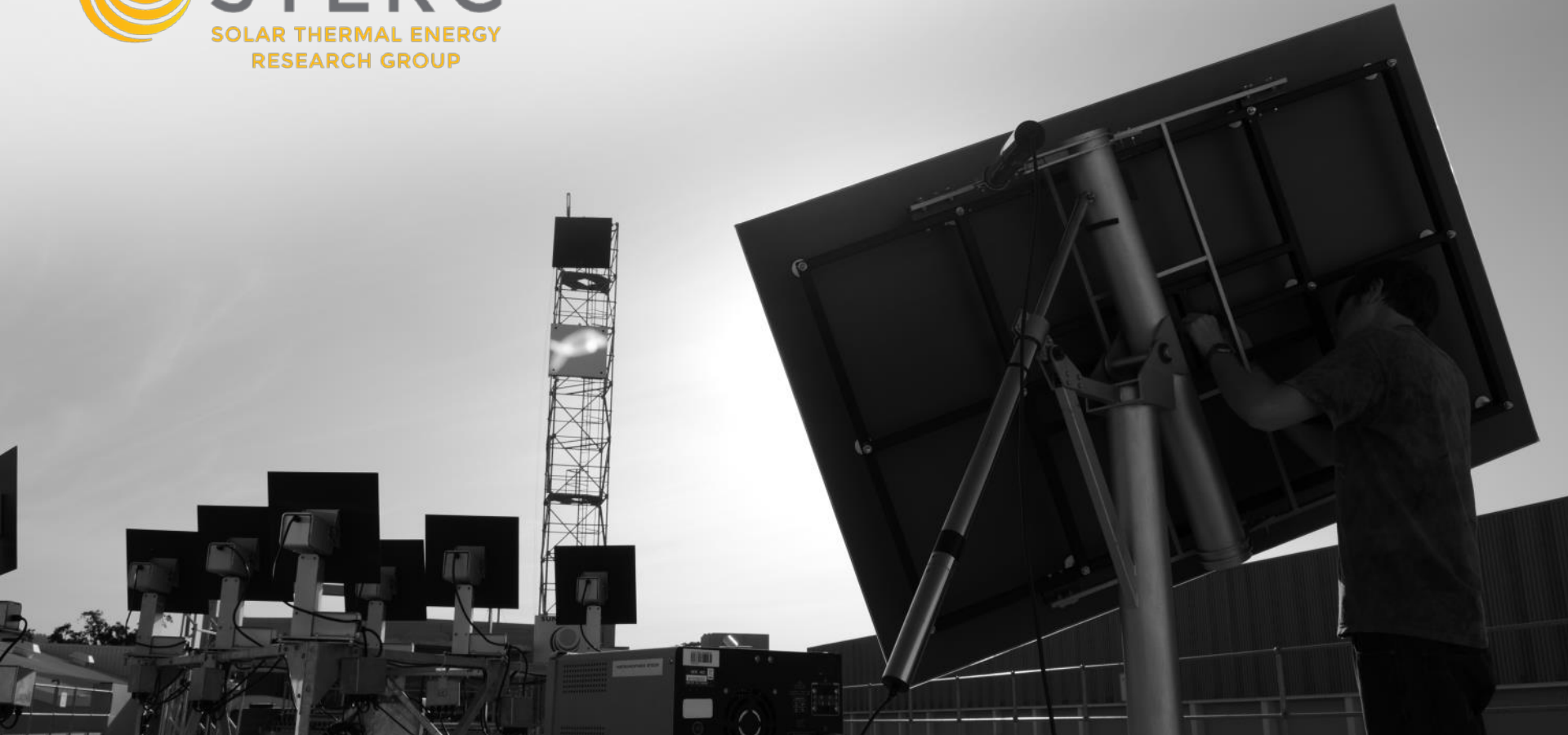




STERG

SOLAR THERMAL ENERGY
RESEARCH GROUP



Review: State of the art parabolic trough technology and the way moving forward

R N Laurie

MEng candidate

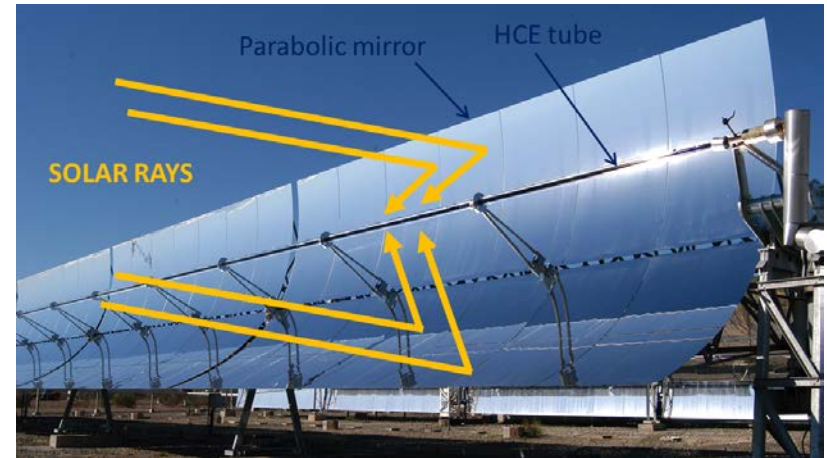
Supervisors: Prof Frank Dinter & Dr Jaap Hoffman

Solar Thermal Energy Research Group (STERG)
University of Stellenbosch

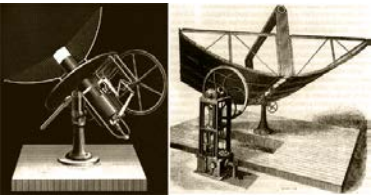
What are parabolic troughs?



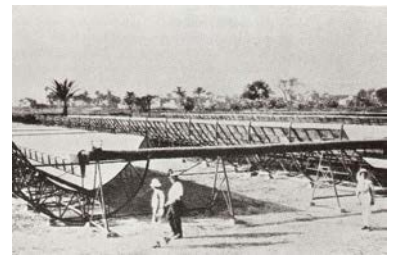
- Specialized geometry
 - Mirror reflectors (silver coated glass mirror/glass-free panels)
- Reflect and concentrate rays of sun
- HCE absorbs thermal energy
 - Fluid usually oil



Progression of parabolic troughs



**First PTC
1870**



**Irrigation
plant 1912**



**SEGS I-VI
1980**



**PTC with
DSG 1907**

**Gaining
popularity
1970's**

**EuroTrough
2002**



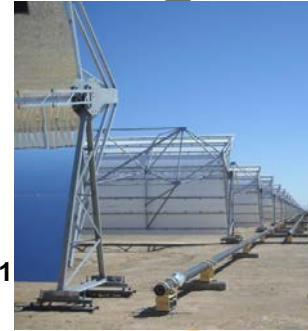
Progression of parabolic troughs



**SGX-2, SNT-0
2005**



**HelioTrough
2009**



**E-2
2011**

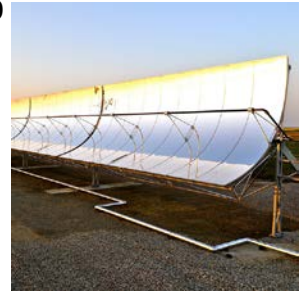
**SpaceTube
2014**



**AstrO
2007**

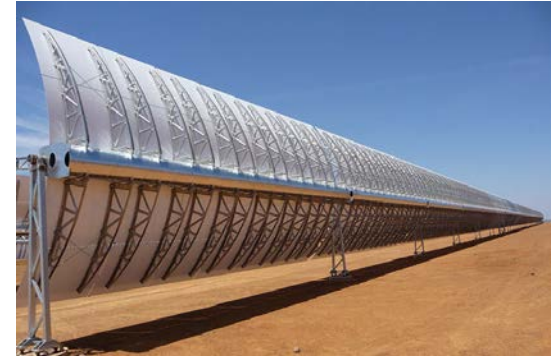
**SkyTrough
2010**

**UltimateTrough
, SNT-2 2013**



Current parabolic trough technology < >

- Structure
 - Torque box
 - Torque-tube
 - Space frame



Current parabolic trough technology < >

- Torque-box
 - More rigid structure
 - More expensive assembly process
- Torque-tube
 - Less rigid structure (bending due to gravity & wind loading)
 - Less assembly costs
- Space frame
 - No jig required for assembly

Current parabolic trough technology

- Approximately 5 GW of installed STE worldwide
- Parabolic troughs make up 4.1 GW
- More accurate collectors
 - Higher $CR_{\text{geometrical}}$, IF
- Larger collectors
- More cost-effective collectors

Current parabolic trough technology ◀ ▶

- SENERTrough-2 (SNT-2)
- SpaceTube
- SkyTrough



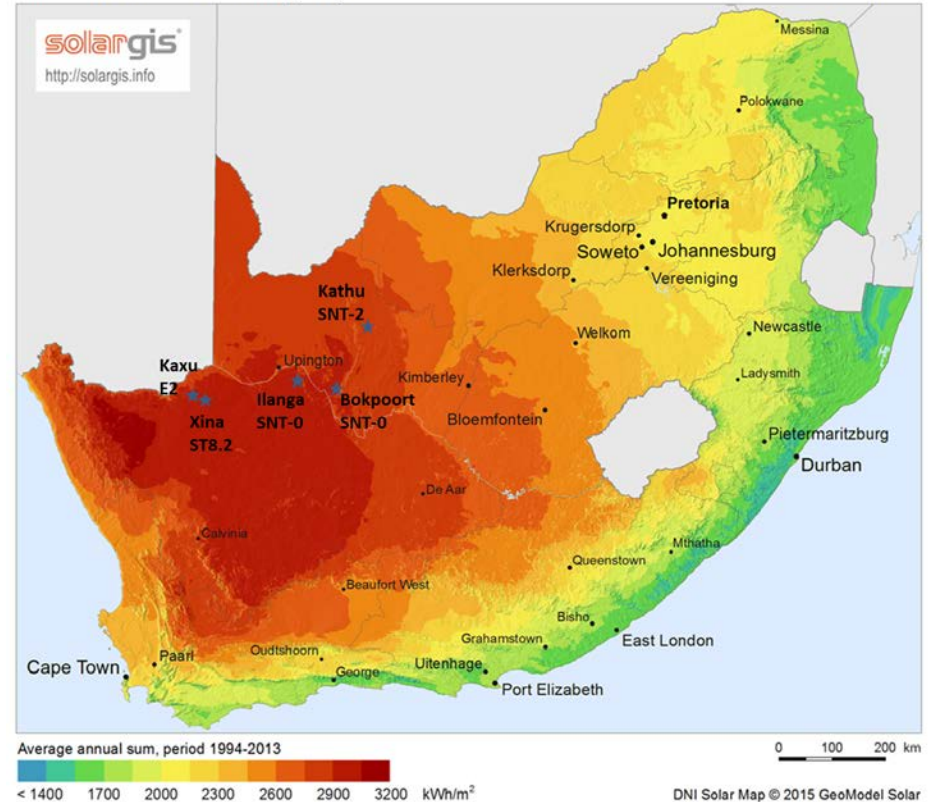
Current parabolic trough technology



- South Africa has 5 parabolic trough plants
- 450 MW

Direct Normal Irradiation (DNI)

South Africa



What's next?



- Matured technology
 - Tried and tested
- Reduce costs
 - Less cost intensive manufacturing processes
 - Alternative materials
 - Alternative structural designs
- Increase system efficiency
 - Molten salt as HTF

THANK YOU

ACKNOWLEDGEMENTS:

CONTACT DETAILS:

R N Laurie
Solar Thermal Energy Research
Group (STERG)
Stellenbosch University
South Africa

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