

Solar and Renewable Building Codes in the MENA Region

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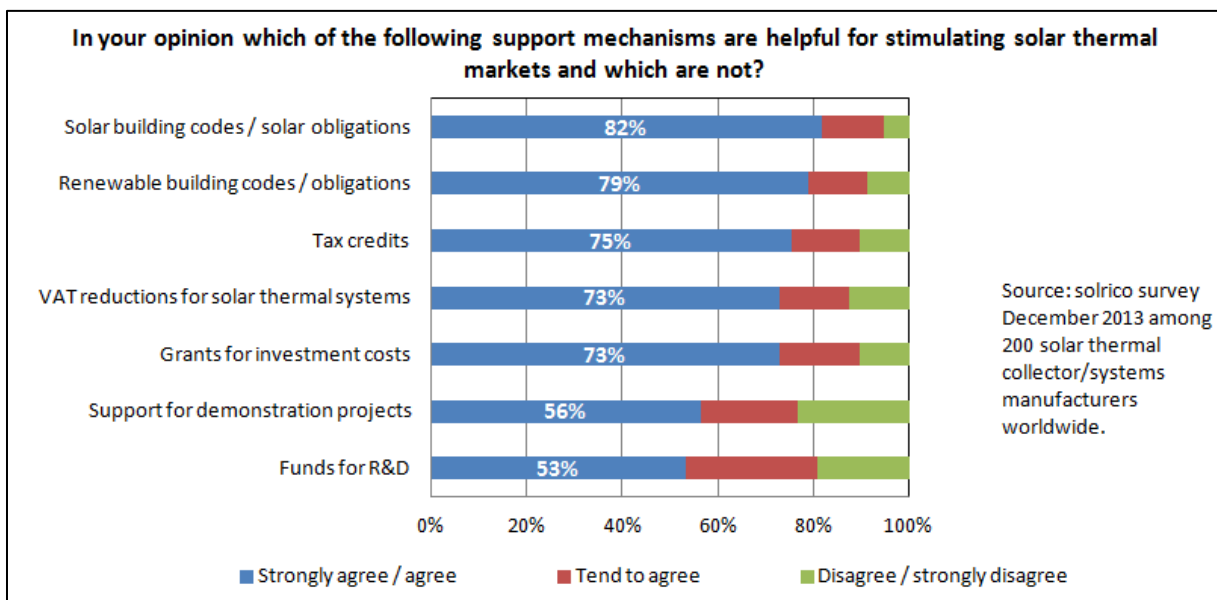
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Summary

Solar / renewable building codes are a popular demand-side support scheme by the industry. Although a small number of only 22 countries have implemented such policies yet, among them are two from the MENA Region - Israel and Jordan. No solar, no connection to water and electricity in your house – this was the regulation that made the Israeli building law in effect since 1980 a successful case study for the whole world. Only what is checked, is correctly installed and therefore the solar thermal system suppliers in Jordan are disappointed by the new building law (since April 2013), because the government agency does not follow-up strictly enough. The countries of the Gulf Cooperation Council (GCC) take a completely different path to green and sustainable buildings following the World Green Building Council. There are 823 premises in the United Arab Emirates, 218 in Saudi Arabia and 97 in Qatar that have a Leadership in Energy and Environmental Design (LEED) accreditation. This rating scheme is mostly voluntary and allows gaining points in a wide range of categories including energy, water, material, indoor environmental quality etc. The impact of such green building codes for solar thermal technology is rather small. Only a certain part of the high-rated buildings rely on onsite renewable energy production. The Emirate of Abu Dhabi made the green building code Estidama mandatory for new buildings. Qatar announced a compulsory regulation for 2016 - based on the Global Sustainability Assessment System (GSAS) developed in the region. Solar obligations are not discussed in these countries, but most probably also not known yet. This at least shows the statement from Iran from Abass Rahimi, Sales Manager of the collector manufacturer Solar Polar. “Unfortunately, we have no solar obligations in Iran yet, but we believe that it is one of the best ways, to develop solar heating market in the country. We are interested in information about the rules of solar heating codes for buildings from other countries.” The implementation of solar building codes in Northern Africa depends very much on the economic situation. The Tunisia consultancy Alcor dosy not recommend the implementation of a solar obligation in its country, Egypt’s association SEDA clearly says yes to a solar obligation for Egypt, but in combination with a subsidy scheme.

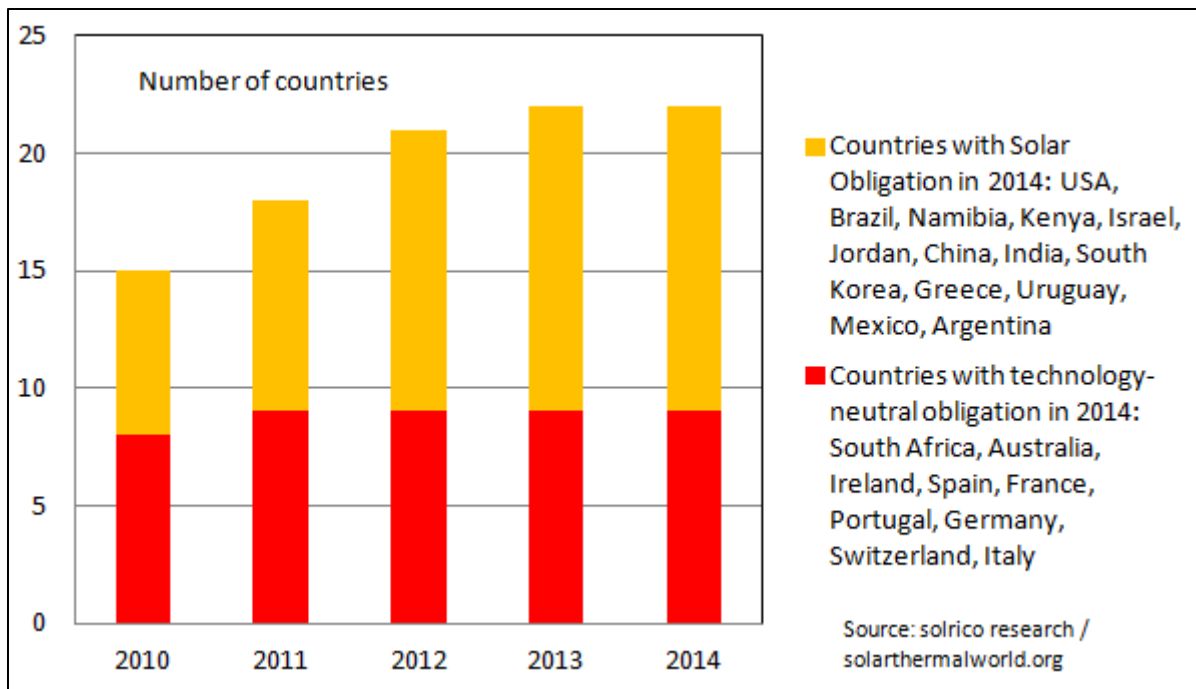
▪ **Introduction: Global overview of solar/renewable obligations**

Solar building codes receive highest acceptance by the solar thermal industry worldwide. 82 % of the solar collector and system manufacturers worldwide assume solar building codes as the most helpful stimulation tool for solar thermal markets, closely followed by renewable building codes with 79 % (200 participating companies). The difference between the two demand side support measures is that a solar building code stipulates the use of solar water heaters in new-built houses or in case of refurbishment, whereas the renewable building code is technology neutral and allows a wide range of technologies to fulfill the efficiency targets which could be heat pumps, insulation, district heating or a biomass boiler. The world map of solar / renewable obligations show that in Europe renewable building codes are dominating whereas in the rest of the world, governments count on solar heat focused building regulations.



Assessment of different support mechanisms by the solar thermal industry based on a multiple-choice question in a global survey, where each participant could chose two measures out of seven in December 2013 Source: solrico survey

Although the industry sees solar obligations as an efficient tool for increasing deployment of ST technology, the number of countries that implemented such a building regulation is not really growing in recent years. The chart below shows 22 countries with a solar / renewable obligation in 2014 based on solrico research. Among the 22 countries are only two from the MENA Region Israel and Jordan which can be seen as the frontrunner in building obligations policy in this region.



Number of countries with a renewable / solar building code over the years. Mexico, Argentina and Brazil implement solar building codes on the municipality level only, China and Australia on the state level and all the other countries on the national level. Source: solrico / solarthermalworld.org

- **Israel – frontrunner in solar obligation policy worldwide**

Israel was the first country worldwide to pass a solar building law – back in 1980. The law stipulates the installation of a solar water heating system for new buildings that use hot water like residential buildings, hotels, guest houses, boarding schools, swimming pools with the exception of industry, workshops and hospitals. Also the installation in high-rise buildings above a height of 27 m, which is about 8 top 9 floors, was excluded. The law was extended in September 2012 and now also applies to buildings above 27 m, stipulating the installation of solar water heaters for the first seven floors under the roof. The 2012 amendment was initiated by a committee which was established by the government and includes members from the solar thermal industry, who have been calling for an extension of the solar obligation for many years.

“Israel is facing an increase in new buildings; most of them are more than 9 floors,” explains Eddie Bet-Hazavdi, Director of the Department of Energy Conservation within the Ministry of National Infrastructures, Energy and Water Resources. “So, we will see the impact of the new extended solar building obligation in two to three years’ time.”

The solar obligation over 35 years shows a tremendous impact on the annual deployment statistics. According to Hazavdi, an average 88 % of the annually installed collector units were replacing existing systems, and only 12 % were new ones between 2010 and 2014. Solar thermal systems are basic furniture in Israel; they are not considered as something special. It is hard to let out a flat without a solar thermal system, because the tenant expects it.

“Whatever is not checked, is also not installed”, this simple statement is from Eli Shilton from the year 2005. Eli Shilton is a solar thermal expert from Israel with today more than 20 years in the industry and former president of the Israeli Solar Systems Manufacturers Association (Isol). No solar, no connection to water and electricity in your house – this was the regulation that made the Israeli building law a successful case study for the whole world. Shilton explained back in 2005: “You need the solar energy system to be checked by an Israeli Standard Institute representative who actually checks that the system is installed according to the Israeli standards. Only then can you obtain a certificate that will enable the municipalities to connect water and electricity to your house.” Today the law has made itself superfluous. More than 90% of the solar systems are installed on a voluntary basis, i.e. they are installed in existing buildings, or the systems are bigger than required by the obligation.

Country	Israel
Name	Solar building law
Goal	To reduce the country’s dependency on imported energy
Date when law came into effect	1980, with an extension in September 2012
Target group	Since 1980, the legislation applies to all new buildings with lower than 27 metres, except buildings used for industrial or trade purposes and hospitals. Since September 2012, the extension of the solar obligation also applies to new residential buildings above 27 metres with solar water heaters stipulated for the top 7 floors.
Special requirements	<u>Residential buildings:</u> The obligation is defined in terms of daily solar energy output per litre of storage tank capacity: 172 kilojoules for open loop systems, and 192 kilojoules for closed loop systems. The tank capacity depends on the number of rooms in each residential unit: at least 60 litres for one-room-apartments, at least 120 litres for two- or three-room-apartments, and at least 150 litres for larger ones. <u>Hotels, guest houses, boarding schools, elderly homes and similar buildings:</u> In this case the obligation is based on the daily solar output per litre of hot water consumption: 126 for open and 142 for closed loop systems.

Regulations of the solar building code in Israel. Source: solarthermalworld.org

▪ **Jordan’s solar building code is half way implemented**

In 2012, the Ministry of Energy and Mineral Resources along with the National Energy Research Center in Jordan approved a solar bylaw which entered into force in April 2013. According to Article 10 of Law No. 73, solar water heaters are a mandatory requirement for every new multi-family building with more than 150 m² of living space, for every new office building exceeding 100 m² of

floor space, as well as each new public building with more than 250 m². The bylaw encourages spreading the national awareness in the field of conservation of energy and improvement of its efficiency and helps establishing a database related to conservation of energy and improvement of its efficiency. There are, however, no additional regulations regarding quality standards or system sizes.

Statement from Angelika Cerny, International Sales Coordinator at Jordan-based solar thermal turnkey-solution provider Millennium Energy Industries (MEI) in an interview in January 2015:

“So far, we have only installed a few projects based on the bylaw. The solar obligation has not really increased MEI’s sales volume. The problem is that adherence to the rules is not really checked upon and the follow-up by the government agency is not as demanding as we hoped. Theoretically, it would be enough to place a single solar water heater on the roof of a multi-family building in order to fulfill the solar obligation. Several national stakeholders and international agencies have jointly called for the approval of additional technical requirements which guarantee quality standards, as well as certain sizes for the stipulated solar water heating systems. But it takes time to pass new guidelines or decrees in Jordan. As the situation looks right now, the solar bylaw is not going to have a strong impact on the market.”

Country	Jordan
Name	The Bylaw Nr (73) on Regulating Procedures and Means of Conserving Energy and Improving its Efficiency
Goal	Conserving energy and improving efficiency of its use
Date when law passed	September 2012
Date when law came into effect	April 2013
Target group	<ul style="list-style-type: none"> • New public buildings exceeding 250 m² living space • News apartment buildings exceeding 150 m² living space • New offices exceeding 100 m²
Special requirements	<p>No work permit shall be granted before submitting a proof of the installation of a solar water heater in any of the three new-built housing types mentioned above</p> <p>The use of flat plate collectors is recommended instead of vacuum tube collectors</p> <p>No other specific technical requirements and rules for sizing the solar water heating systems</p>
Exceptions	n/a

Regulations of the solar building code in Jordan. Source: solarthermalworld.org

▪ **Lebanon on its way to a regional solar obligation in the municipalities in Tyre**

Lebanon is the only country in the MENA region to have plans for implementing a solar obligation on the regional level. The Union of Tyre Municipalities (UOTM) is in consultation with the Lebanese Center for Energy Conservation (LCEC) to develop a solar building code to be implemented on the municipality level in the around 60 members. According to current plans the building obligation is going to address existing and new buildings, as well as premises under renovation. It will not be

limited to residential houses, but extend to other segments as well, for example, restaurants, hotels and factories. The finalization of the technical part is planned for September. Once adopted, the technical personnel of UOTM will be trained to be able to monitor and verify implementation of the ordinance. These activities are part of the MED-DISIRE project.

▪ **UAE: different path to building efficiency and climate protection**

United Arab Emirates (UAE) is the country with the highest number of green buildings in the MENA region. There are 1,369 green buildings in the MENA region that have a Leadership in Energy and Environmental Design (LEED) accreditation. Of these buildings, 60 % are located in UAE. Saudi-Arabia ranks second with 218 buildings and Qatar follows on place 3 with 97 green buildings (see table below).

	Number of certified premises	Number of Platinum	Number of Gold	Number of Silver
UAE	823	11	59	30
Saudi-Arabia	218	20	76	11
Qatar	97	12	0	0
Oman	65	1	9	3
Israel	50	6	8	7
Libanon	43	0	4	0
Jordan	25	0	2	0
Egypt	23	0	3	3
Bahrain	13	0	0	0
Morocco	6	0	1	2
Tunisia	3	0	0	0
Iran	1	0	0	0
Kuweit	1	0	0	0
Yemen	0	0	0	0
Irak	0	0	0	0
Lybia	0	0	0	0
Total	1,369	50	162	56

Number of certified projects per country taken from the project directory of the Green Building Council on <http://www.usgbc.org/projects> including 80,917 projects

▪ **Abu Dhabi to be first with a mandatory Green Building Certificate**

The Emirate of Abu Dhabi, one of the seven emirates which form UAE, followed an individual path to green and sustainable buildings. The Emirate of Abu Dhabi developed its own rating system called Estidama Construction Rating Certificate in 2010. The Pearl Rating System has several levels of certification, ranging from one to five pearls. Since 2010, all new development projects – offices, restaurants, banks and supermarkets, as well as multi-family, school and mixed-use buildings –

within the Emirate of Abu Dhabi require a minimum certification of one pearl. Public buildings even need two pearls.

The first 4-Pearl certified office building is the headquarters of the International Renewable Energy Agency (IRENA) in Abu Dhabi with 115 points presented to the public at the beginning of January 2015. The building has a 1,000 m² PV rooftop generator to produce 305,000 kWh annually on the roof together with a smaller solar water heater system with an expected yield of 85,000 kWh per year. The Sheikh Zayed Desert Learning Center in Abu Dhabi is aiming at becoming the first building to be awarded a 5-pearl Estidama construction rating certificate. The museum and research centre inaugurated in 2015 is located in a tourist area, which includes a 400-hectar wildlife park and a resort consisting of hotels, themed safari tours and residential areas. “The solar cooling system of the building has been essential in gaining 5 pearls, as well as LEED Platinum,” confirms Harald Blazek, Strategic Business Development & Marketing Manager at Austrian turnkey solution provider S.O.L.I.D. His company planned and designed the solar cooling system with a collector field of 1,134 m², which drives a lithium absorption chiller of 352 kW capacity.

The Estidama methodology grants up to 9 points for an onsite renewable energy share of 1 to 20 % (see the table below).

Category name	Number of points
Improved Energy Performance	15
Cool Building Strategies	6
Energy Efficient Appliances	3
Vertical Transportation	3
Peak Load Reduction	4
Renewable Energy	9
Global Warming Impact of Refrigerants & Fire Suppression System	4
Total Resourceful Energy	44

**Maximum number of points in the subcategories of the Resourceful Energy section
Source: Pearl Rating System for Estidama, Version 1.0 from April 2010**

▪ **Impact on Green Building Certificates on solar thermal**

Obviously the sustainable building movement in the MENA Region has completely different key issues than the sustainable building movement for example in Central Europe. The water shortage is a severe problem such as the electricity peaks at lunch time because of the high number of air conditioning units. Therefore the wide approach of LEED accreditation fits well for the MENA countries. Energy efficiency of the building envelope and onsite energy production is only one criterion of several, the others are:

- Integrative Planning Process
- Location and Transportation
- Sustainable Sites
- Water Efficiency
- Materials and Resources
- Indoor Environmental Quality
- Innovation

The interesting question is now whether Green Building Certificates are a suitable measure for increasing solar thermal technology. The following table compares the characteristics. All in all the impact of green building schemes seems rather small for increasing deployment of solar thermal technology. First, because it is a voluntary label, second, because it targets as so many categories that onsite renewable energy production shows up in a very small number of cases. However, there seems to be the trend in making green building schemes mandatory in the countries of the Gulf region (see chapter on Qatar below).

	Solar / Renewable Obligations	Green Buildings Certificates
Available in how many countries	21 countries	Over 80 countries
Year of first creation	1980: first solar building code in Israel	2002: Foundation of the World Green Building Council
Status of the regulation	Binding as part of the building code of the country applying to the national, regional or municipality level Fulfillment is often pre-requirement for the construction permit or the connection to the water or electricity grid	Voluntary label, used by builders and home owners for marketing reasons. If mandatory like in the Emirate of Abu Dhabi only for small ratings of one or two pearls.
Targets	Solar / renewable obligations stipulate a certain solar / renewable energy share in the hot water and/or space heating demand of buildings.	LEED targets at an overall sustainable building as well related to construction and operation even including the integration into the environment or the surrounding quarter.
Impact on solar thermal deployment	Large impact: If the obligation is effectively controlled, then it has an high impact on increasing the deployment of solar / renewable hot water and heating technologies	Small impact: The builder has a very large number of options to gain points for a good rating. That makes it rather unlikely that solar heating or cooling technology is used onsite.

Comparison between solar / renewable obligations and Green Building Certificates. Source: own research

The case studies from the Emirate of Abu Dhabi described above show that 4 or 5 pearls / LEED Gold and Platinum Certification in some cases can lead to onsite renewable energy production. To evaluate the general impact of LEED Platinum certification on the utilization of solar energy, the eleven Platinum-certified buildings in UAE were characterized in the table below: Three have a solar

cooling system, one a solar hot water system, two a PV system and five buildings have not onsite renewable production and no green power purchase. Consequently every second building uses solar energy, so far so good, but looking at the overall statistics only 11 buildings out of 823 total green buildings in UAE carry a Platinum label, and among them only half uses solar energy actively, this corresponds to a very small share of less than 1 % green buildings with solar energy. Unfortunately the Green Building Council in the Emirates was not able to provide any further statistical information on solar energy usage for gold or silver buildings.

Buildings with LEED Platinum Certificate in UAE	Points / total possible score	Points in Energy and Atmosphere / total possible score	Solar Energy usage
Pacific controls HQ Building Dubai	55/69	n/a	Solar cooling and solar PV
Sheikh Zayed Desert Learning Center	54/69	13/17	Solar cooling with 8 % onsite renewable energies, 35 % green power purchase
ESAB Middle East FZE Dubai	53/69	53/69	Solar cooling system with 12% onsite renewable energy (3 points)
Panasonic Avionics Dubai Municipality	80/110	26/35	PV and solar thermal with together 11% onsite renewable energies
The Chance Initiative TCI, Dubai	107/110	40/37	PV system (two points), power purchase (2 points)
TLM International FZE Dubai	52/69	16/17	PV system with 12 % onsite renewable energy
Spacewell Design Hub Dubai	87/110	28/37	No onsite renewable production, but green power purchase
Bloomberg Dubai	80/110	31/37	No onsite renewable production, but green power purchase
Du Retail Store-Fujairah City Center	86/110	33/37	No onsite renewables, no green power
Dubai Chamber of Commerce and Industry	81/110	26/35	No onsite renewables, no green power
Tecom Management Office Renovation Dubai	43/57	9/12	no onsite renewables, no green power

Eleven buildings in UAE certified with LEED Platinum and their results in the category Energy and Atmosphere. Source: <http://www.gbig.org/places/31/activities?page=26>

▪ **Qatar: Plans for compulsory implementation of GSAS in 2016**

The Gulf Organisation for Research and Development (GORD) based in Qatar has developed a Global Sustainability Assessment System (GSAS) in collaboration with T.C. Chan Center at the University of Pennsylvania, USA, in 2010. The system took into consideration well-known international green building codes and modified them according to local climate and traditions. According to an online report about an international workshop on Standards & Codes for Sustainable Construction in Gulf Cooperation Council (GCC) in May 2015, Qatar is about to implement GSAS for government buildings. Dr. Yousef Al Horr, GORD's Founding Chairman, is quoted in the report: "GSAS for Green Buildings

will establish green building standards to which all governmental buildings will have to conform by 2016. Afterward, all new commercial buildings and residential buildings will be brought into the new regime". This compulsory regulation is set up in the Qatar National Deployment Strategy.

In a report on *ecomena.org* Dr Al Horr explains the key features of the GSAS certification. Energy gains precedence over all other seven categories with a weighting of 24 %, followed by water and indoor environment, each taking up 16 % of the complete sustainability spectrum. Dr Al Horr explains that Gulf countries have high per capita energy values, Qatar with the highest rate. Buildings consume more than 40 % of total energy. Besides, water consumption in Qatar more than doubled between 1990 and 2000, while freshwater availability is decreasing at rapid rates.

▪ **Tunisia: No obligation because of economic crisis**

Tunisia is certainly the largest, and most advanced solar thermal market in North Africa. Since 2006 the grant Programme Prosol has supported the market development to a peak of annually more than 80,000 m² newly installed collector area between 2008 and 2010 which was down to 69,000 m² in 2013. The most experienced policy consultancy in renewable energies in Tunisia is Alcor. Energy Expert at Alcor, Ghazi Ben Salem says a clear "No" to a solar obligation in Tunisia:

"We would not recommend the government the implementation of a solar obligation in Tunisia at this time of weak economy. The tourism sector – a target group for the sales of solar thermal system in the past – is going through a severe crisis with a reduced number of tourists and the hotel owners cannot afford additional investments. Gas for hot water preparation in the tourism as well as the industry sector is still cheaper than solar in Tunisia, so in any case a solar obligation would result in extra costs for the management. In the residential sector a solar obligation is not necessary, because the demand is more or less stable anyway.

We even recommended the government to stop the subsidy scheme, because the system prices stay high due to the direct grants. However, instead of the National Fund for Energy Conservation a new fund called the Fund for Energy Transition has been created by law in 2014, which will operate under different modes (subsidies, loans, investment fund) and cover more actions and programmes, especially in the field of renewable energies. For solar thermal, we suggested implementing mechanisms, which allow the access to low-interest loans for solar thermal investors in the tourism sector, the industry or home owners which was positively received by the administration. We expect the promulgation of the related decrees from the Ministry of Industry, Energy and Mines in the last quarter of this year."

▪ **Egypt: A solar obligation in connection with a support scheme**

Egypt is by far the most populous country in North Africa with 87 million people, 9 times more than Tunisia with 11 million heads. The solar thermal market is still in its infancy, with an estimated market volume of 8,000 m² newly installed collector area in 2012. The Egyptian Solar Energy Development Association (SEDA) calls for a financial scheme for hotels to invest into solar thermal since its foundation in 2010 - so far without success. Although they have important arguments on

their side: Egypt became a net oil importer in 2008 and will become a net gas importer in the next decade. The country spends Egyptian Pound (EGP) 100 billion per year or about 20% of its overall budget on energy subsidies (2013). The former government of Egypt signed a Memorandum of Understanding in June 2013 to equip 100,000 hotel rooms with clean energy technologies during the next five years – with technologies such as solar thermal, photovoltaics and smart lighting systems for increased efficiency. This is an ambitious target: Altogether, there were around 200,000 hotel rooms in Egypt in 2009, according to the Egyptian Hotel Association. Instead of concentrated actions to follow up with this target, the successive government implemented a feed-in tariff for renewable electricity at the end of 2014. Ever since there is only interest in solar electricity and solar thermal is pushed into the shadow.

Khaled Gasser, one of the founders and chairmen of SEDA says a clear “yes” to a solar obligation in Egypt:

“The feed-in tariff created a boom in power generation and slowed down the solar water heater business. But we still have a great amount of diesel and electricity that we consume for heating water, which costs us a lot of money. This is a huge problem for the country, where we have 7 million households heating their water with diesel or electricity. Egypt has a ministerial decree (401/1978) which was issued by the Minister of Housing in 1987, but has never been enforced. There are rumors that the government might reactivate the old obligation. We absolutely recommend implementing a solar obligation for example for the hotel sector linked with a small subsidy scheme. The market is ready for that. The target of the 100,000 green hotel rooms will never be realised without a financial scheme, either a tax rebate, a direct subsidy or any kind of support for the industry.”

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