

# The South African Solar Thermal Technology Road Map

Direction for South Africa's solar thermal energy future  
A Discussion Document



UNIVERSITEIT  
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CENTRE FOR RENEWABLE &  
SUSTAINABLE ENERGY STUDIES

*sessa*   
SUSTAINABLE ENERGY SOCIETY  
SOUTHERN AFRICA



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## About Soltrain

The Austrian Development Agency (ADA) and AEE - INTEC (Institute for Sustainable Technologies from Austria) set up a 3-year solar thermal energy project in cooperation with Southern African educational institutions, renewable energy institutions and companies in South Africa, Mozambique, Namibia and Zimbabwe. Soltrain 2 builds on a previous project, which ran from 2009 – 2012.

The main activities of SOLTRAIN 2 are **focused awareness campaigns** on solar thermal systems to inform all relevant stakeholders and the interested population about the different applications of solar thermal energy and the related impact on security of energy supply, poverty, employment and on the environment.

Another major activity is to implement a sustainable institutional structure and focal points for solar thermal information, training, support for industry and policy as well as for applied research. These **Centres of Competence** will be implemented in institutions of higher education in each country. The Centres of Competence are going to carry out a comprehensive training programme, ranging from practical hands-on training to University level courses.

Furthermore “**Solar Thermal Technology Platforms**” (STTP) will be implemented into all Centres of Competence in each partner country. These national platforms will be cross-linked to a Southern African Solar Thermal Technology Platform in order to enhance the information exchange and the cooperation between the platforms.

In order to apply the knowledge gained during the training courses, and to increase the public awareness, **40 - 50 solar thermal demonstration systems** of different sizes and applications will be installed at social institutions and small and medium enterprises.

## About CRSES

The Centre for Renewable and Sustainable Energy Studies (CRSES) was established in 2006 and is currently partly funded by the Department of Science and Technology (DST) through the Postgraduate Programme in Renewable and Sustainable Energy Studies. The Hub of the Programme is in the Faculty of Engineering at Stellenbosch University in collaboration with other departments and institutes within the University structure, as well as the Sustainability Institute (SI), which is based at Lynedoch outside Stellenbosch.

***Our Vision** is that Stellenbosch University is recognised as the leading, best-known and most productive research and teaching university in the field of renewable energy in Africa facilitated by the Centre for Renewable and Sustainable Energy Studies.*

## About Sessa

The Sustainable Energy Society of Southern Africa or SESSA, is dedicated to the use of renewable energy and energy efficiency including all solar-based energies such as photovoltaics, thermal heating and cooling, wind, biomass and hydro power. These principle sources of energy can be used in passive building design and in energy efficiency projects.

The inter-disciplinary nature of SESSA attracts the membership of industry, scientists, researchers, developers and the general public – the only qualification is a keen interest in renewable energy and its utilization to ensure a sustainable energy future.

SESSA was founded in 1974 and is one of 50 National Sections of the International Solar Energy Society (ISES). ISES is regarded as the premier body in solar energy with members in over 100 countries. SESSA is the duly appointed African office of ISES.

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WORKING DOCUMENT

## Foreword

The current use of fossil fuels for the majority of South Africa's energy needs is economically, socially and environmentally unsustainable. A significant percentage of final energy used in the industrial, commercial and residential sectors is for heat and with South Africa's unexploited higher than average solar resource, solar thermal energy can play a large part in our path to an independent, low carbon and sustainable energy future.

This roadmap attempts to document the progress made in the use of solar thermal technology in South Africa and gives an analysis of the technological, legislative, regulatory and other barriers that need to be overcome to accelerate the deployment of this technology in South Africa.

Achieving this roadmap's vision will require an effective, long-term and balanced policy effort to allow for optimal technology progress, cost reduction and ramp-up of industrial manufacturing for mass deployment. The South African Government will need to provide long-term targets and supporting policies to build confidence for investment in manufacturing capacity and deployment of solar thermal systems.

This is a discussion document. Please feel free to distribute widely and send all comments, corrections and additions to [karink@sun.ac.za](mailto:karink@sun.ac.za). An interactive workshop on this Roadmap will be held on 27 November 2014 at the Breakwater Lodge, Cape Town, where this document will be finalised and adopted.

## Key findings and actions

To be completed after the workshop of 27 November 2014.

WORKING DOCUMENT

## 1. Background

The South African Solar Thermal Technology Roadmap (SA STTRM) is a project within the South African Solar Thermal Technology Platform (SA-STTP), which forms part of the SOLTRAIN 2 project.

The SA-STTP supports the switch from fossil fuels to sustainable solar energy sources for applications such as water heating, (solar) cooling, process heat and low temperature steam.

The SA-STTP brings together all interested parties from academia, government, financiers, end-users and industry to;

- Share information on technical, practical and financial aspects of solar thermal energy
- Identify knowledge gaps and opportunities
- Mobilise institutions or individuals to do the required research
- Disseminate the results and keep record of the roll-out of solar thermal energy systems in the country

The SA-STTP furthermore links with a Southern African STTP as well as the STTP in Europe.

The SA STRM outlines the path to arrive at the Vision of the SA-STTP, namely;

***To have ½ m<sup>2</sup> of solar thermal collector area for every member of the population by 2030 in South Africa. (Circa 30 10<sup>6</sup> m<sup>2</sup> by 2030).***

The estimated population in South Africa for 2030 is between 54 and 68 million<sup>1 2 3</sup>

From this, the target for solar thermal installations by 2030, according to the vision of the SA-STTP, is 30 million m<sup>2</sup> (if the population is taken at 60 million for 2030)

The estimated solar thermal installations at the end of 2014 is at least 2 277 835 m<sup>2</sup>, made of by the following<sup>4</sup>;

- Low Pressure Residential Solar Water Heating (1 m<sup>2</sup> per unit): 200 000 m<sup>2</sup>
- High Pressure Residential Solar Water Heating (4 m<sup>2</sup> per unit): 1 200 000 m<sup>2</sup>
- Multi Family Homes Solar Water Heating (10m<sup>2</sup> per unit): 10 635 m<sup>2</sup>
- Industrial / Commercial installations for Solar Heating and Cooling (20 m<sup>2</sup> per installation): No available statistics
- Unglazed Swimming Pool Solar Water Heaters: (200 m<sup>2</sup> per unit): 867 000 m<sup>2</sup>
- Solar Heat for Space Heating in Buildings: (4 m<sup>2</sup> per unit): No available statistics
- Solar Passive Design in Buildings: No available statistics

<sup>1</sup> <http://www.timeslive.co.za/local/2011/01/25/south-africa-s-population-to-shrink-after-2030>

<sup>2</sup> [http://www.issafrica.org/uploads/AF7\\_15Oct2013V2.pdf](http://www.issafrica.org/uploads/AF7_15Oct2013V2.pdf)

<sup>3</sup> [http://www.ifs.du.edu/ifs/frm\\_CountryProfile.aspx?Country=ZA](http://www.ifs.du.edu/ifs/frm_CountryProfile.aspx?Country=ZA)

<sup>4</sup> <http://www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2014.pdf>

## Existing legislation, regulations and government targets for South Africa

### Targets

Department of Energy: 1 Million Solar Water Heaters by 2014<sup>5</sup>

The White Paper on Renewable Energy (2003): 10 000GWh of energy to be produced from renewable energy sources by 2013<sup>6</sup>

The South African Government's National Development Plan 2030 has a target of 3 000 000 solar water heaters by 2030<sup>7</sup>

The 2011 Green Economy Accord signed by Government and business reiterates the 2014 target of 1 000 000 solar water heaters, secures the support of the insurance industry for replaced units, and commits to promote the marketing of solar water heaters<sup>8</sup>.

### Regulation and legislation

SANS 10400-XA Energy Efficiency in New Buildings: A minimum of 50% of the annual average heating requirement for hot water must be provided by means other than electric resistance heating or fossil fuels<sup>9</sup>

The Preferential Procurement Policy Framework Act (PPPFA) regulations, which came into effect on the 7 December 2011, empower the Department of Trade and Industry to designate industries, sectors and sub-sectors for local production at a specified level of local content. Solar Water Heater Components have a 70% minimum threshold for local content<sup>10</sup>.

### Rebates

Eskom: Residential solar water heater programme for high pressure solar water heaters<sup>11</sup>

Department of Energy contract programme for low pressure solar water heaters (not in place as yet)

### Programmes

City of Cape Town Solar Water Heater Programme<sup>12</sup>

eThekweni: Shisa Solar<sup>13</sup>

Johannesburg: City Power Solar Water Heating Programme<sup>14</sup>

Nelson Mandela Bay and Ekurhuleni Solar Water Heater Pilot Programmes (currently on hold)

<sup>5</sup> [http://www.energy.gov.za/files/swh\\_frame.html](http://www.energy.gov.za/files/swh_frame.html)

<sup>6</sup> [http://www.energy.gov.za/files/renewables\\_frame.html](http://www.energy.gov.za/files/renewables_frame.html)

<sup>7</sup> <http://www.gov.za/issues/national-development-plan/>

<sup>8</sup> <http://www.gov.za/documents/download.php?f=159756>

<sup>9</sup> <https://www.sabs.co.za/Sectors-and-Services/Services/Energy/index.asp>

<sup>10</sup> [http://www.dti.gov.za/industrial\\_development/ip.jsp](http://www.dti.gov.za/industrial_development/ip.jsp)

<sup>11</sup> [http://www.eskom.co.za/IDM/EskomSolarWaterHeatingProgramme/Pages/Solar\\_Water\\_Heating\\_Programme.aspx](http://www.eskom.co.za/IDM/EskomSolarWaterHeatingProgramme/Pages/Solar_Water_Heating_Programme.aspx)

<sup>12</sup> [http://savingelectricity.org.za/pages/water\\_heaters.php](http://savingelectricity.org.za/pages/water_heaters.php)

<sup>13</sup> <http://www.shisasolar.org.za>

<sup>14</sup> [http://www.joburg.org.za/index.php?option=com\\_content&view=article&id=8304:08102012-launch-of-solar-water-heating-programme-by-city-power&catid=217:press-releases-2013&Itemid=114](http://www.joburg.org.za/index.php?option=com_content&view=article&id=8304:08102012-launch-of-solar-water-heating-programme-by-city-power&catid=217:press-releases-2013&Itemid=114)

## 2. The technology roadmap

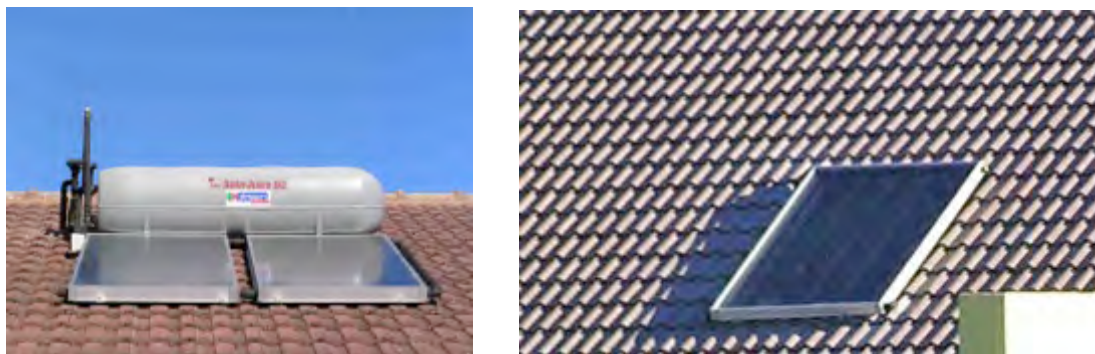
For the purposes of this roadmap, the solar thermal industry in South Africa is divided into sub sections, namely;

- Residential Solar Water Heating
  - High Pressure Residential Solar Water Heating
  - Low Pressure Residential Solar Water Heating
  - Multi Family Homes Solar Water Heating
- Industrial / Commercial Installations for Solar Heating and Cooling
- Unglazed Swimming Pool Solar Water Heaters
- Solar Passive Design in Buildings
  - Solar Heat for Space Heating in Buildings
  - Passive solar heating in buildings

A roadmap for each of these sections is developed below and these roadmaps are then combined in Section 3.



## Roadmap 1: High Pressure Residential Solar Water Heating



**Figure 1: Typical high pressure solar water heaters with flat plate collectors**

High-pressure solar water heaters is the typical technology used by middle to upper income families in residential homes. It consists of a high-pressure water tank, or geyser, and a solar collector.

The solar collector can be flat plate or evacuated tubes, and the transfer of heat to the geyser can be direct or indirect, and circulated by thermo syphon or pumped. The geyser can be installed above the collector outside, or split and installed inside the roof space.

Water is traditionally heated by electric resistance elements in South Africa and the energy to heat hot water typically makes up about 50% of monthly electricity spend. South Africa is blessed with abundant sunshine, and switching to a solar water heater can typically save about 70% of the electricity spend for hot water over a year<sup>15</sup>.

A rebate, based on the potential electricity saving that generally amounts to about one third of the capital cost of the installation, has been available through Eskom since 2008.

An amendment to the National Building Regulations and Building Standards (SANS10400 Part XA: Energy usage in buildings) to introduce requirements for energy usage in buildings came into effect on 9 November 2011. This includes the requirement to install a solar water heater or heat pump in all new buildings where water will be heated<sup>16</sup>.

The City of Cape Town as well as eThekweni Municipality have programmes in place to promote the installations of high-pressure solar water heaters. Nelson Mandela Bay Metropole and Ekurhuleni Municipalities had pilot programmes in place where high-pressure solar water heaters could be paid off via the municipal bill. Both these programmes are on hold at present.

The cost for solar water heaters can be added to a home loan and short-term loans are supported by all the large commercial banks<sup>17 18 19 20</sup>. The insurance industry (the largest procurer of standard geysers in South Africa) supports the switch to solar and actively supports the SWH industry<sup>21 22 23 24 25</sup>.

<sup>15</sup> <http://solarthermalworld.org/sites/gstec/files/Solar%20Market%20-%20South%20Africa.pdf>

<sup>16</sup> <http://www.buildingregulations.co.za/free-downloads/>

<sup>17</sup> [http://www.absa.co.za/Absacoza/Offers/Promotions/Solar?cmpid=PSC\\_BT13101](http://www.absa.co.za/Absacoza/Offers/Promotions/Solar?cmpid=PSC_BT13101)

<sup>18</sup> [http://www.nedbank.co.za/website/content/homeloans\\_microsite/greening.asp](http://www.nedbank.co.za/website/content/homeloans_microsite/greening.asp)

<sup>19</sup> <http://sustainability.standardbank.com/solar-water-heaters/>

<sup>20</sup> <https://www.fnb.co.za/home-loans/building-loan.html>

<sup>21</sup> <http://sustainability.standardbank.com/solar-water-heaters/>

<sup>22</sup> <http://www.nedbankgroup.co.za/sustainEnvironmentFacilitation.asp>

The strong government support, coupled with the financial benefits from installation of a solar water heater, has convinced many entrepreneurs on entering the market significantly growing the supply side<sup>26</sup>. However, all these measures have not been able to convince households in South Africa to install solar water heaters, and the demand remains low.

The total residential geyser market in South Africa is estimated at 450 000 units per year. In the light of this, it should be clear from Figure 2 and Figure 3 that the high-pressure solar heater market is performing well below this potential. The average solar collector area per residential solar water heater installation is estimated at 4 m<sup>2</sup> <sup>27</sup>.

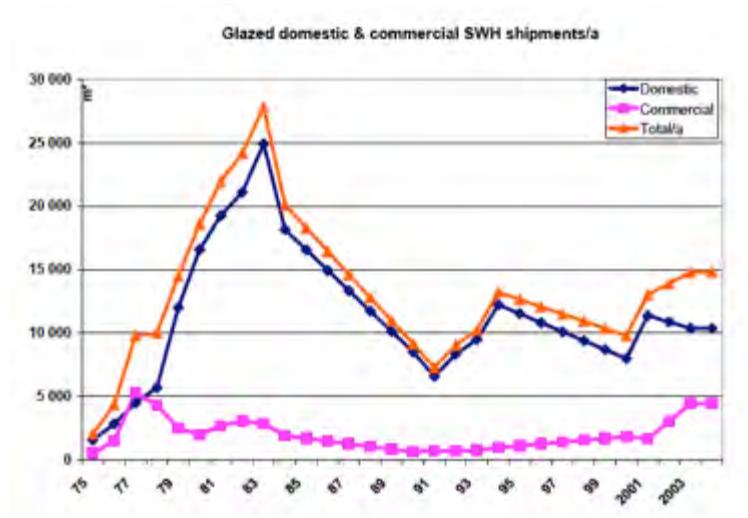


Figure 2: Solar water heater collectors installations in m<sup>2</sup> per year 1975 - 2005<sup>28</sup>

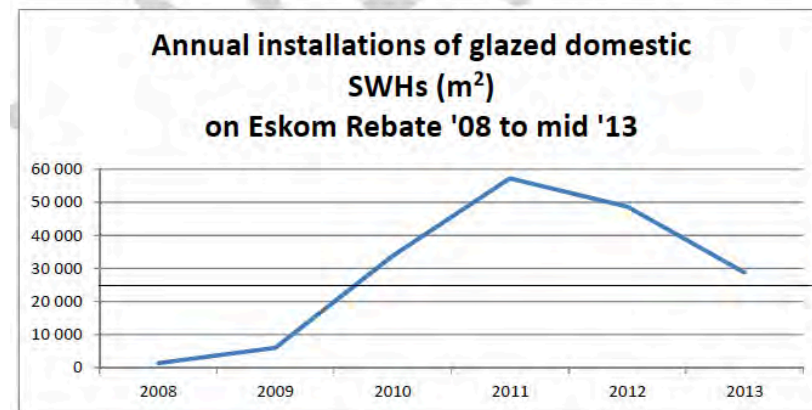


Figure 3: Solar water heater collector installations in m<sup>2</sup> per year on the Eskom rebate 2008 - 2013<sup>29</sup>

<sup>23</sup> <http://www.santam.co.za/about-us/media-centre/sustainability/hot-water-is-going-green-with-santam/>

<sup>24</sup> [http://www.absa.co.za/Absacoza/Offer/Promotions/Solar?cmpid=PSC\\_BT13101](http://www.absa.co.za/Absacoza/Offer/Promotions/Solar?cmpid=PSC_BT13101)

<sup>25</sup> [http://www.thefulcrumgroup.co.za/uploads/files/SAIA\\_Bulletin\\_-\\_May\\_2014\\_+114835.pdf](http://www.thefulcrumgroup.co.za/uploads/files/SAIA_Bulletin_-_May_2014_+114835.pdf)

<sup>26</sup> <http://green-cape.co.za/assets/Uploads/GreenCape-MIR-Energy-Efficiency.pdf>

<sup>27</sup> <http://www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2014.pdf>

<sup>28</sup> <http://solarthermalworld.org/sites/gstec/files/Solar%20Market%20-%20South%20Africa.pdf>

<sup>29</sup> <http://green-cape.co.za/assets/Uploads/GreenCape-MIR-Energy-Efficiency.pdf>

Estimated units installed 2014: ~150 000<sup>24</sup>

Estimated installation area at 4 m<sup>2</sup> per installation: ~600 000 m<sup>2</sup>

Estimated total houses with existing geysers in South Africa for 2009 (potential for solar water heaters at 1 geyser per house at 100% penetration) ~4 200 000<sup>30</sup>

Target for 2030: ~12 000 000 m<sup>2</sup> (3 000 000 units)

To grow the installed area to ~12 000 000 m<sup>2</sup> by 2030, requires a growth rate of 25% per annum on annual installations.

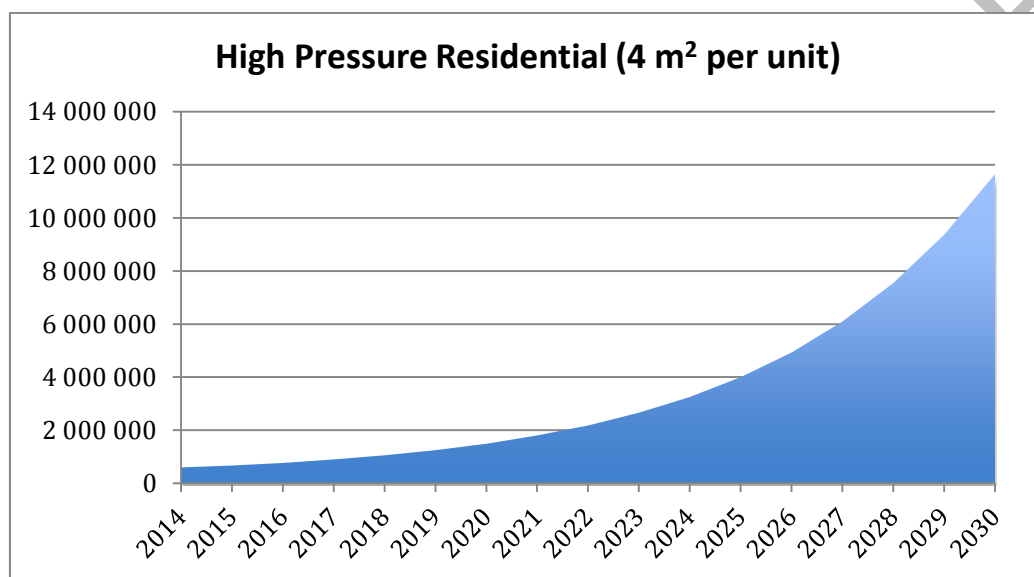


Figure 4: Total estimated installations, high pressure residential 2014 - 2030, with an annual 25% growth rate in installations

<sup>30</sup>[http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCMQFjAB&url=http%3A%2F%2Fsessa.org.za.resources.s3.amazonaws.com%2F5WH\\_DoE\\_High\\_Level\\_%2520Framework\\_Workshop\\_5Nov.pdf&ei=2B1rVOz5PMqM7Abtn4GQCQ&usg=AFQjCNHHC6BnDhtYv4aAfyIMKLZSJ4HUg&bvm=bv.76477589,d.ZGU&cad=rja](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCMQFjAB&url=http%3A%2F%2Fsessa.org.za.resources.s3.amazonaws.com%2F5WH_DoE_High_Level_%2520Framework_Workshop_5Nov.pdf&ei=2B1rVOz5PMqM7Abtn4GQCQ&usg=AFQjCNHHC6BnDhtYv4aAfyIMKLZSJ4HUg&bvm=bv.76477589,d.ZGU&cad=rja)

**Table 1: Industry and Government roles in support of High Pressure Residential Solar Water Heaters**

<b>Awareness and Marketing</b>	
<b>Industry Role</b>	Collect and share consumer satisfaction surveys Develop the needs for marketing campaign
<b>Government Role</b>	Support industry in awareness and marketing Assist and support (financially and through leadership by example) marketing campaign
<b>Institutional Issues</b>	
<b>Industry Role</b>	Insurance sector to take a leading role <sup>31</sup> Banks to actively promote loans for SWHs
<b>Government Role</b>	Continue with the SWH rebate scheme until a sustainable market is established Support the inclusion of component testing <sup>32 33</sup> Regulations for a switch to green hot water at point of geyser failure Regulation for energy efficient water heating at sale of property Support local manufacturing concerns Apply SANS10400 and other relevant legislation consistently at Local Government level
<b>Education and Training</b>	
<b>Industry Role</b>	Ensure all installers well trained and certified Ensure proper maintenance
<b>Government Role</b>	Develop, support and expedite training certification Develop hands on public education
<b>Research and Development</b>	
<b>Industry Role</b>	Support initiatives to collect and share installation statistics Develop more efficient and lower cost collectors Reduce manufacturing cost of collectors, tanks and components
<b>Government Role</b>	Take the lead with collection and sharing of installation statistics in IEA SHC format, and incorporate in annual Stats SA reports Fund R&D in this area Enhance regional alignment of manufacturing and installation standards

<sup>31</sup> [http://www.thefulcrumgroup.co.za/uploads/files/SAIA\\_Bulletin\\_-\\_May\\_2014\\_+114835.pdf](http://www.thefulcrumgroup.co.za/uploads/files/SAIA_Bulletin_-_May_2014_+114835.pdf)

<sup>32</sup> <http://green-cape.co.za/assets/Uploads/energy-efficiency/The-case-for-component-testing-du-plessis-mulcahy.doc>

<sup>33</sup> <http://green-cape.co.za/assets/Uploads/energy-efficiency/Component-testing-for-SWH-120912-1.pdf>

## Roadmap 2: Low Pressure Residential Solar Water Heating



**Figure 5: Typical gravity fed / low-pressure solar water heater with evacuated tube collector**

Gravity fed solar water heaters, also known as low-pressure solar water heaters, represent the typical technology used for water from solar thermal energy in low cost housing developments in South Africa. The hot water tank is fed via a separate feeder-tank with a ball valve to reduce the high pressure of the water from the municipality, and the hot water flows to the house with the pressure from gravity alone. These geysers are always installed on the rooftop and most make use of evacuated tubes to collect the solar heat.

The South African government supported the installation of gravity fed solar water heaters with the Division of Revenue Act Allocations (DoRA) from 2009 – 2011 and a rebate from 2011 to December 2012. About 400 000 units (mostly Chinese imports) were installed with these schemes. A Revised Contracting Model has been designed and would have been rolled out in 2014. Due to the sectoral determination from the Department: Trade and Industry, only units deemed to be locally manufactured will be able to qualify for this programme.

Over and above these national initiatives, some local governments also have installed, and are in the process of installing gravity fed solar water units for low-income households. Some examples are Kuyasa, Joe Slovo<sup>34</sup> and Lwandle<sup>35</sup> in Cape Town, The City of Johannesburg solar water Heating Programme by City Power<sup>36</sup>, Nelson Mandela Bay Metropole's Zanembula Solar Water heater Pilot Project<sup>37</sup> and eThekweni's Low Cost Solar Water Heater Programme<sup>38</sup>

Estimated installations 2014: 400 000

Estimated m<sup>2</sup> of installation area at 1 m<sup>2</sup> per installation: 400 000 m<sup>2</sup>

<sup>34</sup> <http://www.westerncape.gov.za/news/solar-water-heaters-and-partnership-pays-joe-slovo-housing-langa>

<sup>35</sup> [http://lcs-rnet.org/pdf/lcs\\_rnet\\_meetings/2010/ppt\\_p5\\_2\\_3\\_Thorne\\_prst.pdf](http://lcs-rnet.org/pdf/lcs_rnet_meetings/2010/ppt_p5_2_3_Thorne_prst.pdf)

<sup>36</sup> [http://www.joburg.org.za/index.php?option=com\\_content&view=article&id=8304:08102012-launch-of-solar-water-heating-programme-by-city-power&catid=217:press-releases-2013&Itemid=114](http://www.joburg.org.za/index.php?option=com_content&view=article&id=8304:08102012-launch-of-solar-water-heating-programme-by-city-power&catid=217:press-releases-2013&Itemid=114)

<sup>37</sup> <http://www.nelsonmandelabay.gov.za/Content.aspx?objID=425>

<sup>38</sup> [http://www.kznenergy.org.za/download/projects/8\\_eThekweni\\_Energy\\_Office\\_Project\\_Briefing\\_Document\\_Low\\_Cost\\_Solar\\_Water\\_Heaters.pdf](http://www.kznenergy.org.za/download/projects/8_eThekweni_Energy_Office_Project_Briefing_Document_Low_Cost_Solar_Water_Heaters.pdf)

Estimated total houses without geysers in 2009 (potential units at 100% penetration at 1 geyser per house) ~5 300 000<sup>39</sup>

The South African government has committed to install 600 000 units in the next two years. For the purposes of this roadmap, it is presumed that this commitment of 300 000 units per year will be sustained up to 2030, to produce a total installation number of 5 200 000.

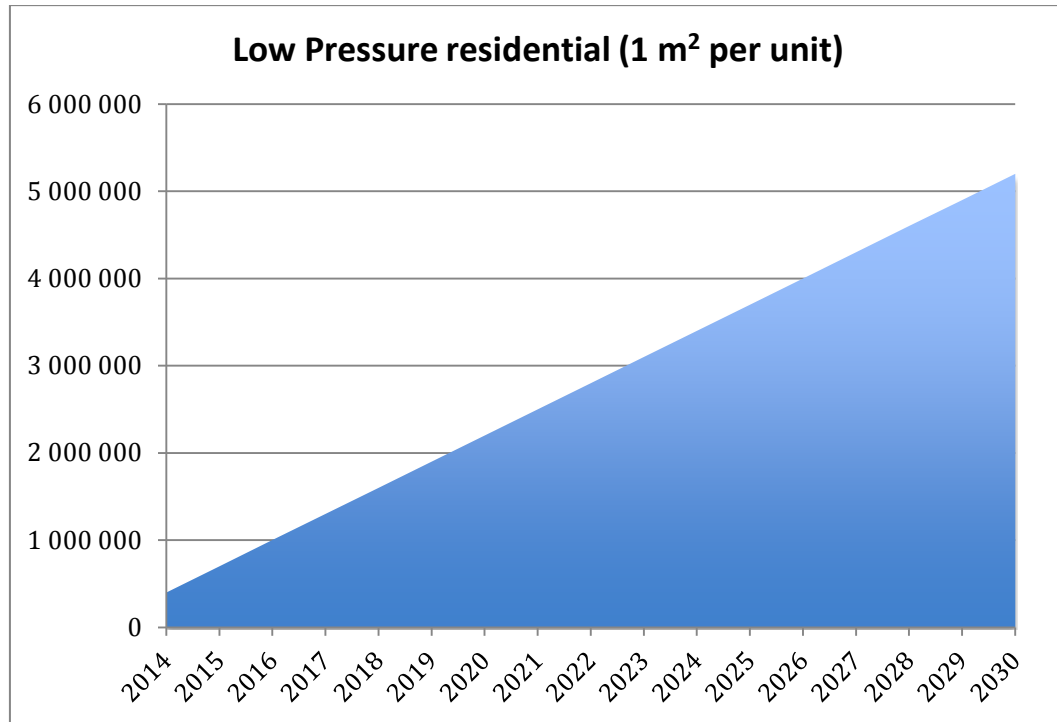


Figure 6: Total installed Gravity Fed solar water heaters in m2 for 2014 – 2030

<sup>39</sup>[http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCMQFjAB&url=http%3A%2F%2Fseesa.org.za.resources.s3.amazonaws.com%2FFSWH\\_DoE\\_High\\_Level\\_%2520Framework\\_Workshop\\_5Nov.pdf&ei=2B1rVOz5PMqM7Abtn4GQCQ&usg=AFQjCNHc6BnDhtYv4aAfyIMKLZSJ4HUG&bvm=bv.76477589,d.ZGU&cad=rja](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCMQFjAB&url=http%3A%2F%2Fseesa.org.za.resources.s3.amazonaws.com%2FFSWH_DoE_High_Level_%2520Framework_Workshop_5Nov.pdf&ei=2B1rVOz5PMqM7Abtn4GQCQ&usg=AFQjCNHc6BnDhtYv4aAfyIMKLZSJ4HUG&bvm=bv.76477589,d.ZGU&cad=rja)

**Table 2: Industry and Government roles in support of Gravity Fed Residential Solar Water heaters**

<b>Awareness and Marketing</b>	
<b>Industry Role</b>	Promote low pressure SWHs in low income communities
<b>Government Role</b>	Promote low pressure SWHs in low income communities
<b>Institutional Issues</b>	
<b>Industry Role</b>	Develop manufacturing facilities for low pressure systems, especially collectors
<b>Government Role</b>	Put measures in place for the roll out of 300 000 units per year on an on-going, sustainable basis Enforce local manufacturing requirements Enforce SA National Building Regulations on all buildings
<b>Workforce Development</b>	
<b>Industry Role</b>	Ensure oversight from qualified installers
<b>Government Role</b>	Support training and certification of installers
<b>Research and Development</b>	
<b>Industry Role</b>	Develop low cost, low pressure SWHs
<b>Government Role</b>	Support the development of low cost, low pressure SWHs that can be locally manufactured

### Roadmap 3: Multi Family Homes Solar Water Heating



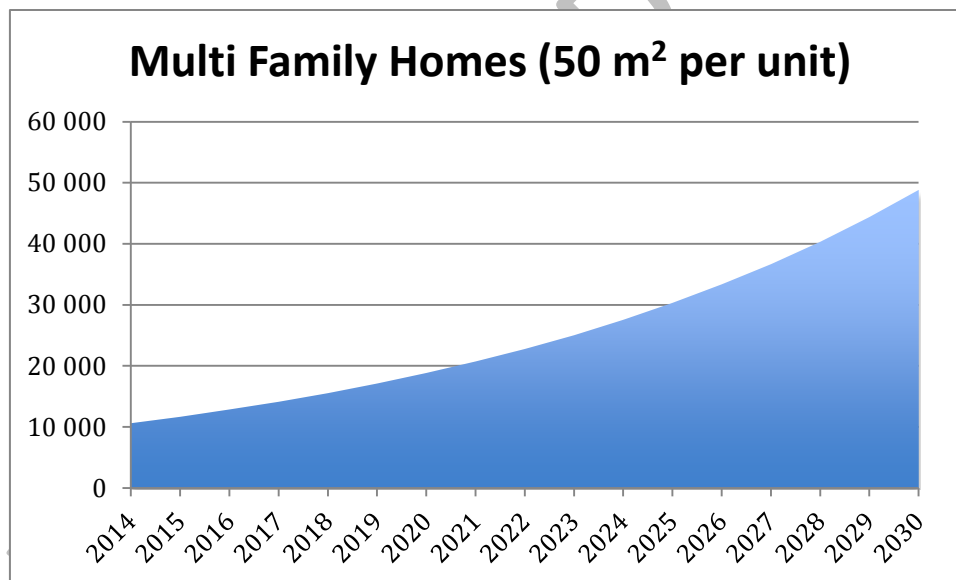
**Figure 7: Typical multi family building solar water heater installation**

Estimated installations 2014: 213<sup>40</sup>

Estimated m<sup>2</sup> of installation area at 50 m<sup>2</sup> per installation: 10 635 m<sup>2</sup>

Estimated number of hotels and multi family homes in South Africa (potential units at 100% penetration at 1 geyser per house) ~???

If this market is grown with 10% per year on total installations, there will be 48 848 m<sup>2</sup> of solar collectors installed by 2030



**Figure 8: Total installations in m<sup>2</sup> for multi family homes and hotels, 2014 – 2030**

<sup>40</sup> <http://www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2014.pdf>



**Table 3: Industry and Government roles in support of Multi Family Home Solar Water Heating**

<b>Awareness and Marketing</b>	
<b>Industry Role</b>	Promote multi-family and larger commercial installations to the building and property development industries Develop the needs for marketing campaign
<b>Government Role</b>	Support industry in awareness and marketing Assist and support marketing campaign
<b>Institutional Issues</b>	
<b>Industry Role</b>	Develop expertise and products for this market
<b>Government Role</b>	Support the inclusion of component testing <sup>41 42</sup> Subsidise testing Regulations for a switch to green hot water at point of conventional electric geyser failure Regulation for energy efficient water heating at sale of property Support local manufacturing concerns
<b>Education and Training</b>	
<b>Industry Role</b>	Ensure all installers well trained and certified Ensure maintenance contracts/procedures
<b>Government Role</b>	Develop and support training certification Develop hands on public education
<b>Research and Development</b>	
<b>Industry Role</b>	Support initiatives to collect and share installation statistics Develop more efficient and lower cost collectors Reduce manufacturing cost of collectors, tanks and components
<b>Government Role</b>	Take the lead with collection and sharing of installation statistics, as above Fund R&D in this area

<sup>41</sup> <http://green-cape.co.za/assets/Uploads/energy-efficiency/The-case-for-component-testing-du-plessis-mulcahy.doc>

<sup>42</sup> <http://green-cape.co.za/assets/Uploads/energy-efficiency/Component-testing-for-SWH-120912-1.pdf>

### Roadmap 4: Industrial / Commercial installations for Solar Heating and Cooling

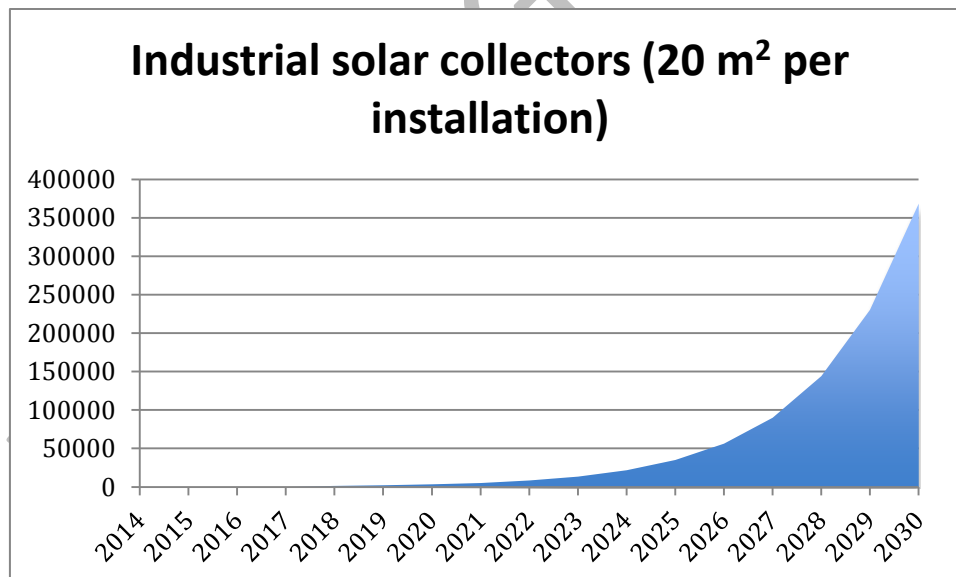


**Figure 9: The world's largest solar thermal installation for industrial application at a copper mine in Chile<sup>43</sup>**

The large percentage of final energy used in South Africa, coupled with the good solar resource, results in a yet to be exploited potential for solar thermal energy for industrial application.

There are no statistics available for this sector and installations are estimated at 10 installations of 20 m<sup>2</sup>, giving a total installed area of 200 m<sup>2</sup> for 2014.

If this market is grown at 60% per year on total installed area from this very low base, a total area of 368 935 m<sup>2</sup> will be installed by 2030.



**Figure 10: Total installed area of solar collectors for industrial applications 2014 - 2030**

<sup>43</sup> <http://solarthermalworld.org/content/275-mw-provide-heat-copper-mine-chile>

**Table 4: Industry and Government roles in support of Industrial Solar Collectors**

<b>Awareness and Marketing</b>	
<b>Industry Role</b>	Develop expertise and products for this application Promote larger systems to industrial clients
<b>Government Role</b>	Implement rebates for large customers as part of a demand side management programme
<b>Institutional Issues</b>	
<b>Industry Role</b>	Insure standard maintenance contracts, and maintenance training
<b>Government Role</b>	Introduce SWH legislation for preheating and industrial/agricultural process heat
<b>Workforce Development</b>	
<b>Industry Role</b>	Train engineers and technicians to design, install and maintain larger systems
<b>Government Role</b>	Support training programmes at the tertiary level of engineers and technicians qualified to design and install large SWH systems
<b>Research and Development</b>	
<b>Industry Role</b>	Develop products and components for local manufacture
<b>Government Role</b>	Support the R&D of local components for the industry Use SWH on parastatal installations

### Roadmap 5: Unglazed Swimming Pool Solar Water Heaters



**Figure 11: Typical rooftop installation of an unglazed swimming pool heater in South Africa**

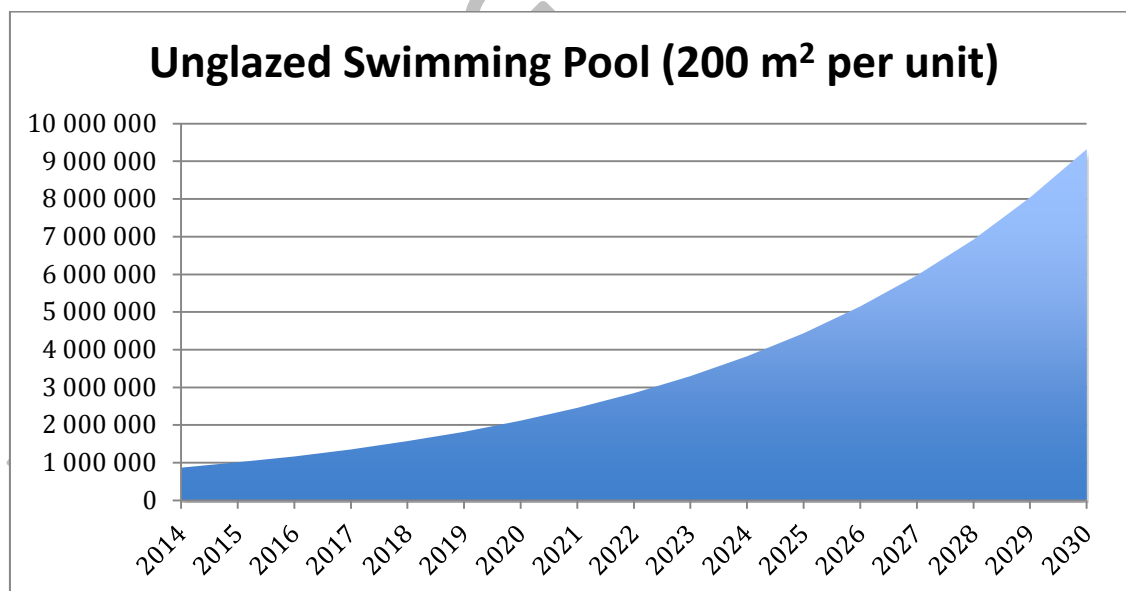
The market for unglazed swimming pool heaters is showing strong growth in South Africa, without any government support or interventions. These heaters consist of an array of thin plastic tubes, usually installed on a roof or any other suitable flat surface. When the pool pump circulates the water through the filtration systems, the water is also circulated through the collector and heats up.

Estimated installations 2014: 4 335<sup>44</sup>

Estimated m<sup>2</sup> of installation area at 20 m<sup>2</sup> per installation: 867 000 m<sup>2</sup>

The number of swimming pools in South Africa is estimated at 800 000<sup>45</sup>

If this market is grown with 17% per year on total installations, there will be 53 451 installations, or 10 690 374 m<sup>2</sup> of solar collectors installed by 2030



**Figure 12: Total installed area of unglazed solar collectors for swimming pool applications 2014 - 2030**

<sup>44</sup> <http://www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2014.pdf>

<sup>45</sup> [http://active.cput.ac.za/energy/past\\_papers/DUE/2008/PPT/DUE%20Conference%20-%20Workshops/Swimming%20Pools/R%20Hill.pdf](http://active.cput.ac.za/energy/past_papers/DUE/2008/PPT/DUE%20Conference%20-%20Workshops/Swimming%20Pools/R%20Hill.pdf)

**Table 5: Industry and Government roles in support of Unglazed Swimming Pool Solar Water Heaters**

<b>Awareness and Marketing</b>	
<b>Industry Role</b>	Promote unglazed collectors for swimming pools
<b>Government Role</b>	Promote unglazed collectors for swimming pools
<b>Institutional Issues</b>	
<b>Industry Role</b>	Develop suitable systems for SA conditions
<b>Government Role</b>	Replace non-solar water heaters with solar on all government installations, public swimming pools
<b>Workforce Development</b>	
<b>Industry Role</b>	Train installers of unglazed systems
<b>Government Role</b>	
<b>Research and Development</b>	
<b>Industry Role</b>	Develop lower cost collectors
<b>Government Role</b>	Support the development of lower cost, locally manufactured collectors

### Roadmap 6: Solar Heat for Space Heating in Buildings

With solar space heating, water is heated with solar collectors and circulated with pipes under the floor or in walls/ceilings for space heating. This technology can be used by the residential, commercial and industrial sectors.

There are no statistics available for solar space heating in South Africa and installations are estimated at a low 100 units of 4 m<sup>2</sup> each, giving an estimated total of 400 m<sup>2</sup> installations in 2014.

If this market is grown from this very low base at 50% of installed area per year, this will result in a total collector area of 262 736 m<sup>2</sup> in 2030.

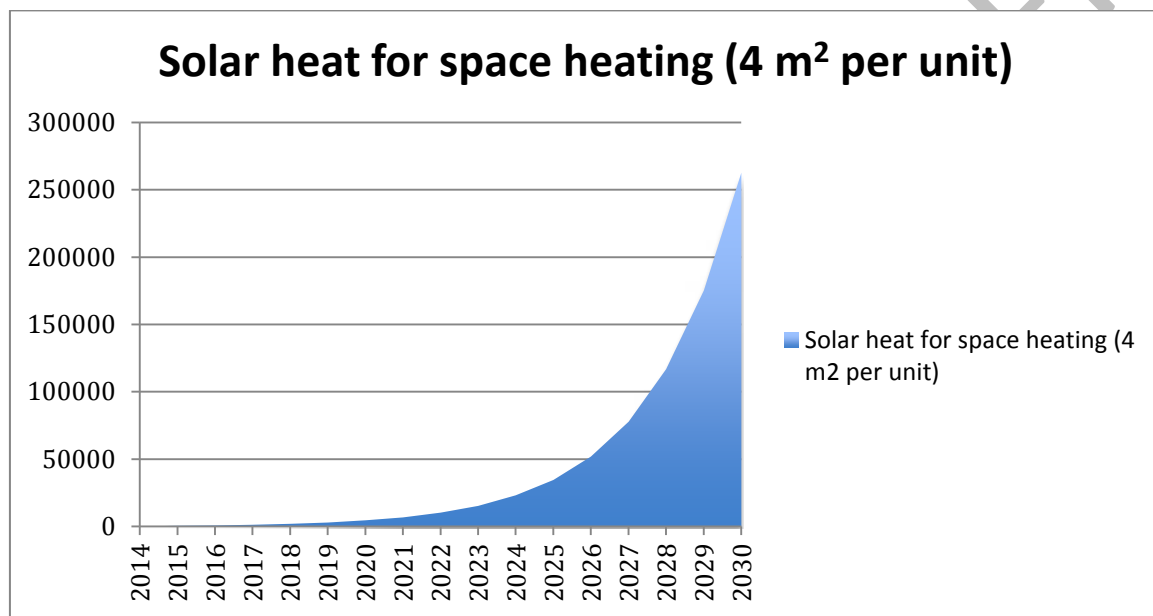


Figure 13: Solar collector area installed for space heating 2014 – 2030

**Table 6: Industry and Government roles in support of Solar Space Heating in Buildings**

<b>Awareness and Marketing</b>	
<b>Industry Role</b>	Promote SWH for space heating
<b>Government Role</b>	Install solar space heating in government buildings to replace electric systems
<b>Institutional Issues</b>	
<b>Industry Role</b>	Develop suitable project for SWH space heating
<b>Government Role</b>	
<b>Workforce Development</b>	
<b>Industry Role</b>	Train installers and maintainers of space heating systems using SWHs
<b>Government Role</b>	
<b>Research and Development</b>	
<b>Industry Role</b>	
<b>Government Role</b>	

### Roadmap 7: Solar Passive Design in Buildings

Solar passive design is the art and science of using the natural forces of a given climate and a building’s orientation, size, disposition and management of building elements in order to achieve indoor comfort while using a minimum of imported energies. Energies flow naturally while the building is in a passive mode – hence passive design.

It pertains to i.a. orientation, window placement, operable windows, thermal mass, insulation and solar chimneys. Passive systems are typically strive to be simple with minimal maintenance. No statistics are currently available for this sector.

**Table 7: Industry and Government roles in support of Passive Solar Heat**

Awareness and Marketing	
Industry Role	
Government Role	
Institutional Issues	
Industry Role	
Government Role	
Workforce Development	
Industry Role	
Government Role	
Research and Development	
Industry Role	
Government Role	



### 3. Combined roadmap and way forward

Table 8: Total installations of solar collectors in m<sup>2</sup>, 2014 – 2030

	High Pressure Residential (4 m <sup>2</sup> per unit)	Gravity Fed residential (1 m <sup>2</sup> per unit)	Multi Family Homes (50 m <sup>2</sup> per unit)	Industrial / commercial (20 m <sup>2</sup> per installation)	Unglazed Swimming Pool (200 m <sup>2</sup> per unit)	Solar heat for space heating (4 m <sup>2</sup> per unit)	Solar Passive Design in Buildings	TOTAL
2014	600 000	400 000	10 635	200	867 000	400		1 880 249
2015	680 000	700 000	11 699	320	1 014 390	600		2 409 024
2016	780 000	1 000 000	12 868	512	1 186 836	900		2 983 133
2017	905 000	1 300 000	14 155	819	1 388 598	1350		3 611 940
2018	1 061 250	1 600 000	15 571	1311	1 624 660	2025		4 306 835
2019	1 256 563	1 900 000	17 128	2097	1 900 852	3038		5 081 696
2020	1 500 703	2 200 000	18 841	3355	2 223 997	4556		5 953 473
2021	1 805 879	2 500 000	20 725	5369	2 602 077	6834		6 942 905
2022	2 187 349	2 800 000	22 797	8590	3 044 430	10252		8 075 439
2023	2 664 186	3 100 000	25 077	13744	3 561 983	15377		9 382 390
2024	3 260 232	3 400 000	27 584	21990	4 167 520	23066		10 902 417
2025	4 005 290	3 700 000	30 343	35184	4 875 999	34599		12 683 440
2026	4 936 613	4 000 000	33 377	56295	5 704 918	51899		14 785 128
2027	6 100 766	4 300 000	36 715	90072	6 674 755	77848		17 282 182
2028	7 555 958	4 600 000	40 386	144115	7 809 463	116772		20 268 722
2029	9 374 947	4 900 000	44 425	230584	9 137 072	175158		23 864 214
2030	11 648 684	5 200 000	48 868	368935	10 690 374	262736		28 221 626

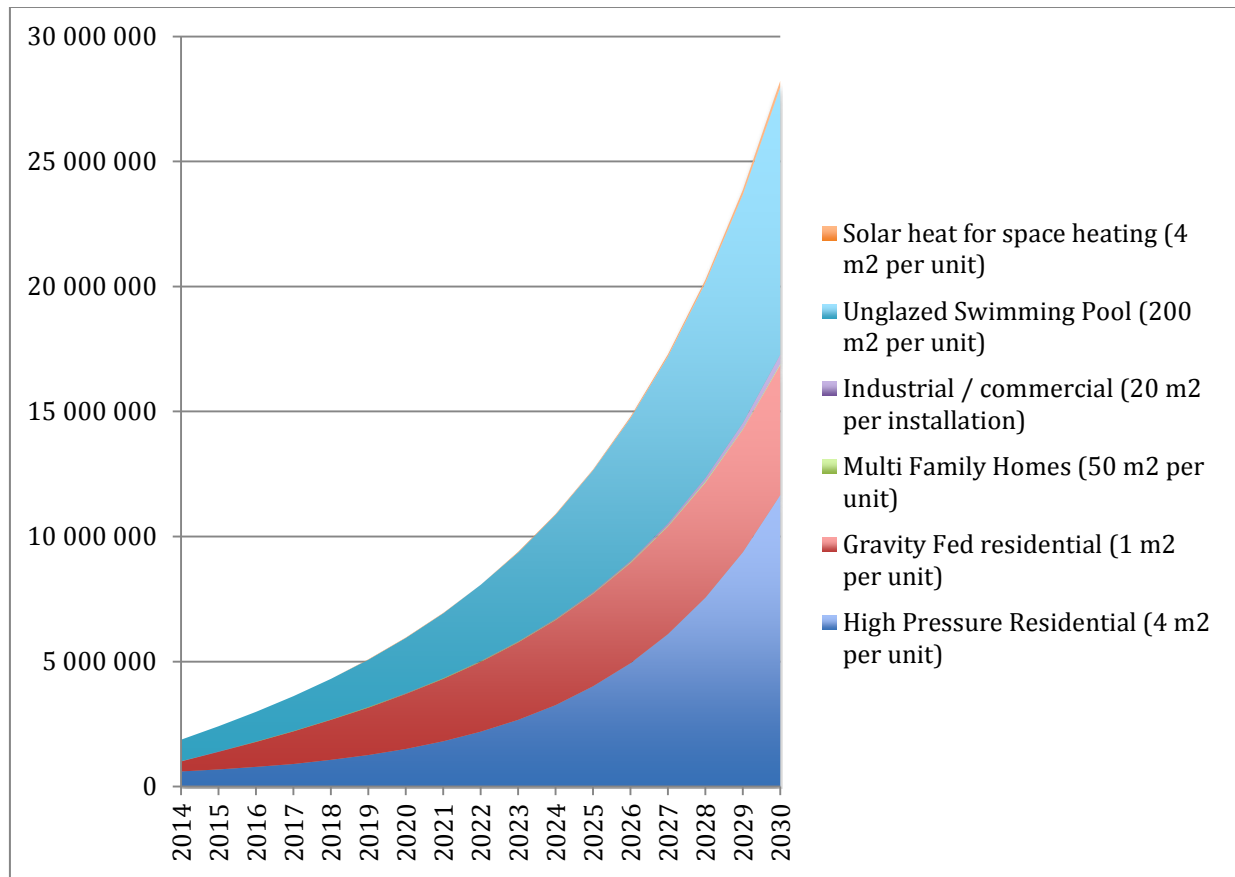


Figure 14: Total installed solar thermal collectors (m<sup>2</sup>), 2014 - 2030

## Appendix 1: Interested Parties

ABSA	Hollard	South African Institute of Architects (SAIA)
Advocate Neville Melville, Consumers Ombudsman	Holms and Friends	South African Local Government Association (SALGA)
AEE-Intec	ICLEI Africa	SANEA
AGS Solar	iLanga Heat	Sanedi
Cape Chamber of Commerce	Ikhwezi Solar	Santam
CEF	Innovation Group	Sessa
CEP Group	Investec	Solac
City of Cape Town	Institute of Plumbing South Africa (IOPSA)	Solahart
City Power	Kayema	Solar Heat Exchangers
Cape Peninsula University of Technology	Kwikot	Solarbeam
City of Cape Town	Lion of Africa	Soldardome
Crest Africa	Masters Artisans Academy	Solar Juice
Centre for Renewable and Sustainable Energy Studies (CRSES)	Master Builders Association	Solar IQ
CSIR	MTech	Solarmax
Department: Energy (DE)	National Solar	Solar Primeg
Department: Science and Technology	National Business Initiative (NBI)	Soltrain
Duratherm	Nedbank	Standard Bank
Department: Trade and Industry (DTI)	Nelson Mandela Metropolitan University (NMMU)	Stellenbosch University
E3	National Regulator for Compulsory Specifications (NRCS)	Suntank
Enervision	North-West University (NWU)	SWH-Mancosa
Energy Research Centre (ERC)	Outsurance	Tasol
Eskom	PowerzOn	Tecron
eThekweni Energy Office	Plumbing Industry Regulation Board (PIRB)	The Copper Alliance
Euroheat	Renaissance Solar	Tshwane University of Technology (TUT)
First National Bank (FNB)	SANCU Clif Johnston	University of Cape Town (UCT)
FOGI	SAPOA	University of Johannesburg (UJ)
Franke	South African Bureau of Standards (SABS)	University of Pretoria (UP)
Frost And Sullivan	South African Insurance Association (SAIA)	Urban Earth
Geyserwise		Watersmith
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)		Western Cape Government (WCG)
GreenCape		WWF
		Xstream Geysers