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Ready for “My Sun”

The Egyptian Solar Water Heater Industry and its Readiness to Adopt the SHAMCI Quality Certification Scheme

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Acknowledgements

The team of the International Institute for Industrial Environmental Economics (IIIEE) would like to express their deep gratitude towards RCREEE for inviting us to Cairo and being the perfect hosts. Special thanks goes to Dr. Tareq Emtairah, Executive Director of RCREEE, Ms. Nurzat Myrsalieva, Policy Analyst at RCREEE and Eng. Ashraf Kraidy, Senior Expert. Mr. Firas Niaaj deserves our deepest appreciation for taking care for us at any time and organising and coordinating all the interviews with stakeholders.

A big thank you goes to the solar water heater manufacturers and suppliers for welcoming us and patiently answering all our questions. A special thanks goes to NREA, SEDA, and the Egypt National Cleaner Production Centre for their time and cooperation.

To the amazing RCREEE team of interns – Radwa Samy, Rana El-Guindy, Amr Ibrahim, Aymen Trabelsi, Khaled Tawfik, Lina Osman idris, Rana Amgad and Ghassan Jaradet – you are awesome! To our supervisor Mr. Thomas Lindhqvist, thank you for the memories and the great support throughout the whole project.

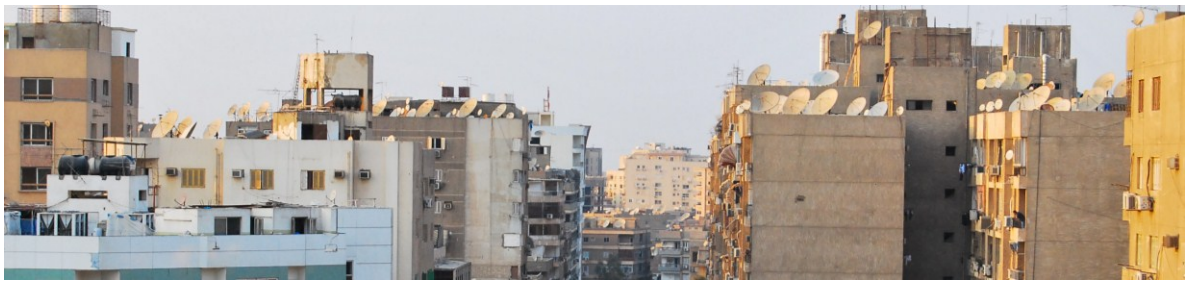
Executive Summary

To ensure high quality solar water heater (SWH) products, and thereby promote and expand their use in the Arab region, the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE) in Cairo is developing a SWH certification scheme called SHAMCI (Solar Heater Arab Marking and Certification Initiative). In cooperation with RCREEE, the IIIEE team has conducted a study to assess the readiness of the Egyptian SWH manufacturers to adopt the SHAMCI certification scheme.

Based on the analysis of the Egyptian SWH market, several challenges and opportunities for the implementation of SHAMCI were identified. The main strengths are that manufacturers are generally positive towards the idea of SHAMCI and there is a high production capacity and capability to produce SWHs of sufficient quality. Opportunities include unstable access to fossil fuels, rising energy prices, upcoming changes to the building code and incentive programmes that favour SWHs. Main weaknesses are product durability issues, tendency to prioritise low cost at the expense of quality and the often poor quality of locally produced sub-components. Threats to the future SWH market include low demand, insufficient governmental support, lack of awareness, lack of cooperation between public entities such as the Ministry of Tourism, Ministry of Housing, Utilities and Urban Development and The Ministry of Industry and Foreign Trade, and the bad reputation of SWHs due to historical quality issues.

The interview findings are summarised in a diagram where companies' attitudes towards SHAMCI and companies' capability to adopt the scheme are measured (see page 16). Manufacturers appear to be willing to adopt SHAMCI, but with varying capability of doing so, while suppliers are fully capable but less willing. As the assessment has shown, the Egyptian manufacturers are ready to adopt the SHAMCI certification scheme and are capable of upgrading their production systems.

The next important steps for a successful implementation of SHAMCI are to ensure that the local testing facilities are capable of conducting all tests in accordance with required standards; promote SHAMCI through marketing and stakeholder engagement; educate and train building sector actors like manufacturers, installers and consulting engineers; ensure that the SHAMCI requirements are compatible with the plans for a future harmonisation with Solar Keymark; and to establish a specific coordinating entity with a clear political mandate as Ministries and authorities need to coordinate their actions regarding the promotion of SHAMCI and SWH demand.



Ready for “My Sun”

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By Albert Orrling, Gabriele Schliwa, Zina Sørensen, Yi Yang

Introduction

Egypt, with more than 80 million inhabitants, is the most populated amongst the Arab Countries. Population growth and urbanisation is already resulting in a high increase in energy demand and stress on the nation’s heavily fossil-fuel based energy supply [1].

The Solar Water Heater (SWH) is a simple and often cost-effective renewable energy technology used for heating water. For Egypt, SWHs can reduce dependency on gas and electricity, reduce CO_2 emissions and increase energy security [1]. However, due to subsidised gas and electricity and the fact that the price for SWHs is still about four times higher, conventional fossil-fuelled water heater systems are still the main source for hot water in Egypt [2]. Issues related to quality and durability have further limited the interest for SWHs in the country.

To ensure high quality SWH products, and thereby promote and expand their use in the Arab region, the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE) in Cairo is developing a SWH certification scheme called SHAMCI (Solar Heater Arab Marking and Certification Initiative). In Arabic, the word means “my sun”. In 2013, the scheme will be piloted in Egypt, Jordan and Tunisia. Prior to the implementation in the pilot country, several assessments are required of the status quo of manufacturers, testing facilities and the market situation.

Task and Approach

The task assigned to the IIIEE team by RCREEE is to assess the readiness of the Egyptian SWH manufacturers to adopt the SHAMCI certification scheme. In cooperation with the RCREEE staff and interns, the SED team has conducted a study aiming to answer the question:

How prepared is the solar water heater industry in Egypt to meet the requirements by SHAMCI and, thus, adopt the certification scheme developed by RCREEE?

Preparation Phase

The study commenced with a preparation phase in Lund, Sweden. A literature review on the topic was conducted, including a case study of the Chinese experience with SWH certification. Based on the research, a questionnaire for semi-structured interviews with manufacturers was developed. The questionnaire consists of two parts: In the first part the manufacturers are asked about their view on chal-

lenges and opportunities for the SWH market in general and for a quality scheme like SHAMCI in particular. The second part addresses the readiness of the current management system to adopt to SHAMCI and is based on the SHAMCI inventory list. For the entire questionnaire, please see Appendix A.

Interviews and Site Visits

On-site in Cairo, an in-situ assessment of four SWH manufacturers and two suppliers was carried out. The first part of the interview focused on the manufacturers' and suppliers' attitude towards quality certification, perceived potential benefits and obstacles, and to what extent help is needed to adopt SHAMCI.

As management systems are crucial for ensuring consistent quality in industrial production, SHAMCI places demands on management systems. The second part of the investigation focused on how well manufacturers' management systems meet these demands today.

Recommendations:
Assessment in the next Pilot Countries

- Send a SHAMCI information brochure prior to the interviews
- Ensure that interviewed companies represent higher as well as lower end of manufacturers in the market
- Keep suppliers included in the assessment to get a balanced view
- Avoid leading questions during the interviews

Part I: Attitudes, challenges & opportunities

The interviews were followed by the third step, a walk-through assessment of the production site. Particular attention was put on documentation procedures, like check lists at the workshops.

Part III: Walk-through of production site

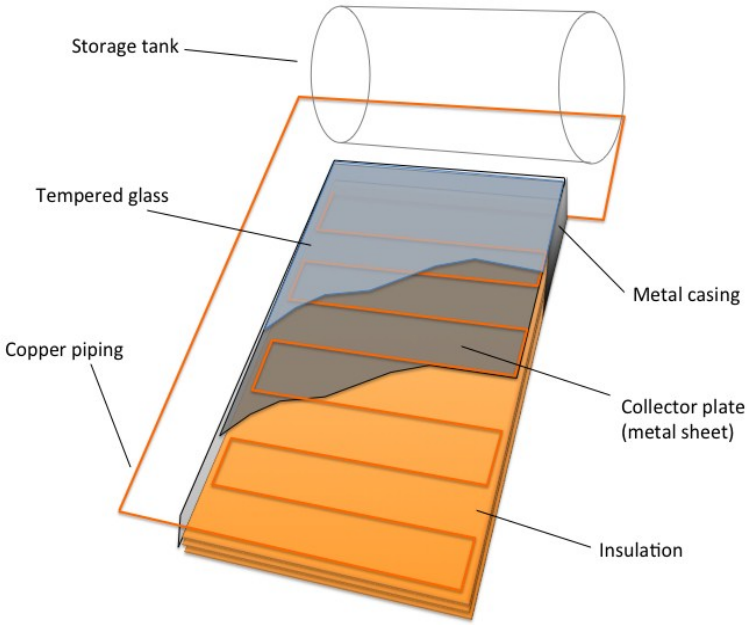
Visits to relevant authorities like the Egypt National Cleaner Production Centre and the New and Renewable Energy Authority (NREA) supplemented the research.

Data Analysis

The data collected during the interviews was transcribed, anonymised, categorised and ranked according to frequency. Please see Appendix B for the data analysis of interview outcomes. A case study of the successful implementation of a SWH quality scheme in China will be presented in the background section to complement and support our recommendations.

Simplified design of a flat-plate collector, thermosyphon SWH.

The medium is heated running through a pipe circuit attached to collector metal sheets inside a flat, glazed-top, insulated bottom metal box.



Background

Solar Water Heaters - Technology

Solar water heaters (SWHs) catch the radiation of the sun and turn it into heat stored in water. SWH systems can be used on a small (households) or large scale (district heating, industry, commercial buildings).

There are mainly two types of solar thermal collectors: flat-plate collectors and evacuated tubes. The basic principle of both is that a cool medium fluid enters a collector exposed to the sky, inside which it absorbs the energy of the sunlight as heat via a number of intermediate transmission components. This report mainly concerns flat-plate collectors as they dominate the Egyptian market as well as the production of the interviewed companies.

Evacuated tube collectors comprise a set of parallel, double tubes, using vacuum to achieve higher heat transfer efficiency than in flat-plate collectors [2]. Both collector types may be used in either a closed loop or open system. In a closed loop system, the heated medium fluid passes through a heat exchanger that transfers the heat energy over to tap water inside a storage tank, while the medium returns into the collector. In an open system, the tap water *is* the medium that is passed through the collector and stored in the tank.

Flatplate & evacuated tube SWHs (thermosyphon)

Both system types are being used in Egypt. There may be a central storage tank receiving heat from many collectors, or each SWH may be a separate unit with its own tank. The latter type is known as *thermosyphon*. Closed-loop thermosyphons use natural heat convection to circulate the medium through collector and heat exchanger, thus requiring no pumping [2].

An Egyptian SWH in operation

The SWH Industry in Egypt

Egypt is located in the world's solar belt. According to the Solar Energy Development Association (SEDA), the country enjoys 2900 to 3200 hours of sunshine annually with an energy density between 1970 and 3200 kWh/m^2 [3]. Hence, there is an unexplored economic and environmental opportunity for Egypt to expand and develop its solar thermal industry. The Egyptian energy market is still dominated by the use of fossil fuels, which cover 96% of the energy demand. Fossil fuels are highly subsidised. In the fiscal year 2011/12, government subsidies amounted to EUR 12.4 billion [4]. The total number of SWH manufacturers operating in Egypt is not clear and varies among different sources as many manufacturers have workshops ready to produce but are waiting for demand to pick-up. According to SEDA, there are about forty SWH manufacturers and suppliers on the market but only nine manufacturers are actually producing at the moment [5]. NREA states that there are twenty manufacturers of SWHs. Out of these twenty companies, three are able to produce SWHs entirely without external supply of components.

Application of SWH in Egypt

In the Egyptian market, SWHs compete with cheaper conventional systems such as electric water heaters, gas-fired water heaters and liquefied petroleum gas (LPG)-fired water heaters. Estimations of the number of installed units of SWH systems vary between 25 000 [5] and 400 000 units [1] each with a typical collector surface of 2 m^2. The most widely used type of SWH in Egypt is the direct passive thermosyphon system with flat-plate collectors (about 90%) [2].

Legislation Background

Egypt's policies so far have failed to provide effective incentives to promote use of SWHs. The Ministry of Housing, Utilities and Urban Development introduced a solar obligation (Decree N. 401/1987) that required SWHs to be used in new buildings. However, it was never properly enforced [2]. Contractors have found ways to pass the initial verification and install electric water heaters instead.

Incentive Programmes

The most recent solar initiative is called EGY-SOL and was initiated by the Italian Government, United Nations Environmental Programme (UNEP) and NREA and implemented within the "Mediterranean Renewable Energy Programme" (MEDREP). The initiative's aim is to install 4 000 m^2 of solar thermal systems for hot water demand using a fund of USD 500 000. The fund provides a 25% capital cost subsidy and a decreasing subsidy for maintenance for four years [1]. The project is seen as a major failure because subsidies were linked to the European Solar Keymark certification but only very few local manufacturers met this requirement. Instead, products were imported without any benefit for the local manufacturing industry. The project is still in effect. So far 40% of the funding has been used.

Current Certification and SHAMCI

There is no mandatory certification in Egypt or in most other Arab countries. In 1996, the Renewable Energy Testing and Certification Centre (RETCC) was established by the Ministry of Electricity and Energy in cooperation with the European Union. The RETCC operates under NREA and uses the ASHRAE 93/86 Testing Procedures and Egyptian Standards to test and certify solar thermal components and systems. The testing facility does currently not fully comply with international requirements and only a limited number of products have been tested. SHAMCI is a voluntary scheme. However, it can be used as a mandatory criterion to be eligible for subsidies or incentive schemes. The rules of SHAMCI were developed in cooperation with the German Institute for Solar and Heating Technology (SWT), and are based on the Solar Keymark, a voluntary European scheme for SWHs. Solar Keymark is widely recognised and implemented in Europe and beyond. The future aim is to harmonise both systems to further reduce market barriers, facilitate trade between Europe and the Arab countries and to promote SWHs of high quality [6]. The rationale behind introducing SHAMCI to the Arab market and not Solar Keymark is to obtain a less complex, less bureaucratic, and locally accessible procedure for manufacturers [7].

Logos of "SHAMCI" and "Solar Keymark"

SWH Certification in China

China is the biggest SWH producer in the world. The Chinese market accounts for over half of the global market with an annual growth rate of 20% in the last decade [8]. China has made a difficult but eventually successful journey towards a SWH quality certification, which may serve as an interesting example. The certification project in China effectively changed the situation that the whole market was suffering from a bad reputation due to low quality products and declining consumer trust. After almost ten years of implementation, more than twenty manufacturers are certified with more than 50% of their products and certified products now account for over 70% of all products sold on the domestic market. The quality mark itself has also started to become accepted by consumers in surrounding countries such as Vietnam, and was officially recommended by the governments of these countries for bulk procurement [9].

The development of SWH in China started in the 1950s. From the 1970s to 1980s, the main technology used was flat-plate collectors. The flat-plate collector accounted for over 70% of the market share in the early 1990s [10]. Subsequently, the whole glass vacuum solar water heater was developed. This new product took over the market and has dominated it since. A national standard was first established in 1991 and set a market entry threshold for SWHs. It was the only standard in the industry for over thirteen years. The standard was criticised as being too low and responsible for the bad reputation of the industry. At the time, manufacturers had to adopt higher standards in order to export their products since the national standard was lower than international standards.

The Chinese government launched the certification project in 2004. The project comprised of three phases: 1) modification of national standards for SWHs, 2) an upgrade of the national certification body and 3) establishment of the certification labelling scheme "Golden Sun". The last modification of national standards for SWHs took place in 2006.

In the second phase, three certification centres within the country were selected and made responsible for both the national standard and the labelling certification. The testing equipment and method was harmonised in all these centres. Each centre also has a field work team responsible for follow-up and control. The follow-up procedure includes regular announced manufacture inspection visits and randomly selected unannounced inspection visits. The follow-up procedures allow the field work team to ascertain the quality maintenance of certified products.

The third phase of the project is the establishment of the "Golden Sun" certification labelling scheme, which is a voluntary certification scheme with higher standards than the national standard. The scheme requires manufacturers to provide sufficient after-sale service with a qualified and certified team. Once a product fulfils the requirements, permission is granted to place the "Golden Sun" label on the product. The label is proof of excellence in efficiency, performance and quality.

The "Golden Sun" certification scheme is supported by different stakeholders through several measures. The Chinese government provides economic incentives for the manufacturers. Subsidies are made available to manufacturers if their products are certified with "Golden Sun". Furthermore, hotels are eligible for a special subsidy provided by the government if certified products are made a requirement in their procurement. Certified products became mandatory for public procurement in 2006. The United Nations Development Programme and the World Bank have also made certified SWHs mandatory for all World Bank projects procuring SWHs from China. The integrated certification process has made it easier for manufacturers. The Chinese government raised a nation-wide awareness campaign. All these supportive measures and initiatives have led to the success of the "Golden Sun" project [10]

Findings

After the preparation phase, the on-site assessment phase started in Cairo, Egypt. The interviews were conducted between the 8th and 11th of April, 2013. The main interview findings were the following:

Market Situation

Currently, only a small number of SWH manufacturers operate in the Egyptian industry. According to the interviewed manufacturers, the market for SWHs is characterised by low demand, lack of public awareness, threat of low quality and bad reputation, lack of incentives and challenges within the building sector.

Demand. A low demand for SWHs persists in the market despite the foreseen growth in solar energy technology. The low demand is mainly a result of the high price of a SWH system compared to a conventional electric or gas water heater, low gas and electricity prices due to heavy government subsidies and a perceived short durability of current SWH products.

Awareness. There is a lack of public awareness regarding the existence of SWHs in general and

their economic benefits from the lifecycle cost perspective. For example, assuming increasing electricity prices, a SWH system becomes more profitable than an electric water heater after six years. Running costs are negligible [2].

Quality. There is a consensus amongst the manufacturers and suppliers that good quality SWHs are essential for the market. However, the often low quality of domestically available components for SWHs is a major issue. Some manufacturers sacrifice on quality by sourcing low quality components to produce cheap SWHs and survive in the price competitive market. SWHs have suffered from a bad reputation amongst customers due to short durability caused by low quality material and insufficient maintenance. In some cases, SWHs have had to be replaced after just one year. With proper maintenance and care a SWH can be in operation for twenty years.

Legislative framework. Interviewees expressed their dissatisfaction about the insufficient enforcement of the Decree 401/1987 by the Ministry of Housing, Utilities and Urban Development. The current legislative framework for the integration of SWH in new buildings does not seem to be transparent for relevant market actors and requires clarification.

Buildings. There are challenges regarding the compatibility of SWHs and the current building design in Egypt. A frequently mentioned constraint was the lack of roof space for SWH installations due to the proliferation of satellite dishes on roof tops. Resistance to SWHs amongst construction companies, architects, engineers and construction consultants was expressed as a significant barrier to the success of the SWH market. The current building code does not reflect support of renewable energy technologies. There was ambiguous information regarding a government initiative by the Ministry of Housing, Utilities and Urban Development to enforce the use of SWHs in new residential developments. Such regulatory schemes were widely welcomed by the industry as they were deemed to stimulate the market and create demand.

Corrosion of solar water heater tank

Support needed for the Market

The need for several support mechanisms for the SWH market was expressed during the industry assessment.

Public sector engagement. One manufacturer confirmed that 75% of their SWH business came from the tourism sector whilst 25% came from the housing sector. Nonetheless, there was wide consensus that the most promising business opportunities exist in the residential sector, which is largely an untapped market. The residential sector is the most electricity consuming sector in Egypt with an estimated 59 651 out of 140 770 GWh consumed in 2012 [11]. There is a need for the Ministry of Tourism and the Ministry of Housing, Utilities and Urban Development to support the SWH market development through incentive programmes and regulations favouring SWHs. The Ministry of Industry was clearly interested in seeing growth in the SWH industry leading to

employment opportunities and development of the skills of the labour force. A need was expressed for an unbiased institution with a political mandate that could coordinate all activities between stakeholders and facilitate co-operation.

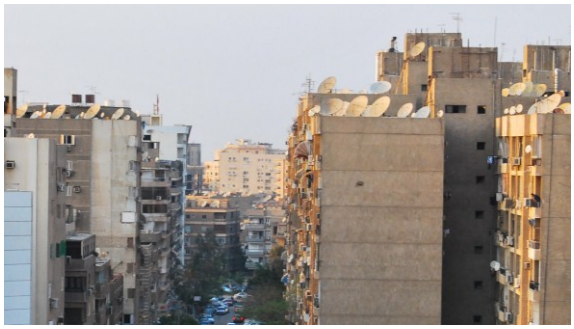
Public awareness campaigns. There is a need for raising the awareness of SWH technology. Households tend not to be familiar with the technology and have grown accustomed to electric and gas heaters. There is also a lack of understanding from the general population of the economical benefits of a SWH when the costs over the lifetime of the product are taken into consideration.

Building sector reform. Raising the awareness of stakeholders within the building sector to overcome the resistance to change was pointed out by manufacturers and suppliers. Rethinking the design of buildings to allow for easy integration of SWHs in buildings is a necessary step forward. It was expressed that the building code should be reformed to include updated rules around design and construction of structures.

Recommendations:
Market - Increasing quality & demand

- Safeguard the success of SHAMCI to assure quality and rebuild consumer trust
- Awareness and promotion campaigns for SWHs in the mass media
- Enforcement of the decree for mandatory SWH in new buildings
- Financial options for customers

Financial support. A need for economic incentives for customers was expressed. The price of a SWH can reach fivefold the price of an electric or gas heater [2]. Installment payments, direct subsidies and low-interest loans were suggested as options to lessen the economic burden on the customer and make SWHs more attractive.



Current building design with satellite dishes

Benefits of SHAMCI

A quality mark for the Arab region was welcomed by the industry, which saw numerous benefits in introducing SHAMCI:

Product quality assurance. By introducing a quality mark that entails compliance with minimum technical standards and certification scheme rules, the overall quality of the producers' management system, production processes, equipment control and end-product will increase. Both industry and customers will be able to benchmark products and, thus, easily identify products of better quality. SHAMCI is seen as an opportunity to restore consumers' trust in the quality and durability of SWH systems and gain a competitive advantage compared to non-certified products.

Reduction of trade barriers. Certified products were viewed as advantageous when it comes to opening markets for export and trade within the Arab region and between the European

Union. Compliance with quality standards and quality labelling schemes is a frequent condition in tenders and the industry in Egypt saw a clear advantage of having their products certified. It was stressed that the quality mark needs to be internationally recognised.

Manufacturer showing quality certified components

Challenges of SHAMCI

Both manufacturers and suppliers expressed concerns regarding the successful implementation of SHAMCI with the current state of low demand being frequently mentioned. Additional concerns were brought up.

Increased material cost. It was noted by industry that compliance with the SHAMCI scheme rules will result in an increase in production material costs. However, it is believed that higher demand would offset the cost increases and economies of scale could be reached quickly.

Lack of knowledge about SHAMCI. Industry felt that more information was needed on the requirements of SHAMCI, as the scheme has not been implemented and detailed information not provided yet.

Efficiency and credibility of the testing body. It was stressed that the testing of the products should be conducted in an efficient, credible and transparent manner. The testing body should be able to test the products' performance according to the SHAMCI certification scheme rules. Currently, the New and Renewable Energy Authority (NREA) is the main body responsible for testing of SWHs.

At the current state, the NREA testing facility is not able to meet the SHAMCI scheme standards for testing requirements of solar collectors and SWHs due to several constraints. There is a need for the testing facilities to be upgraded in terms of equipment, know-how and capacity. According to NREA, an upgrade of the facilities and equipment is expected in 2014 after which the lab aims to become ISO 17025 certified.

International recognition. The Solar Keymark is internationally renowned. Manufacturers' expressed a concern that SHAMCI would not be regarded as compatible or equal with the Solar Keymark but rather as an inferior quality mark for inferior quality products. It was especially stressed by suppliers, who occasionally import SWHs certified with Solar Keymark, that SHAMCI and Solar Keymark need to be treated equally in tenders and governmental incentive programmes.

Support needed to adopt SHAMCI

During the interviews, manufacturers were asked what type of support was required in order to adopt SHAMCI if any. The answers may be helpful for decision makers to better understand where resources should be allocated to address the perceived obstacles of SHAMCI.

Information sharing. SHAMCI has not yet been introduced to the industry. Interviewees urged the responsible actors to share information and details of the certification scheme in a

timely fashion. Stakeholder engagement and participation in the earlier phases of the SHAMCI development process was implied as being important to the appropriateness of the setting of requirements and standards. It is imperative that manufacturers understand the gap between their current state and the SHAMCI standards to better identify areas of improvement and the external support needed to be prepared when SHAMCI is launched.

Capacity-building. The interviewees requested trainings and workshops for capacity building. Specific suggestions revolved around technical know-how and knowledge transfer to train their employees. A need to train installers and maintenance staff was brought up so that the product performance did not suffer due to inadequate installation and maintenance.

Recommendations:
Implementation of SHAMCI

- Upgrade the testing body
- Establishment of unbiased institution with clear political mandate for coordination between stakeholders
- Provide more and detailed information about SHAMCI requirements
- Increasing public sector involvement (e.g. building code)
- Provide capacity building workshops for manufacturers and also suppliers
- Ensure that any distinctions between SHAMCI requirements and Solar Keymark are clearly expressed and the reasons behind are explained
- Ensure that the two schemes are equally treated

Financial support. When asked if financial support was needed to adopt SHAMCI, the majority of the interviewees confirmed that financial support was certainly welcomed but that high demand would be sufficient to adopt the scheme and comply with the scheme requirements. A few interviewees proposed soft loans, direct subsidies and tax reductions as economic incentives that would encourage them to invest in upgrading and up-scaling production and absorbing other costs related to the certification scheme.

Less bureaucracy. Manufacturers highlighted the issue of ease and transparency in the certification process. Authorities involved in the certification process should cooperate in a way that the process is short and simple for the manufacturers and suppliers to follow.

Management System Readiness

During the assessment of the current state of the manufacturers' management system readiness to adopt SHAMCI, it was revealed that three out of four manufacturers have a sufficient management system in place as they were all certified with ISO 9001 for their quality management system. One remaining manufacturer was clearly lacking a functioning management system, documentation routines and production control procedures.

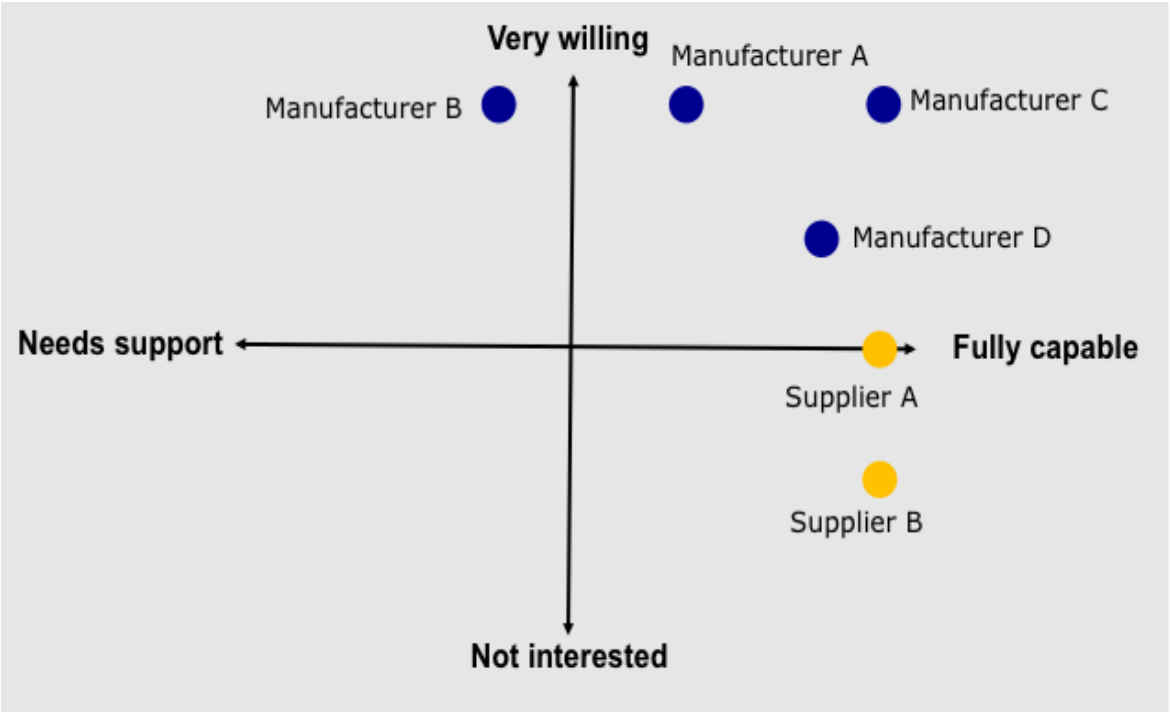
Analysis

Attitude and Capability

Our interview findings are summarised in the diagram where companies' attitudes towards SHAMCI and companies' capability to adopt the scheme are measured. Three out of four manufacturers are fully willing and eager to adopt the scheme once launched. The last manufacturer (D) was positive towards the idea of a certification scheme but preferred to wait with adopting SHAMCI until there was a higher demand for SWHs. Manufacturers' capability to adopt SHAMCI varies from those that would be able to adopt the quality mark immediately (C and D) to those that would need some support in order to reach a level where their products could be certified (B). The two suppliers interviewed both import and sell SWHs certified with Solar Keymark. Thus, the quality standards of SHAMCI will pose no challenge to them. However, suppliers are less willing and interested in SHAMCI certification than manufacturers. Since their products are already certified with Solar Keymark, they question the benefit in adding a less recognised quality mark. To sum up, manufacturers appear to be willing to adopt SHAMCI, but with varying capability to do so, while suppliers are fully capable but less willing.

SWOT Analysis

Based on the analysis of the Egyptian SWH market, internal strengths and weaknesses of the industry as well as external opportunities and threats were identified. The main strengths are that manufacturers are generally positive towards the idea of SHAMCI and there is a high production capacity and capability to produce SWHs of sufficient quality. Main weaknesses are product durability issues, tendency to prioritise low cost at the expense of



Companies' readiness for SHAMCI: Attitude and Capability

quality and the often poor quality of locally produced sub-components. Opportunities include SHAMCI, unstable access to fossil fuels, rising energy prices, upcoming changes to the building code, incentive programmes that favour SWHs, and the fact that SWHs are a generally suitable technology for this region. Threats to the future SWH market include low demand, insufficient governmental support, lack of awareness, lack of cooperation between public entities such as the Ministry of Tourism, Ministry of Housing, Utilities and Urban Development and The Ministry of Industry and Foreign Trade, and the bad reputation of SWHs due to historical quality issues.

Discussion

This study assesses the readiness of SWH manufacturers to adopt SHAMCI, taking their management system, current practice and attitudes as basic benchmarks. As about four out of nine operating manufacturers in Egypt were interviewed, the findings can be considered representative for the market. On the other hand, the companies assessed represent high-end manufacturers. Thus, we can assume that more companies are likely to require more support to adopt SHAMCI. A technical inspection and assessment of the products was not part of the study. Whether manufacturers are ready to be certified with Solar Keymark was not asked, but would have given a more complete picture. The interviews revealed that customers consider warranty, which can range between two and ten years, rather than certification when purchasing a SWH. There are remarkable differences in the product durability claimed by different manufacturers, from four to twenty years depending on conditions and maintenance. Suppliers stressed that longer warranties are offered if linked to maintenance service packages. This raises the question of whether SHAMCI should include a warranty requirement. Durability and maintenance of tanks was stressed as a major concern due to exposure to desalinated water.

Suppliers expressed concerns about a possible exclusion of Solar Keymark on the local market.

Internal	S - Positive attitude towards quality mark - Production capacity - Qualitative capability	W - Low cost prioritised - Low local content - Low quality of locally produced components - Product durability issues
External	O - SHAMCI quality mark - Increasing price of energy - Unstable access to fossil fuels - Adequate technology for local market - New building code - Incentive programmes	T - Low demand - Insufficient governmental support - Lack of stakeholder awareness - Bad reputation due to low quality - Lack of cooperation between public entities - Testing body credibility/efficiency

SWOT Analysis of the Egyptian Solar Water Heater Market

The development of the Tunisian SWH market has shown that it is an effective measure to link subsidy schemes to a quality certification scheme, and similar initiatives are initiated in Egypt. Even though policy measures in Tunisia promoted the use of SWHs, the market collapsed due to low product quality. When quality certification was made mandatory for SWH subsidies, the market recovered and grew.

While SHAMCI is a way to increase demand, increased demand may also be what is required for SHAMCI to be successful. Thus, steps should be taken to stimulate demand, for instance public procurement, building regulations and incentive programmes.

Final Recommendations

As this assessment has shown, the Egyptian manufacturers are ready to adopt the SHAMCI certification scheme and are capable of upgrading their production systems. The next important steps for a successful implementation of SHAMCI are:

- Ensure that the local testing facilities are capable to conduct all tests in accordance with required standards;
- Promote SHAMCI through marketing and stakeholder engagement;
- Capacity-building: educate and train building sector actors like manufacturers, installers and consulting engineers
- Ensure that the SHAMCI requirements are compatible with the plans for a future harmonisation with Solar Keymark; and
- Ministries and authorities need to coordinate their actions regarding the promotion of SHAMCI and SWH demand. Establish a coordinating specific entity with a clear political mandate.

As demonstrated by the Chinese experience with the implementation of the “Golden Sun” quality mark, success is dependent on the following:

- Making SHAMCI a mandatory requirement for subsidies and public procurement tenders.
- Government support is essential. Support measures can be regulatory, economic or information-based.
- Maintaining a highly efficient testing body is important.
- Recurring monitoring and control helps maintain the quality of certified products.
- Simplification of the certification process is an important success factor.

The challenge of the success of SHAMCI lies in the simultaneous stimulation of demand and the building of quality awareness and capacity among manufacturers, suppliers and building sector actors. This in turn requires coordinated cooperation between authorities themselves, and between authorities and industry.

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List of people interviewed

Mr. Abdul-Latif, GMC, Quality Control Manager, 8th April 2013

Mr. Islam Rihan, Olympic Electric, General Manager, 9th April 2013

Mr. Bohgat Eldahesh, Olympic Electric, R&D Manager, 9th April 2013

Dr. Samir S. Ayad, Egyptian Solar Energy Systems Company, President & CEO, 8th April 2013

Eng. Emeel Shafik Yowakem, New & Renewable Energy Authority, General Manager of Testing Dept., 10th April 2013

Eng. Mostafa Mohamed, General Manager for Production, Nova, 13th April 2013

Mr. Mostafa El-Zoghby, Acropol, Chairman & CEO, 8th April 2013

Mr. Sameh Aziz, Solaris, CEO & Managing Director 11th April 2013

Mr. Ali Abo Sena, Egypt National Cleaner Production Center (MIT and UNIDO), Director, 11th April 2013

Appendix A: Questionnaire

RCREEE
Regional Center for Renewable Energy and Energy Efficiency
المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة

iiiee
Internationella Miljöinstitutet

Readiness of Egyptian solar water heater industry for SHAMCI quality scheme

Name of Company:
Location: Person interviewed and position in company: Date:

PART I – General Questions

Block 1: Company Information
I.1.1. What is your core business and product? I.1.2. How long have you been in business? I.1.3. How much do you produce per day/month/year? I.1.4. Do you export your products? Which products do you export?

Block 2: SWH Market and quality scheme
I.2.1. What do you consider to be the **most important issue** in the development of the SWH industry?
I.2.2. What do you consider to be the **major obstacle** in the development of the SWH industry?
I.2.3.a. Do you prefer a quality scheme to be existent in the market or not? I.2.3.b. Is there a demand (from your customers) for certified SWHs? (e.g. Egysol)
I.2.4.a. What **benefits** do you see? (e.g. financial support, technical support, quality assurance, competition, market harmonization and transformation, long term/life cycle thinking) I.2.4.b. What **obstacles** do you see?
I.2.5.a. Are your products ready to be certified with Solar Keymark? I.2.5.b. What type of **support do you need** to reach a level where you will be ready to fully adopt the certification?
I.2.6. How can **other actors/stakeholders** help your business to thrive and grow? (Ministries, SWH association, financial institutions, donors, national agencies,… importance of actor scale 1-3)

I.2.7.a. In your opinion, is there a lack of financial support? Where would it be needed? I.2.7.b. Is a **high demand** enough to be competitive and run your business? How can that be stimulated?
I.2.8.a. Would subsidies (e.g. soft loans) enlarge the market for SWHs? (or e.g. enforcements like building codes?) I.2.8.b. Would you support a decision of **making certification mandatory** for receiving financial support?
I.2.9.a. How many components do you **import** for your products? I.2.9.b. What are the reasons not to source locally produced components? Why? Why not? (e.g. quality) Which components?
I.2.11.a. Do you expect **changes of the product price** in the future **due to increasing demand**? I.2.11.b. Do you expect changes of the product price **due to certification**? E.g. effect on the production costs?
I.2.12.a. Would you as a manufacturer like to join the SHAMCI quality scheme? Yes ☐ No☐ I.2.12.b. What would you require to join the SHAMCI quality scheme? (e.g. subsidies, enforcements, awareness campaigns, capacity building programs)
I.2.13. Do you have any other comments?

PART II: Readiness to adopt SHAMCI quality scheme

Block 1: Quality Management System					
II.1. Does the manufacturer have a Quality Management System such as ISO 9001 or any other? *(The manufacturer should hold a certified quality management system that includes the products in question.)*					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 2: Incoming goods *This section deals with all the materials, components, sub-assemblies and services coming from the suppliers of the manufacturer needed for the production of the products subject to inspection.*	
II.2.1. Do you have an up to date list/bill of the materials (BOM) of the product? *(The manufacturer should have an up-to-date part list/bill of materials (BOM) which summarises all parts needed to build the products subject to the factory inspection.)*	Yes ☐ No☐
II.2.2. Do you have documented specifications for these materials, components, sub-assemblies and services relevant to the product? *(Typical specifications are the thickness and the optical properties (absorptivity and emissivity) of the absorber sheet; These specifications should be part of his quality management system; Technical data sheets of suppliers can be used as internal specifications)*	Yes ☐ No☐

II.2.3. How do you control the quality of products and services that you purchase? *(The manufacturer is obliged to check the incoming goods. The frequency of the checks must be documented within the quality management system and can be defined by the manufacturer.)*					Yes ☐ No☐
II.2.4. Are non-conforming products clearly identified/segregated to prevent unauthorized use? *(The manufacturer should clearly identify/mark or isolate non-conforming materials, components, sub-assemblies and services from the production process to ensure that they are not used within the production.)*					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 3: Production control and routine tests *This section deals with the controls and tests during the production process.*					
II.3.1. Do you have procedures for measuring and testing during the production/assembly process? *(These checks and tests need to be documented within the quality management system.)*					Yes ☐ No☐
II.3.2. Are the results from these tests incl. the decision for the product to be ready for the market clearly documented?					Yes ☐ No☐
II.3.3. Do you have documents like procedures, quality plans, inspection and test instructions, photographs, drawings or samples on all parts that have an impact on the conformity of the finished product? (*The manufacturing staff should have ready up-to-date documents, like as procedures/work instructions, quality plans, inspection and test instructions, photographs, drawings or samples on all those parts that have an impact on the conformity of the finished products.)*					Yes ☐ No☐
I.3.4. Are there appropriate records on all the checks and tests done during the production available? *(In case no records are available the tests are considered as not performed.)*					Yes ☐ No☐
II.3.5.a. Is there a documented procedure describing how to handle non-conforming products? I.3.5.b. Are non-conforming products clearly identified and segregated to prevent their use?					Yes ☐ No☐
II.3.6. Are the trends of the test results monitored and reported to the production and management authorities?					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 4: Calibration/check of measuring equipment *This section deals with the measuring equipment used during the incoming goods inspection and production. Typical measuring equipment is e.g. caliber for length or thickness measurements, pressure gauges for leakage tests, spectrometer for the measurements of the optical properties of the absorber coating, etc.*	
II.4.1. Is there a documented procedure describing how to handle measuring equipment including the responsibilities related?	Yes ☐ No☐

II.4.2. Is a list with all equipment used for measurements available?					Yes ☐ No☐
II.4.3. Is the relevant measuring equipment calibrated/checked and marked with ID? *(All measuring equipment used must have an ID-tag on it if possible. In case this is not possible the equipment must be clearly identified by e.g. the serial no. and the list of measuring equipment.)*					Yes ☐ No☐
II.4.4. Is the equipment provided with a label or similar method indicating the date of the next calibration/check? *(In case this is not possible it must be clearly identified by e.g. ID/serial no. and the list of measuring equipment.)*					Yes ☐ No☐
II.4.5. Do the calibration/check records indicate that calibration/check is traceable to national or international standards? (*Calibrations need to be traceable to national or int. standards. For checks this is not necessary.)*					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 5: Control of production equipment *This section is related to the equipment used for production. Typical production equipment is e.g. welding machines, glass pane washing machines, two component silicone mixers, etc.*					
II.5.1. Is there a documented procedure describing how to handle the production equipment? *(Documented procedures are required which describe the way the production equipment is handled and which regulates the responsibilities of the corresponding actions.)*					Yes ☐ No☐
II.5.2. Is the relevant production equipment checked on a regular basis, such that in case of detection of a failure the previous production can be traced? *(The production equipment needs to be checked on a regular basis to ensure the well-functioning and to be able to trace back failures during previous production.)*					Yes ☐ No☐
I.5.3. Are records about the function checks of the production equipment available? (Is the equipment provided with a label or similar method indicating the next check?) *(Records of the checks need to be available and the equipment must be marked with a label indicating the date of the next check.)*					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 6: Preservation of product *This section is related to the handling and storage of the final products.*	
II.6.1. Is there a documented procedure describing how to handle and store the final product? *(A documented procedure is required describing the handling/treatment and the storage of the fin-*	Yes ☐ No☐

ished product.)					
II.6.2. After final inspection and test, are the products handled and stocked in such a way that compliance with the standards is not affected?					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 7: Complaints *This section is related to complaints coming from the customers and/or installers.*					
II.7.1. Is there a **documented procedure** describing how to deal with complaints? *(A documented procedure is required describing the complaint management of the manufacturer how to deal with complaints.)*					Yes ☐ No☐
II.7.2. Are complains concerning the products **recorded**? *(All complaints concerning the certified products must be recorded in an appropriate way. Appropriate ways are e.g. data bases, folders or spread sheets.)*					Yes ☐ No☐
II.7.3. Are complains evaluated and **corrective actions** taken if the complaints are relevant? *(To discover weaknesses in the product, production process or handling it is necessary to evaluate the complaints in such a way that appropriate corrective actions can be taken.)*					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 8: Storage of Records *This section is related to storage of records made during incoming goods inspection, production, etc.*					
II.8.1. Records of customer complaints and corrective actions					Yes ☐ No☐
II.8.2. Records of internal audits					Yes ☐ No☐
II.8.3. Records of corrective / preventive actions					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Block 9: Marking of products					
9.I. Do you mark your products (including name of manufacturer, serial number, type etc.)?					Yes ☐ No☐
How would you assess your readiness?	1	2	3	4	5
(1=room for improvement, 5= ready to adopt)	☐	☐	☐	☐	☐

Appendix B: Summary and Ranking of Interview Findings

Categories and answers	*Companies*						*Frequency*
General Information	**Manufacturer (M)**				**Supplier (S)**		
Anonymus Name	A (M)	B (M)	C (M)	D (M)	A (S)	B (S)	
Annual Production SWH	1000	1000	1000	(small portion)	1000 (buy/sell)	200	
Own manufacturing	yes	yes	yes	yes	planned	no	
Export of products	yes	yes	yes	yes	yes	-	
Domestic sourcing	yes	yes	-	-	-	no	
Production of SWH since	2003	1989	1992	2006	2011	2009	
SWH Market - Issues and obstacles							
Low demand	X	X	X	X	-	x	5
SWH for new buildings	X	-	-	-	-	-	1
Lack of government promotion	X	-	-	-	-	-	1
High initial costs compared to gas & electric WH	-	X	-	X	-	x	3
Roof structure, building design SWH suitability	-	-	X	-	-	-	1
Bad reputation of SWH	-	X	X	-	X	x	4
Costumer awareness (e.g. payback time)	-	-	X	-	X	x	3
Low domestic quality - component import necessary	-	-	-	-	X	x	2
Low & subsidised energy prices	-	-	X	-	-	x	2
Customer demand for certification?	-	no	no	no	Warrenty more important	no	
Import due to low local quality	X	X	-	-	X	X	4
Support needed for SWH market							
High demand enough to run the SWH business?	most important	X	X	-	X	-	4
Technical support	-	-	-	X	-	-	1
Financial support (e.g. tax deduction, soft loans etc)	-	-	-	X	X	-	2
Public awareness (e.g. vs. cheap gas / electricity)	X	X	X	-	X	-	4
Governmental support	X	X	-	-	-	-	2
Ministry of Housing	X	X	X	-	-	-	3
Ministry of Tourism	X	-	X	-	-	-	2
Ministry of Industry	X	-	X	-	-	-	2
Public procurement / SWH purchase for housing & hotels	-	-	X	-	X	-	2
Building design regulation	-	-	X	X	-	-	2
SWHs mandatory for new buildings	-	X	-	-	-	-	1
Monetary policy: stabilize currency	-	X	-	-	-	-	1

Less buraucracy	-	X	-	-	-	-	1
Association	X	-	not im-portant	-	-	-	1
Workshops	X	X	-	-	-	-	2
Subsidies for costumers (e.g. installment payment	X	X	X	-	-	-	3
Subsidies for industry	-	e.g. tax credits	-	-	-	-	1
Certification mandatory for financial support?	X	-	X	X	X	-	4
Quality scheme - Benefits							
Quality assurance	X	X	X	X	X	x	6
Competitive advantage against cheaper low quality SWH	X	-	-	X	X	x	4
Gain customers' trust	X	-	X	-	-	x	3
Knowledge transfer	X	-	-	-	-	-	1
Technology transfer	X	-	X	-	-	-	2
Increased cooperation	X	-	-	-	-	-	1
Reduction of trade barriers	X	-	-	-	-	-	1
Increase of export	X	X	-	-	-	-	2
Marketing tool	-	-	X	-	-	x	2
Advantage for Tenders	-	X	-	-	-	-	1
Quality scheme - Obstacles							
Increased material costs	X	-	-	-	-	-	1
No SWH market --> no need of certification	-	-	-	X	-	-	1
Lack of awareness	X	-	X	-	-	x	3
Lack of commnication	X	-	X	-	-	x	3
No association	X	-	-	-	-	-	1
Support needed for certification readiness							
Financial (e.g. tax deduction)	-	-	-	X	X	-	2
Training (installer workshops etc)	-	X	-	-	X	-	2
Less buraucracy	-	X	-	-	-	-	1
Information & communication	X	-	-	-	X	x	3
Increase awareness (vs. cheap gas and electricity)	X	X	-	-	-	-	2
Don't know, need to know more about SHAMCI	-	-	X	-	X	-	2
Conclusions							
Do you prefer a quality scheme on the SWH marekt?	yes	yes	yes	yes	yes	yes	6
READINESS to adopt SHAMCI?	yes (5)	partially (3)	yes (5)	good (4)	partially (3)	yes (5)	
Would you like to join SHAMCI?	Yes	yes	yes	-	yes	ok	4

The Authors

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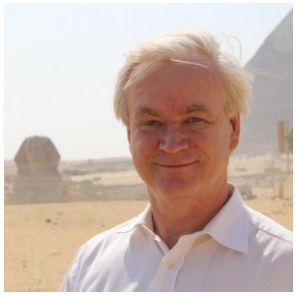

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