

HELIO400 – SOLAR TECHNOLOGY TO SECURE ENERGY FUTURES

An initiative of the Solar Thermal Energy Research Group at the Centre for Sustainable and Renewable Energy Studies, Stellenbosch University



Impact

Reduce Southern Africa's and other regions' reliance on fossil fuels by developing a holistic and cost-effective solar energy solution that is accessible and applicable to Southern African communities, and other communities within Sunbelt regions across the world.

Aims

- Pilot the heliostat component i.e. the first phase of a concentrating solar power (CSP) project by establishing a new solar power plant at Mariendahl Experimental Farm near Stellenbosch
- Once the pilot project has been completed and validated, open the plant as a research and training facility for higher education institutions and companies in Southern Africa and elsewhere
- Develop and implement subsequent phases of the project specifically the power generation (turbine) and energy storage components of the power plant

Background

The South African economy is characterised by a high level of dependence on cheap and abundantly available energy resources such as coal and the importation of large amounts of crude oil. Some projections indicate that the supply of these non-renewable resources will decline rapidly towards the middle of the 21st century. This could result in a national and global resource scramble characterised by dramatic increases in non-renewable resource costs and economic decline.

To secure South Africa's energy future and to minimise the effects the depletion of non-renewables will have on vulnerable communities, the South African government developed the national Integrated Resource Plan (IRP). The IRP embodies South Africa's mandate to ensure a sustainable future energy mix for the country and emphasises the significant role of renewable energy resources including solar energy. The development of independent Concentrating Solar Power (CSP) plants, in particular, is a key objective of the solar energy component of the Plan.

The Solar Thermal Energy Research Group (STERG) has developed solar power technology to support the CSP objective. The technology is based on the central receiver model and uses heliostats (mirrors that track the sun) which focus highly concentrated sunlight on a receiver on top of a tower. The collected energy charges a thermal storage system which produces power on demand using a turbine. The heliostat system design takes into account geographical, environmental, land-use and social/community factors with an emphasis on user-friendliness, cost-effectiveness and accessibility.

STERG forms part of the nationally mandated Centre for Renewable and Sustainable Energy Studies at Stellenbosch University and is

the only formal solar energy research and training entity in the country. The Group has succeeded in prototyping (modelling) all the components of a heliostat system through the Helio 18 project which involves 18 heliostats. Sasol is currently funding a scale-up of Helio 18, namely, Helio40 (40 heliostats).

Proposal

Following the completion of Helio40, STERG will be piloting the first phase of a full-scale CSP power plant, namely, Helio400 at Mariendahl Experimental Farm near Stellenbosch. Mariendahl has been selected as a project site because it is SU owned; is in close proximity to SU and major centres and receives substantial amounts of solar radiation. Helio400 is currently at the advanced planning stage and will consist of 400 square meters of heliostat mirror surface. Once completed and validated, the plant will become a research and training facility and be developed further through the addition of a turbine and an energy storage component.

The heliostat system could then be reproduced at different scales elsewhere in Southern Africa (in particular other parts of South Africa, Botswana, Namibia and parts of Zimbabwe and Angola) for research and development and/or commercial use, as well as in other regions across the globe that receive similar amounts of solar radiation.

STERG currently requires support to cover the cost of Helio400. An investment in Helio400 is an investment in the development of local solar technologies to help secure Southern Africa's (and other regions') energy future.

Budget

- Option 1: Euro 800 000 for the heliostat field and tower
- Option 2: Euro 400 000 for facility research infrastructure and utilities
- Option 3: Euro 400 000 for the turbine
- Option 4: Euro 160 000 x 3 years for staffing and operational costs

Project leaders



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Stellenbosch University's Hope Project

Energy security is a national challenge that needs to be addressed if economic growth in South Africa is to be maintained and stimulated. Decreasing the country's economic dependency on non-renewable energy resources such as coal and crude oil is a crucial step in addressing the energy security challenge. To reduce dependency, the South African government is creating an energy mix within which renewable energy resources such as solar energy are prominent. The development of independent Concentrating Solar Power (CSP) plants has been outlined in relevant plans as an important means to meet national solar energy objectives.

The Solar Thermal Energy Research Group (STERG), a research group of the Centre for Sustainable and Renewable Energy Studies at Stellenbosch University, has responded to the national CSP objective. STERG has developed solar power technology that uses heliostats (mirrors that track the sun) and has succeeded in prototyping (modelling) all the components of a heliostat system. The Group will soon be piloting the first phase of a full-scale CSP power plant, namely, *Helio400* at Mariendahl Experimental Farm near Stellenbosch.

Helio400 is being proposed in line with the objectives of Stellenbosch University's HOPE Project. The HOPE Project showcases key research, teaching and learning and community interaction initiatives that serve humanity and build a better future by entrenching Stellenbosch University's tradition of excellence.

The HOPE Project's initiatives are grouped into five focus areas that align with the international development agenda: poverty eradication, democracy and human rights, human dignity and health, peace and security, and a sustainable ecology and sustainable business.

www.thehopeproject.co.za



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