



## SOLAR WATER HEATING MARKET STUDY FOR THE WESTERN CAPE REPORT SUMMARY

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Prepared for INWENT by OneWorld Sustainable Investments (Pty) Ltd with stakeholder participation.

### Key Participants and Stakeholders:

<b>Industry</b>	Manufacturers and Suppliers: (Atlantic Solar; SA Solar Products; Solardome; Solar Heat Exchange; Suntank Xstream)  Independent Plumbers (11) Independent Electricians (2)  Solarsure & SESSA
<b>Advisors</b>	AGAMA Energy (Glynn Morris)  Sustainable Energy Africa (Mark Borchers)  Cape Town City (Craig Haskins; Monwabisi Boo)
<b>Consultants</b>	Andreas Iliou  Belynda Petrie  Georgy Davis  Sven Kreher
<b>Other</b>	BP SA; Financial institutions (ABSA; Standard Bank); CEF; UNDP



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## Background to the Solar Water Heating Market Study

InWEnt is the third pillar of the German Development Corporation, with a core focus on promoting development through synergies established by the training of people. InWEnt concentrates on the promotion of technological progress and financial support for developing countries in the field of advanced training of experts and managers of its partner institutions and countries. InWEnt enables people to initiate and shape sustainable development in their states, economies and civil societies. This is achieved through practice oriented advanced training programmes, intercultural training, high-ranking policy dialogues and expert panels.

A workshop was held in Cape Town in September 2004 with the purpose of holding a business consultation with entrepreneurs in the Renewable Energy (RE) and Energy Efficiency (EE) sector who have some experience in the industry. Participants explained their specific business support requirements and policy suggestions and in particular were asked to envisage the development of the sector and its future capacity requirements and training needs. The longer-term objective was to design a capacity building programme around the workshop outcomes.

A key opportunity identified in the workshop was to support the Solar water Heating (SWH) Industry and Cape Town City (CTC) to meet its objectives, and in the case of the latter, it's targets.

Based on this outcome, InWEnt designed Terms of Reference and contracted OneWorld Sustainable Investments (OneWorld) to conduct the study. InWEnt's aim was to support a training intervention comprising of a market study for the Western Cape Region. This is based on the envisaged increase of RE application in South Africa as outlined out in the RE White Paper and in particular in view of the marketing initiatives for solar water heaters (SWH) supported by the GEF/UNDP in cooperation with the industry association SolaSure and the Central Energy Fund (CEF).

The key objective is to enhance the capacity of the industry to design, manufacture, install, and maintain reliable SWH technology. It is recognised that the City of Cape Town has introduced concrete RE utilization targets in the Western Cape and a



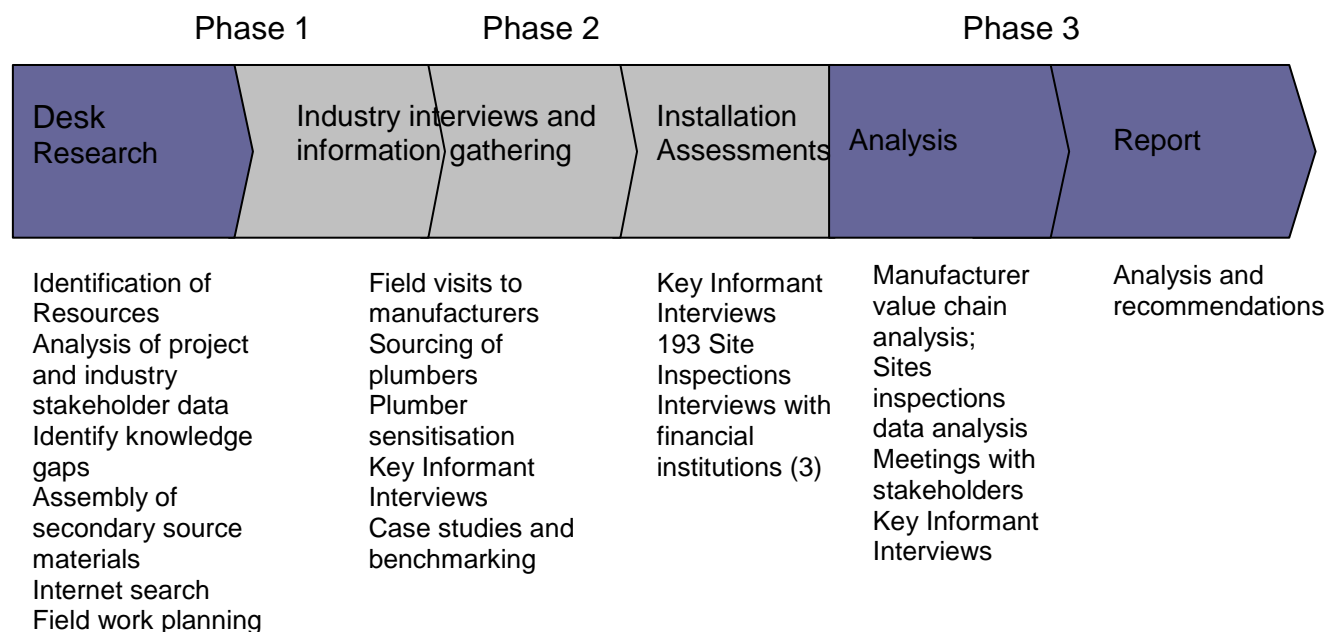
training on market assessment for this Region is an indispensable prerequisite to the City achieving its stated objectives.

**Project terms of reference (Overview)**

Design, development and implementation of the market study with a view to taking the key lessons learnt and replicating / implementing these elsewhere, in conjunction with the SWH industry. The Market Study and resultant report aims to serve as an exercise for the target group encompasses:

- Assessment of the status of a representative number of existing SWH installations (approx. 200) in selected WC sites
- Analyse whether or not the installations are meeting the technical / economic expectations and the reasons for that performance, with special consideration of technical systems quality and skills of people involved
- Determine a realistic market potential and demand structure
- Identify capacity building requirements and mechanisms
- Communicate and publish the result of the market study

The study was conducted in three phases:



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## Report Summary

The market study report summary comprises 3 sections:

- Situation
- Analysis & Complications
- Resolution

### 1. SITUATION

Water heating is a primary provider of hot water as an energy service used for cooking, household washing and cleaning, domestic hygiene, industrial processing and, to a lesser extent, space heating. Electric heaters are currently the primary supplier of this energy service in the South African grid-connected, domestic market and are a direct competitive product to the solar water heater (SWH). Non-grid-connected, domestic markets, primarily use wood and gas-fired systems.

Installed SWHs typically have electrical backup, unless grid connectivity is an issue. Coal-fired water heaters and electrically heated systems are used in the industrial and commercial markets.

While the electric geyser is the key competitor to the SWH (in grid-connected areas) for providing hot water, the primary difference lies in the underpinning energy resource. A SWH system relies on the sun as its primary energy resource and thus can operate independently of the grid. Technical differences between SWHs and electric geysers relate directly to the energy resource difference and on grid / off grid connectivity.

In South Africa the installation and manufacture of electric geysers is a substantial business (480 000 systems per annum of which 40%, or 192 000, are in the replacement geyser market). The average installation is a 150 litre geyser, typically installed in a roof and connected to the household plumbing system. The 150 litre geyser can comfortably maintain a family of four members, although larger homes often install 200l or even larger geysers. The geyser replacement industry alone is significant and is financed, to a large extent, through household insurance claims. The insurance industry is a key driver in the hot water industry in South Africa.



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By comparison, the SWH industry has a substantially smaller nationally installed base, with the Western Cape having between 11 000 and 15 000 installed systems. The bulk of these installations are in the mid- to high-income group, with some low-cost housing initiatives underway.

Awareness and pricing are the primary market drivers. Few are aware of the benefits of SWHs versus geysers (including the insurance industry) and many SWH owners / users that are energy efficiency cognisant, have not had experiences that match their expectations (76% of installations surveyed<sup>1</sup>). SWHs require a capital investment that is typically significantly higher than for electric geysers (3 to 6 times higher) and consumers' default to the cheaper, known alternative.

Economies of scale have not been attained in the SWH supply industry, particularly when viewed in the context of the electric geyser industry. Cost of production is higher and includes an added component in the form of a solar collector. SWHs are not price competitive with an equivalent-sized electric geyser, when making a "like-for-like" comparison. The capital outlay for a SWH is relatively high and insurance industry participation is minimal compared with the electric geyser industry. There are no other financing mechanisms available for this energy service, so financing has to come directly from the household income or reserves.

While the electric geyser industry has the backing of the insurance industry, hence providing for a geyser malfunction guarantee mechanism, the SWH does not benefit from this mechanism and the industry value chain is not focused on maintenance and guarantees.

There are a number of manufacturers and suppliers that operate in the Western Cape, collectively, with between 30 and 40 installations per month. A typical value chain is as per figure 1 below:

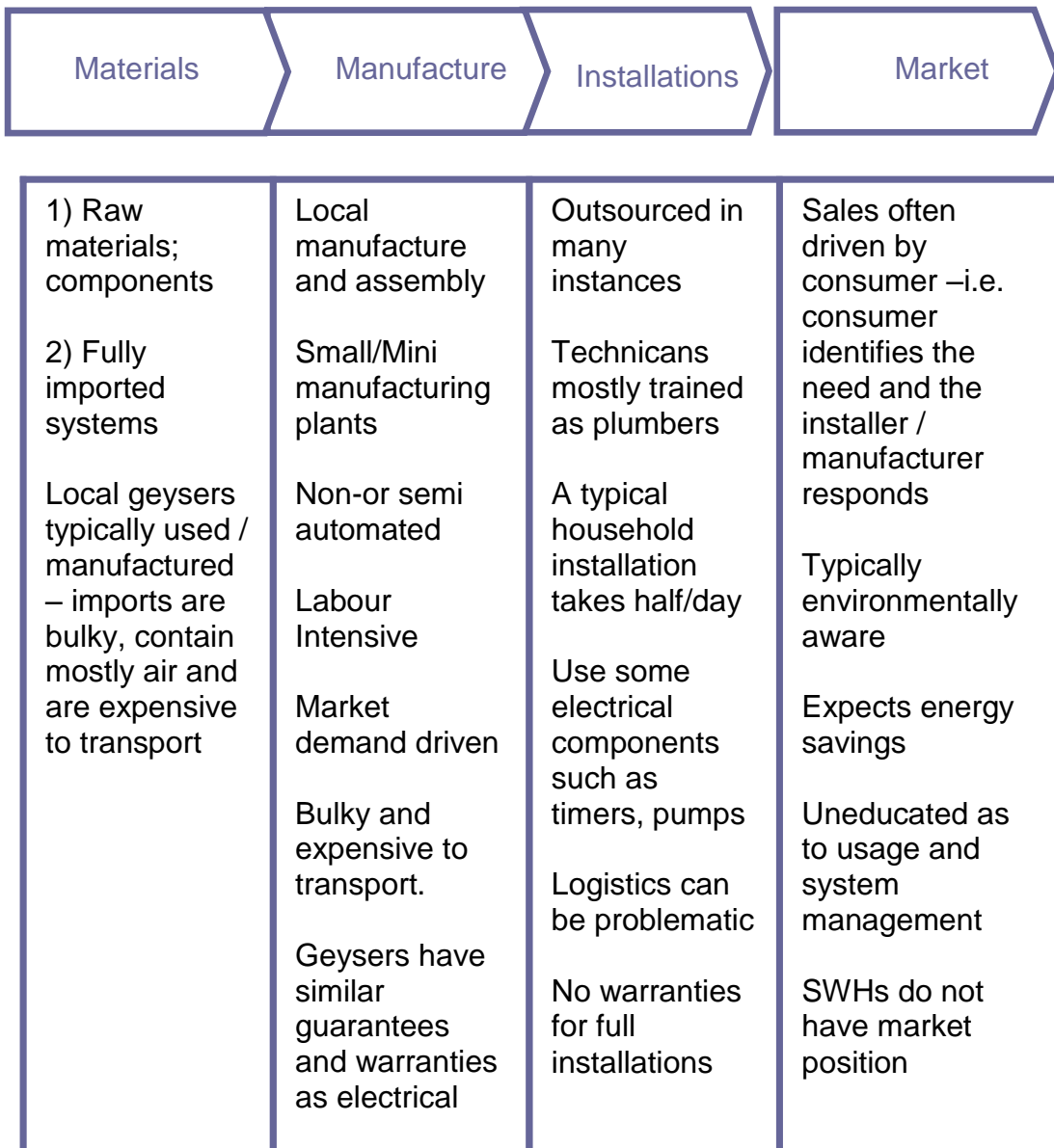
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<sup>1</sup> It is noteworthy that this does not mean that 76% of sites inspected were unhappy with their installations, but rather that there were expectations of greater benefits being derived from the investment.



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*figure 1 : Outline of the typical SWH Value Chain in South Africa*



*Note to figure 1:*

*Maintenance is absent from the value chain as little proactive maintenance and post installation follow up currently occurs in the industry*

The Western Cape suppliers are primarily situated in and around Cape Town, with some being branches of Gauteng-based suppliers. In the case of the latter, offices are frequently sales and installation based, with manufactured supply coming from Gauteng or other parts of the country.

Assessment of the regulatory and supporting environment reveals that:



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- Standards for the industry are not in operation.
- SWHs are currently not a recognised Demand Side Management (DSM) energy efficiency appliance.
- Financing mechanisms to include subsidies and incentives are not in place in the industry.
- Household insurers treat SWH systems in a similar way to electric geyser installations. If a SWH geyser bursts, an assessor is sent out to inspect the installation. If the installation is approved, then the insurer will pay out in accordance with the policy parameters. If it does not pass, then the owner must pay for a corrected installation and then the insurer will pay out for a replacement geyser if required. Collectors are covered for storm damage, burglary etc. Again, replacement is subject to an assessor inspecting the installation. Elements, thermostats, pressure and ball valves and connecting pipes are not covered and hence most leak repairs are for the homeowner's account.
- There is a mixture of imported and locally manufactured systems in the market, with no incentive pushing local manufacture.
- The industry association, Solasure, does not have the capacity to support its stakeholders.
- Insufficient data is available to underpin the payback calculations requisite to the financing mechanism industry. Moreover, existing data is not easily integrated and usable, as it is not in a consistent format.
- Targets exist in the form of the Cape Town City (CTC) Energy Strategy for 10% of domestic systems to be SWH by 2012. This is really just a policy target and is not backed by any regulatory mechanisms, which makes it difficult to enforce.
- Statistics South Africa does not have processes for gathering any renewable energy applications statistics. Therefore, no official baselines exist for assessing progress on local (CTC) or national (Renewable Energy White Paper 2013) targets.
- The CTC target represents a further 66 000 SWH systems by 2012 (i.e. excluding the installed base).
- Other initiatives underway include the UNDP Solar 500 project being implemented nationally by the Central energy Fund (CEF).



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Low-cost housing SWH projects and initiatives are at varying stages of development, with sporadic support from government, with some donor funding and support. These projects are in the low-income housing sector, and exist in spite of no formal government policy framework. They do however particularly exist where housing is subsidised and do not require significant capital outlay by the household.

## 2. ANALYSIS

### Context & Overview

A total of 193 installations were inspected and owners/users interviewed as part of this survey. All the local, CT, and Gauteng-based manufacturers/suppliers were interviewed, which included factory visits. The estimated number of installations in Cape Town and environs is between 16 000 and 20 000. An exact number is indeterminable as the industry has been through severe peaks and troughs, with a boom in the late 1970s and early 1980s, the end of which saw the closure of a number of locally based suppliers. In addition, some existing and long-standing suppliers have not been able to maintain reliable records due, for example, to fire destruction.

An overview of the *international solar thermal industry* focused on selected case study development, where country experience used as a benchmark was considered relevant in the South African and Western Cape context. Case studies included the Philippines, China (in particular Yunnan) and Israel. In addition, financing mechanisms, subsidies and industry value chains were analysed in Austria, Germany and Australia<sup>2</sup>. Relevant highlights of these case studies are in the main body of this report.

Key lessons learned concerned industry value chain structure vis-à-vis quality, standards, payback periods and guarantees, enabling environments and financing mechanisms.

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<sup>2</sup> Full case studies in appendices section





A particular success story took place in the province of Yunnan in Southwest China. This province has a similar population to South Africa (about 45m): it is home to a variety of ethnic groups, it has similar energy security and supply issues to the Western Cape, and it is now home to a highly successful manufacturing industry that no longer depends on government subsidy support. Today, 30% of the province's hot water is provided by SWH and, while provincial government subsidisation (in the form of capital subsidisation of systems for consumers) got the industry on its feet approximately 30 years ago, these subsidies fell away in the 1980s. The industry is of a world-class standard and technologically innovative, with hybrid SWH installations now also catering for space heating (primarily under-floor).

The local industry has, as mentioned, a chequered history and there are a number of positive insights gained from the study:

- Locally manufactured technology is robust and compares favourably with its imported competition.
- Overall, locally used technology stands up against international comparisons.
- There is a good technical skills base in South Africa in terms of design and manufacture.
- Manufacturer/supplier owned installations were of the best systems installations inspected. This was particularly enhanced where the installers/sellers "educated" the user.
- The insurance industry typically does cover the SWH owner for actual replacement costs (with the given parameters) and treats the SWH in the same way same as an electric geyser installation. Most insurance companies do have preferred solar technicians and suppliers.

There is however a number of barriers that the industry faces and local analysis reveals that some proactive interventions are required through the industry value chain. Key barriers have been identified on the consumer as well as the supply sides. Many of these have the potential to be better managed by the industry directly. There are further complications that are specific to the external environment and are, by and large, outside of the industry's control. Many of these issues overlap and should be considered on 2 levels.



## Complications

*Industry specific:*

*Consumer education and awareness*

- Over 80% of households interviewed (of a total base of 193 installations) and systems inspected revealed inefficient usage. This was due primarily to a lack of knowledge as to how to best use a system for maximum energy efficiency. The majority of installations inspected revealed that most installations are done with little or no supporting explanation and advice for “best practice/consumption” usage. Inefficient SWH usage means that households could be doing one or more of the following:
  - Unnecessarily using electricity backup through inadequate attention to showering/bathing patterns
  - Not switching the mains electricity off during hot summer months
  - Not using a timer to “exclude” the electricity backup over peak consumption periods
  - Not being aware of whether the hot water supply is coming from solar or electricity
  - Inefficient water usage
- 
- Analysis of the supply side of the industry revealed that there is little follow up and unless the user contacts the supplier or installer, in most cases, no further contact is made (in over 90% of the cases).
- Furthermore, education and awareness is a broader issue in the non-SWH market, where the perception exists among electric geyser owners and insurance companies that key risks are to do with poor quality and lengthy payback periods. The survey however confirms that the quality issues lie not with the technology, but in the installations.
- Environmental (pollutant) issues are not firmly on the radar screen of the South African population, and the prevailing low-cost electricity situation creates little energy efficiency incentive and drive. A household in the market for a new or



replacement hot water heating system typically does not factor in issues of energy saving, longevity and geysers quality.

*Industry value chain and skills / capacity.*

In addition to inefficiency of household usage and hot water management, many systems inspected were found to be inefficient because of inadequate installation practices. Whilst the manufactured technology in South Africa is generally of a high standard, good installation techniques were found to be lacking in 65% of the installations viewed. The reasons range from the poor placement of the collectors to the quality of pipe works, connections and/or geysers. Some installations require electrical knowledge but have been done by plumbers who typically avoid any electrical aspects on installations such as timers and pumps, which could enhance the performance of the system. Not only do poor installations result in inefficient operation of the SWH, but they also stand to compromise the owners. Insurance will only cover a sound installation and they are mostly basing these by benchmarking against electric installations, which thus in turn, set the standards.

- Non-“supplier owned” installations present an industry problem where installations are primarily done by a contracted plumber (although some manufacturers have their own installation teams). Plumbers are often the primary point of contact between the supplier and the consumer, but few proactively sell SWHs – there is little incentive, as many operate successfully through the geyser replacement industry and are on insurers' “preferred supplier” lists, guaranteeing them a steady revenue flow. In addition, there is an electrical component to many SWH installations that the plumbing community is not familiar with, often resulting in inadequate installations, with significantly reduced functionality. Last but not least, plumbers typically do not communicate the benefits of a SWH system to a potential or existing user, resulting in low efficiency and functionality levels, and fuelling the belief that SWHs are of poor quality and inefficient, with lengthy, “if ever”, payback periods.
- Marketing activity in the industry is minimal and the overall level of marketing investment in relation to revenue and turnover is less than 5%.



- Manufacturing capacity is of concern when analysing the market potential <sup>3</sup>. Any significant market growth will require equivalently significant up scaling of current manufacturing capacity. Processes are not highly automated and achieving scale will require increased levels of automation at substantial investment cost to the industry and its financiers. Manufacturing is also typically (and understandably) demand based, meaning that customers sometimes compete for installations and lose interest or revert to electric geysers that are readily available. The skills base is lower than the current demand requires and, again, any up scaling will require significant skills development and capacity building.

*Industry value chain structure & consumer management / security*

- Few manufacturers manage their own installations and even fewer have proactive maintenance schemes or plans in place. Some sites contacted to enquire as to their availability for SWH inspections were interested simply to the extent that they had maintenance issues and saw the site inspections as an opportunity to resolve these (21 out of 193). While the belief is prevalent that SWHs need no maintenance, survey results indicated that many systems not in use, or not effectively used, had maintenance requirements or issues. Also, the lack of effort in systems maintenance and follow ups, results in systems being less and less effectively used, with decreasing benefit to the owner/user. The latter is frequently unaware of this as he is most often simply using electrical backup and so the need to deal with the issue is reduced on the consumer side.
- Full guarantee and warranty systems are seldom to be found, and manufacturers are reluctant to guarantee systems that are installed at locations logistically difficult to reach from their manufacturing base. Geysers typically have 5 year warranties and thermostats, elements, pressure and ball valves are usually covered for the first 12 month period of a new installation. Collectors also frequently come with a warranty but an entire system installation is seldom covered. Consumers are sometimes faced with the issue of having to go to different players in the value chain to deal with a repair/maintenance issue. The consumer does not always start from a base of knowing where to go to for what.

<sup>3</sup> See market potential analysis section on p32 of the full report



- Some manufacturers use externally supplied components, for example elements or anodes, and will, therefore, not guarantee an entire installation. This places a hassle-and-risk factor on the consumer, who does not enjoy the assurance that a problem is easily rectifiable on a “one-stop-shop” basis.
- The insurer does not cover the homeowner comprehensively if the installation is found to be inadequate. In these instances, the insurer’s assessor inspects the installation pre payout. If the installation is found to be inadequate, the homeowner is required to pay for the rectification of the installation before the insurer will pay for replacement and/or damages. Whilst the same applies to electrical geyser installations, the latter industry has a better-established skills base and insurance companies indicate that a higher incidence of poor installations occurs in the case of SWHs.
- Few suppliers are focused on developing solar solutions for the consumer. Conversions and retrofits in particular require careful planning and design and ultimately, for maximum efficiency and customer satisfaction, this should be an integral part of the service to the consumer.

*Industry related barriers:*

A range of barriers external to the industry’s capacity to exert direct influence exists and must be accommodated in their business models.

- Since SWHs rely on the sun as an energy resource, as opposed to SA’s coal-based grid, SA’s currently *low electricity cost is a market driver*. The cost of electricity in SA is currently amongst the cheapest in the world. In countries such as Germany, where electricity prices are relatively high and sun is available, there is greater long-term financial incentive to install SWHs’.
- In spite of SA’s looming energy capacity crisis, (SA ‘runs out’ of energy generation capacity in 2007), there is *little drive towards energy efficiency measures* amongst SA consumers, both domestic and industrial. Those that have access to electricity believe this to be a constant and are not yet sufficiently threatened by shortages to adopt energy efficient policies and mechanisms in



their businesses and homes. Whilst energy inefficient consumers currently present as a barrier, this could become an industry opportunity should the potential energy crisis become a reality

- *Financing mechanisms are not readily available* to overcome the capital costs of SWHs in South Africa. No government subsidies/incentives are currently in place. Furthermore, whilst SA has progressive leasing finance available through most of the major finance houses, off the shelf product does not currently exist for SWHs. At the same time, the current cost of an installation is typically too high to be readily purchased by the consumer directly.
- *Standards for the industry* are currently inadvertently set by the insurance industry and relate only to installations and not to technology.<sup>4</sup>

### 3. RESOLUTION

The SWH industry has a history and a future in South Africa. However, it has not achieved a position in relation to its competition.

Industry value chain and consumer market analysis clearly highlight two priority issues, namely skills and finance that need to be addressed if the industry is to attain market share and become fully self-sustaining. Whilst the industry related barriers are likely to continue, it is envisaged that a strong focus on resolving those issues, or the aspects thereof that fall within the industry's control, will reduce the impact of the related barriers and stimulate initiatives to resolve these.

The industry supply side has more direct control to exert over the skills factor, but can also play a role to some extent in financing issue. There are secondary issues, such as standards, which are also important and can be addressed in parallel. There is however the danger of focusing on 'fixing' the secondary factors to the detriment of resolving the primary.

#### 31. Skills

The lack of skills and capacity is significant in the installation (supply side) **and** in the consumer education (demand side) components of the value chain. Industry has

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<sup>4</sup> Refer to the Complications section hereto



much to gain from incorporating installations and post installation monitoring in their value chain as well as ensuring a level of consumer education. There is an insufficient base of well-trained installers in the market, particularly where a system installation requires any “non standard” applications. Value chain analysis indicates that suppliers are selling technology rather than solutions. Selling solutions requires a level of control across the value chain and a tighter relationship between the supplier and the end user than is currently evident.

Whether industry ‘owns’ the installation process or not, the skills base is in need of expansion and it is in the supply side of the industry’s interests to drive this as far as possible. An analysis of the job creation aspect of the SWH industry meeting the CTC 10% target indicates that approximately 500 people (direct jobs) would be employed through simply meeting this target.

In terms of demand side management, very few consumer-training programmes exist, either in the form of brochures or by way of thorough explanation by the supplier/installer. There is a distinct problem with the emergent fact that many SWH consumers do not (and do not know how to) use their installed systems efficiently. This has a negative impact on the industry in general, as the communiqué typically is that SWHs are not worth the money spent on them.

Whilst energy efficiency is not on the average South African’s radar screen, resulting in very little attention being paid to the SWH as being an energy efficiency appliance, the survey indicates that the average buyer is environmentally aware. In some cases, the buyer actually intended to save on electricity consumption and thus expenditure. 95% of the users interviewed expected energy savings. The remaining 5% did not know that the SWH is an energy efficient appliance and hence had no related expectations. The implication is that the SWH owner/user (a captive audience) is not SWH educated and this study report moots that this is easily remedied and that it is in the interests of the industry that ownership of direct consumer education is taken by the suppliers, directly or indirectly. This again requires a level of skill and capacity currently not well deployed in the industry.



### 3.2 *Financing*

The lack of adequate financing mechanisms is a key issue that dogs the industry and is typically regarded as being a factor outside of the industry's control. Ideally, suppliers and consumers should stand to benefit from the insurance industry participation in a similar manner to which the electric geyser industry benefits.

For this to happen though, key issues such as SWH payback period calculations on which the insurance industry can rely are critical. Other risk mitigation factors also require assessment and plans and industry standards, specifications and a reliable, functioning industry body are all essential factors. Whilst the SWH supplier base cannot control the insurance industry, it can provide reliable information, specifications, and the unbiased support of an independent industry representative body. The latter is critical and can play, if empowered, a number of roles to include lobbying for SWH to be recognised as an EE appliance, for related government grants, for relevant by-laws and legislation and for industry standards, to mention a few.

Financing through leasing mechanisms is also a possibility where again, industry participation and support is necessary to the lessee having sufficient comfort and security for his finance stream. An obvious option is to develop a simple method of adding the cost of an installed system to the outstanding term of an existing house mortgage. This would facilitate an easy source of finance already available to the homeowner, at minimal extra repayment cost. Another way may be to market systems through the larger furniture and appliance retailers. These companies supply credit to their customers and are well placed to assess risk and to collect payments and are accessible to rural South Africa. A government subsidy could and should also be awarded, including an incentive to encourage conversions from electricity to solar for water heating.

### 3.3 *Role Players*

Industry's role in developing mechanisms such as these proposed and others, would be to develop industry standards and certification thus providing the financing





institutions a greater level of comfort when developing product and assessing finance risk.

On the other hand, financing mechanisms for lenders and a role played by Government in energy efficiency based awareness campaigns and support for the SWH industry through official policy are critical success factors for the exponential growth of the solar water heating industry in South Africa.

To conclude, Industry stands to benefit from, where applicable, a reconsideration of the value chain. Capacity building required is thus identified as lying primarily in the installation aspect of the industry value chain with the development of a strong pool of trained, qualified and accredited installers. Ownership of the activities in that value chain that impact directly on skills and consumer security ideally should reside with the supplier. Given that the actual technology is not at issue (whether assessing locally manufactured systems or imported), this requires a clear focus on selling hot water services / solutions rather than technology.

