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## *Accelerating Renewable Energy Deployment*






*Energy Innovation For Life*

# Outline



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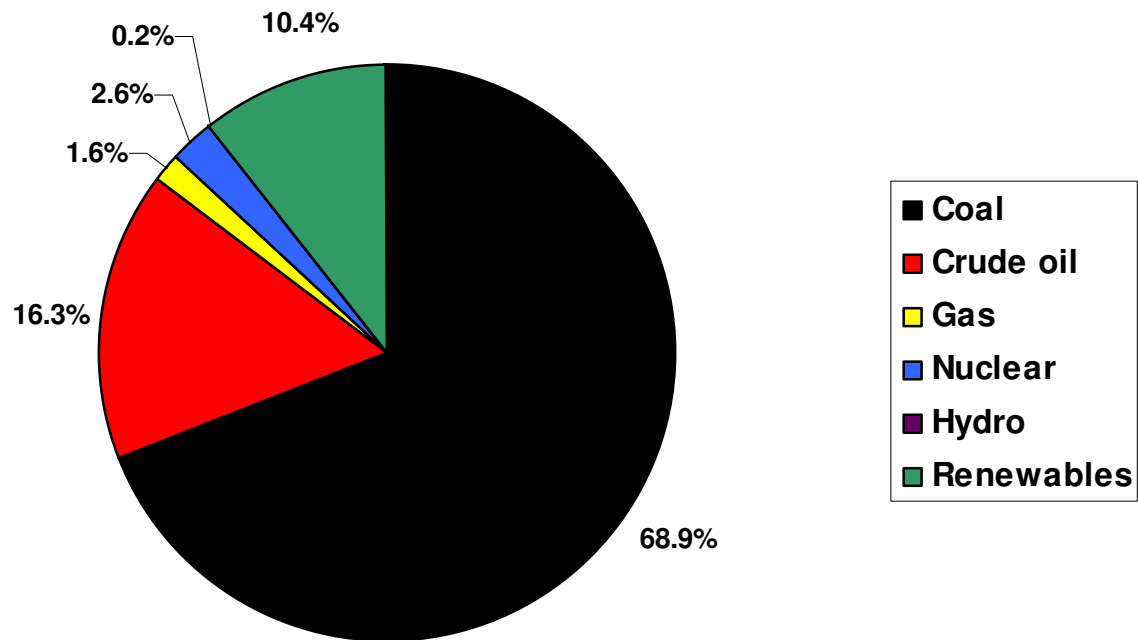
-  National framework
-  Existing capacity
-  Future plans

# Total Energy Supply



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**Total primary energy supply**



# A case for Renewables



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SA among highest emitters of carbon dioxide in the world

More than 75% of primary energy requirement from fossil fuels

SA ranked 12<sup>th</sup> in the world in terms of top emitters



Urgent need:

- Reduce fossil fuel dependency
- Reduce carbon footprint
- Diversify our energy mix and supply



Solution (no panacea)

- RENEWABLE ENERGY – resources are abundant, sustainable, can be implemented quickly, offer more work opportunities and have a much lower impact on the environment

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# Renewable Energy Sources



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Biomass



Solar



Wind



Ocean











- Natural resources
- Naturally replenished

# Strategic context



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## National Policies and Strategies

-  National Energy Research, Development and Innovation Strategy (developed by DME, DST and stakeholders)
-  National target – Renewable Energy Production of 10 000 GWh by 2013 (under Review)
-  Biofuels Industrial Strategy 2007 – 2% penetration by 2013
-  EE target - energy demand reduction of 12% by 2015
-  REFiT
-  SWH National Target – 1 000 000 by 2014
-  Ten-Year Innovation Plan for South Africa (5 Grand Challenges – Energy Security)
-  Long Term Mitigation Strategy
-  IRP 2010 (in discussion)

# REFIT



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## Phase 1

Technology	R/KWh
Small hydro (<10 MW)	0,94
Wind	1,25
Landfill Methane	0,9
CSP (Concentrated Solar Power)	2,10

## Phase 2

CSP (Parabolic trough without storage)	3,13
PV (>1 MW)	4,48
Biomass	1,18
Biogas	0,96
CPV without storage	5,48
CSP (Tower with 6 hours/day storage)	2,30

Energy Conversion Factors

# Key Objectives



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- 🔥 Ensure long term health of energy research capacity in the country and assist in stimulating a culture of innovation in the energy research environment
- 🔥 Support government goals of energy security of supply through identifying viable and sustainable diversified energy supply options
- 🔥 Address deficiencies in current race, gender and age profile of postgraduate students, academia, engineers and scientists
- 🔥 Stimulate socio-economic upliftment through improved access to modern, clean and affordable energy services
- 🔥 Support economic growth - accelerating applied research projects getting to market, ultimately resulting in commercial rollout.

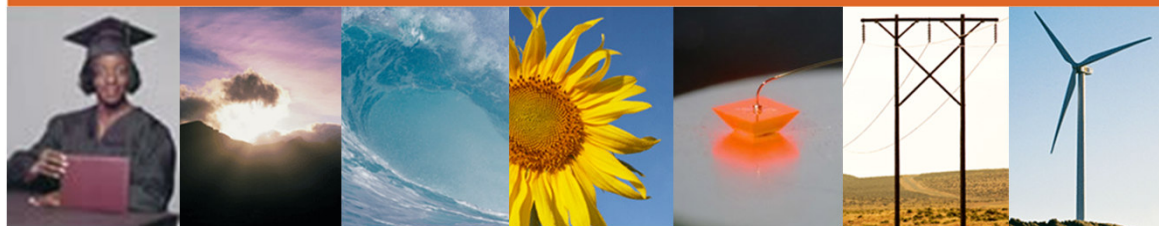


# Existing Research Capacity (CSP)



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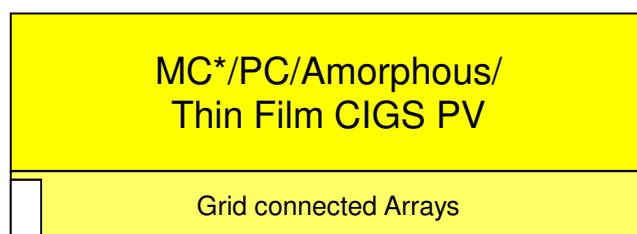
	UCT	UP	WITS	UKZN	SU	CSIR	Eskom
Energy systems analysis	X	X			X	X	X
Policy and regulation	X					X	
Resource assessment				X	X	X	X
Parabolic troughs				X	X		
Heliostats			X		X	X	
Solar gas turbine					X	X	
Volumetric receivers					X	X	
Solar thermo-chemistry	X				X	X	
Thermal energy storage					X	X	X
Dish Stirling				X			X
Dry/hybrid/wet cooling		X			X		X







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## Solar PV Research / Activity in SA










### Grid connected / Centralised Systems






#### Legend

-  SANERI / NEEA / CEF Focal Area
-  Eskom Focal Area
-  University Focal Area
-  Private Sector Focal Area

### Standalone / Decentralised

MC*/PC/Amorphous/ Thin Film CIGS PV	
	Building Integrated PV
	Solar Water Pumping
	Solar Traffic Lights
	Solar Street Lighting
	Telecommunications power
	Energy Islands
	Signage
	Hybrid Mini-Grids
	Concentrating solar PV applications

Solar Water Heating	
	Commercial Sector
	High and Middle Income Domestic Sector
	Low-income Domestic Sector

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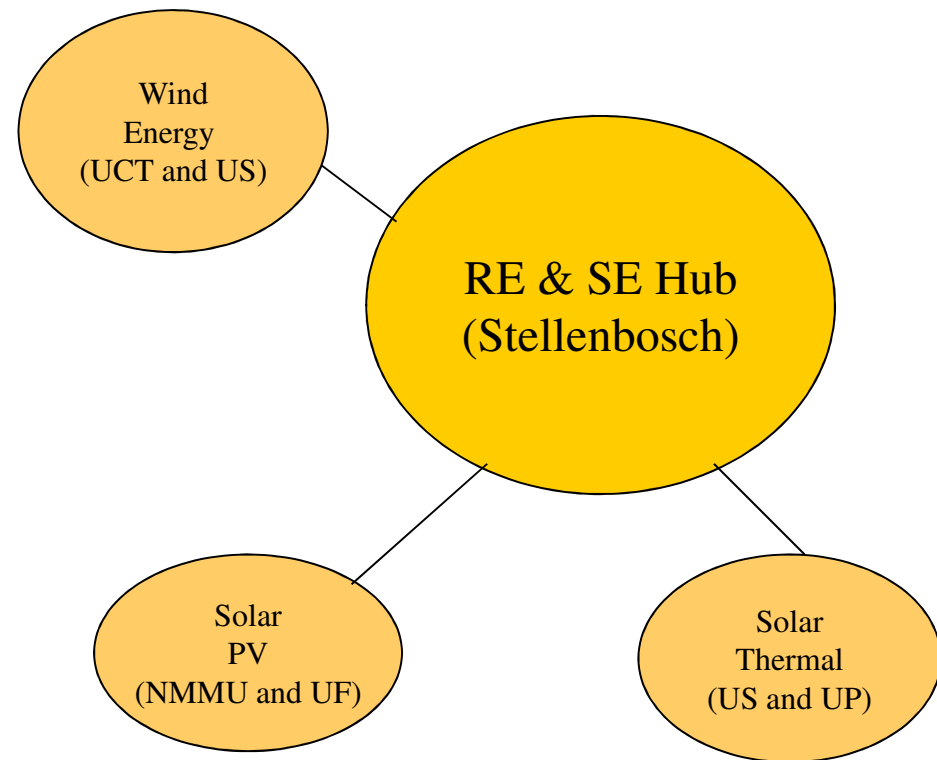
\* MC/PC – Mono and Polycrystalline Silicon

# Hub and Spokes



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- 🔥 University of Stellenbosch - national hub of a Postgraduate Programme in Renewable and Sustainable Energy (RSE) Studies.
  - 💡 train scientists and engineers with the required technical expertise to unlock the country's renewable energy resources on the one hand and implement appropriate technology for using sustainable energy on the other
- 🔥 3 Spokes
  - 💡 Photovoltaic Research and Teaching from NMMU and University of Fort Hare
  - 💡 Solar Thermal Power Generation from Stellenbosch University and University of Pretoria
  - 💡 Technologies for Wind Energy from University of Cape Town and Stellenbosch University
- 🔥 51 Students in 7 universities



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# SA Solar Resource - Measured



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- 🔥 Measurements by various organisations has taken place over the years
- 🔥 The most significant of these are:
  - 🔥 **South African Weather Services:** GHI and Diffused Irradiation Measurement at 10 locations during the period 1975 – 1995.
  - 🔥 **Eskom:**
  - 🔥 Soil: GHI (quality not suitable for bankable data)
  - 🔥 Developers
    - Exxaro: Lephalale
    - Solafrica: Groblershoop
    - Abengoa: Upington, Pofadder
    - Group5: Kathu
- 🔥 From measured data some maps has been developed. These maps are only for GHI.

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**Source:CRSES**

# SA Solar Resource – Satellite Derived



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- 🔥 Satellite Derived data for SA:
  - 🔥 NREL (40 x 40 km), Long term monthly average
  - 🔥 NASA (110 x 80 km), Long term monthly average
  - 🔥 HelioClim (4 x 4 km), hourly data
  - 🔥 DLR (2.5 x 2.5 km), hourly data
- 🔥 Satellite Derived maps:
  - 🔥 NREL
  - 🔥 NASA
- 🔥 Satellite Derived data:
  - 🔥 Relatively accurate for GHI and LTI (about 5 % on monthly sums)
  - 🔥 Less accurate for uncorrelated DNI (about 5 – 15% on monthly sums)
  - 🔥 Satellite data that is correlated with ground measured data are more accurate and the correlation can be applied to historic satellite derived data

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Source: CRSES

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# RECORD's Objectives



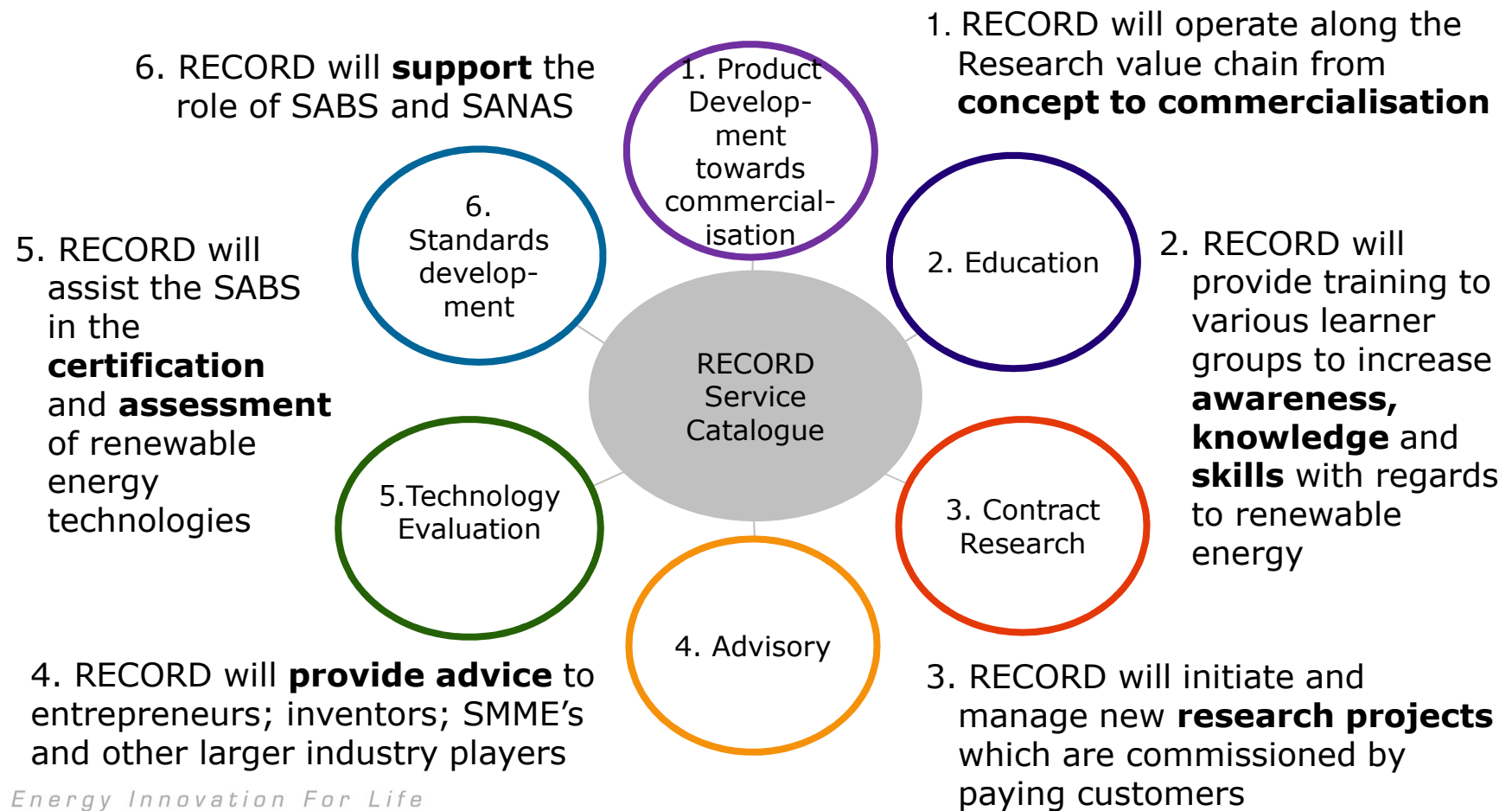
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- ⑥ Maximise **collaboration** regarding renewable energy
- ⑥ Create **science awareness** in the field of renewable energy
- ⑥ Promote the development of a **knowledge skills base**
- ⑥ Launch **commercially viable businesses** that can be self sustaining entities
- ⑥ Advance **scientific research**

## Six Service Categories have been identified as RECORD's Service offering to their Stakeholders



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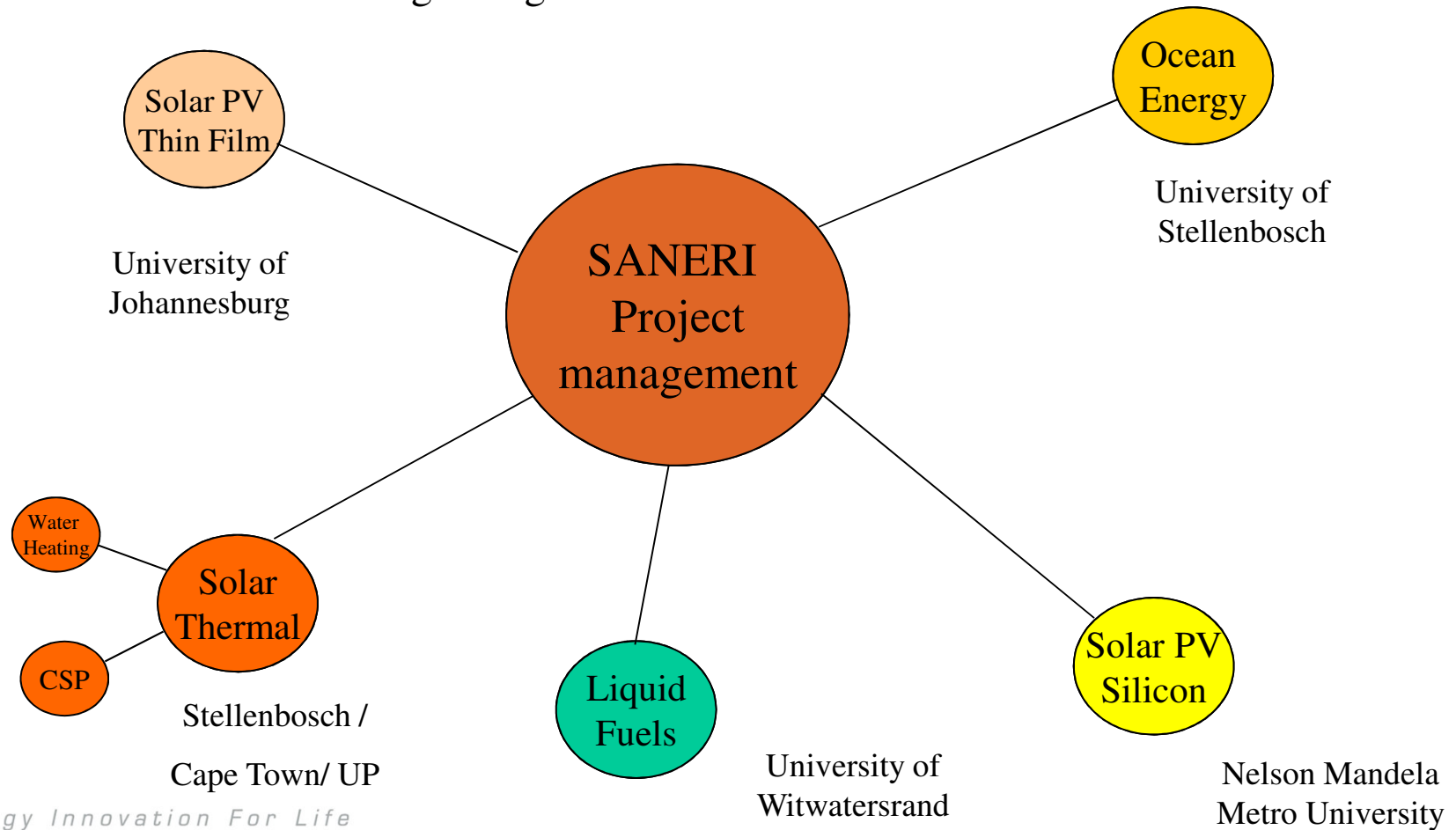
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# Institutional Framework (RE Research Demo Centres)



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Centre will build on existing strengths from different universities





# RE Research and Demonstration Centre



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- 🔥 Test Facility
  - 🔥 Outdoor test beds to characterize the performance and reliability of solar systems
  - 🔥 Indoor testing (environmental, accelerated testing, module characterisation)
  - 🔥 Met station (to collect high-quality solar resource and surface meteorological data)
- 🔥 R&D – demo
  - (localisation) development of new designs and manufacturing processes for solar components
- 🔥 Training – technicians, graduates and post graduates
  - artisan (welders, electricians, installers, operators)

In partnership with NREL and other institutions (SAWS, DST, Eskom)

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# Thank You



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*First solar traffic light intersection installed by SANERI /  
NEEA in 2007 in Cape Town*