STREAMLINED PROCUREMENT PROCESS

Address delays in procurement processes and expedite the signing of power purchase agreements, particularly under programs like REIPPP, to accelerate the development of renewable projects.

CAPACITY BUILDING AND TRAINING

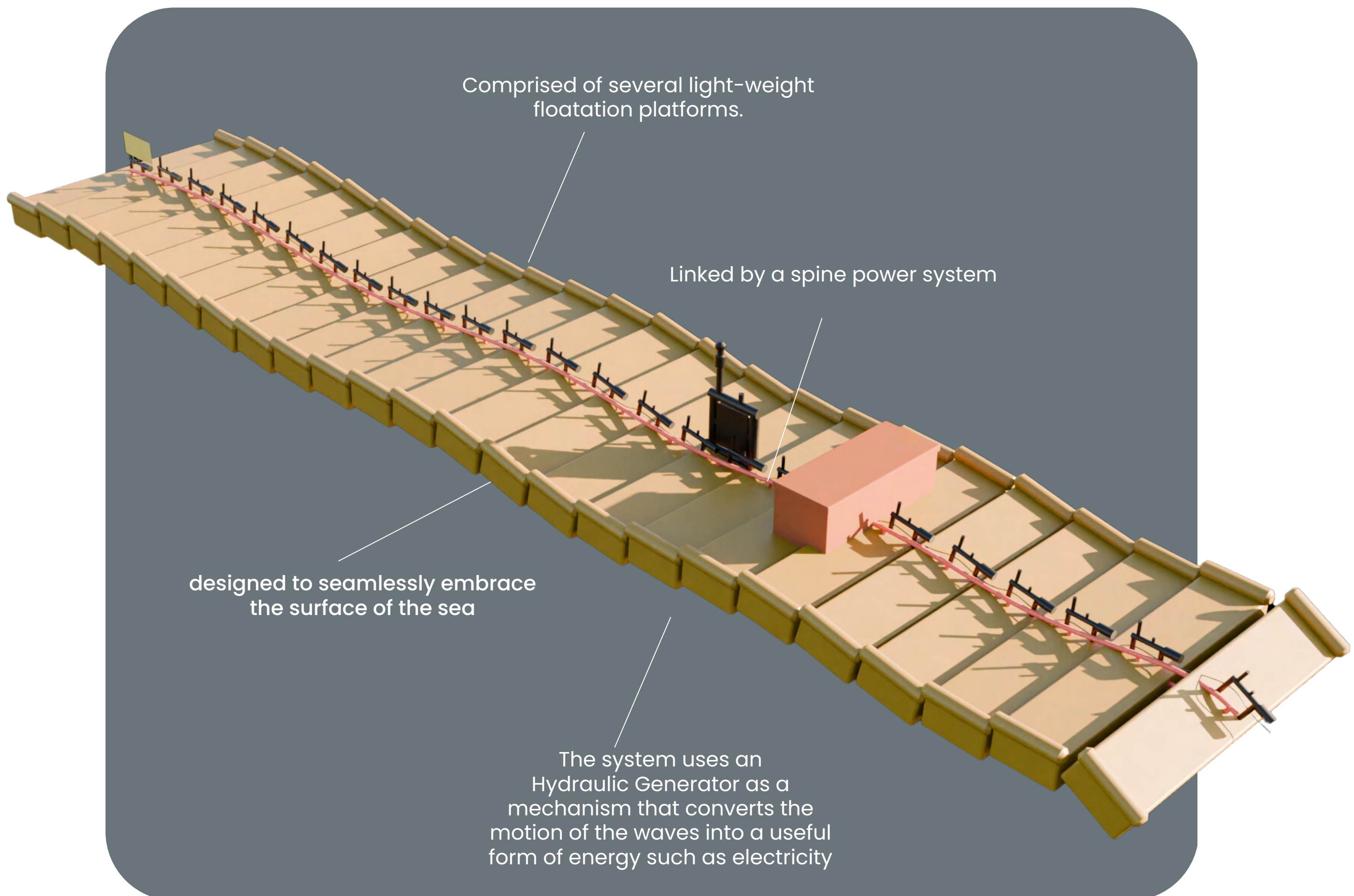
Invest in education and training programs focused on renewable energy technologies to overcome the shortage of skilled personnel and support the sector's growth.

INTERNATIONAL COLABORTATION

Collaborate with international organisations, governments, and industry partners to bring in expertise, technology, and financial resources, supporting the development of South Africa's renewable energy sector.

THE SOLUTION

WAVE LINE MAGNET



Designed by Sea Wave Energy Ltd

The Waveline Magnet is comprised of an **array of flexible assemblies** linked by a **spine power system**. The patented technology allows the **wave to pass through the system**, generating **power** as the wave **rises and falls**.

The wave energy converter is **designed to embrace the surface of the sea**, or the 'wave line' as it is often referred to by **SWEL**. This allows the WEC to become **ONE MOVING MASS** with the wave itself creating a unique interaction that allows SWEL to **REGULATE** how much **energy** is **extracted** from the wave in a **CONTROLLED AND NON-DISRUPTIVE manner**.

The **seamless** and **frictionless** interaction is a **UNIQUE CHARACTERISTIC** of the technology that allows it to work in **harmony** and in **synchronization** with the deployed sea area, **IRRESPECTIVE** of the **wave profile** and the **weather conditions**.

- Sea Wave Energy Ltd