



EIE-06-085 SOLPOOL

Intelligent Energy  Europe

# Solar Energy Use in Outdoor Swimming Pools SOLPOOL

**Fact Sheets Germany**

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## **1 National Fact sheet Germany**

The national fact sheets will provide an overview about the situation of the usage of solar thermal heating for outdoor pools. This information will be used to show the state of the art, regarding the special regional conditions and to develop a common approach for the supporting solar thermal systems in this special application. The information was requested by every participating country in the project.

### **1.1 State of the art of conventional heating systems for outdoor pools**

The present common heating systems for outdoor swimming pools and the used fuels are listed.

#### **Used techniques:**

- Boilers
- Heat pumps
- Solarthermal systems

#### **Used fuels**

- Fuel Oil
- Gas
- Solar Energy

### **1.2 State of the art of solar thermal applications for outdoor pool heating**

A list of present available and used solar thermal technology, especially for pool heating, is provided. This will provide the state of the distribution and the acceptance of solar thermal systems.

#### **Collectortype:**

- Unglazed absorber
- Flat plate collectors

#### **System details:**

- Unglazed absorber without heat exchangers
- Flat plate collectors with heat exchanger an optional heating of domestic water for showers

### **1.3 Best available technology and best practice for solar thermal outdoor pool heating**

The best technical approaches, regarding the national and regional s conditions, are listed here. Every participating country will give the best practice for the installation of solar thermal pool heating systems according to the special national conditions. This information will be used in the national campaigns.

#### **Best available technology:**

- Unglazed absorbers with direct heating of swimming pool water

**Best practice:**

- Open water swimming pool in Berlin-Pankow
  - Absorber area 1.150 m<sup>2</sup>
  - Water surface 1.500 m<sup>2</sup>
  - Solar yield per year 325 MWh/a



**Figure 1: Unglazed collectors open air swimming pool in Berlin-Pankow (Source: DGS)**

#### 1.4 Boundary conditions

The list should show the national and regional barriers, which must be overcome to improve the awareness of the end users and the implementation of solar thermal heating systems. This includes technical or climate barriers but also as governmental, financial and societal boundary conditions.

**Technical or climatic barriers:**

- Lack of enough roofage / surface area for installing absorbers
- Lack of information
- Mostly antiquated technologies
- Fluctuant irradiation also during summer months

**Financial Barriers:**

- Investment costs could not be raised
- Funding schemes are not available resp. too intransparent
- Still too low energy price for fossile fuels
- No subsidies for unglazed absorbers

**Governmental barriers:**

- No grant schemes with planning reliability in case of continuity and amount

### **Social barriers:**

- Lacking acceptance by owners, operators and guests
- Low level of information of owners, operators and guests

## **1.5 Existing norms and standards**

The existing standards and norms for the installation and use of solar thermal heating devices are stated here. Additional outdoor swimming pool norms and standards concerning solar thermal heating systems are listed. All important standards, which impacts the installation and usage of a solar thermal system are named and will be concerned by the development of the campaign strategies.

### **Solar Thermal pool heating:**

- VDI 2089/Part 1 Heating, ventilation, water supply, sewage water treatment in indoor and open air swimming pools – Indoor swimming pools
- DIN 19643 – 2 Treatment of water of swimming pools and baths – Combination of process ; adsorption, flocculation, filtration, chlorination
- DIN 19643 – 3 Combination of process: flocculation, filtration, ozonization, absorbing filtration, chlorination
- DGfDB B 66 Wintering pools in open-air pools
- DGfDB 25.03 List of criteria for assessing pool cover installations on swimming pools
- DGfDB 60.07 Maintenance of technical installations in swimming pools
- DGfDB 64.01 Prevention of Legionnaire´s disease in swimming pools
- DGfDB 65.01 pH value adjustment
- DGfDB 94.04 Hygiene, cleaning and disinfection in swimming pools

### **Solar thermal applications:**

- En 12975 – Part 1 and 2 Thermal solar systems and components – Solar collectors
- EN 12976 – Part 1 and 2 Thermal solar systems and components – Factory made systems
- EN 12977 – Part 1, 2 and 3 Thermal solar systems and components - Custom made systems
- DIN 4751 T1-2 Heating systems for domestic hot water
- DIN 4753 T1-11 Heaters and heating systems for domestic hot water
- DIN 1988 T1-5 T7-8 Technical norms for domestic water installations
- DVGW W 551, W 553, G677 Prevention of Legionnaires´ disease in domestic hot water applications
- VDI 6002 Solar heating of domestic hot water

### **Outdoor pool operation concerning ST heating:**

- VDI 2089/Part 3 Heating, ventilation, water supply, sewage water treatment in indoor and open air swimming pools – Open air swimming pools
- DVGW G 677 Heating of open air swimming pool water with gas heaters

- DGfdB B 66 Wintering pools in open-air pools

## 1.6 Cost benefit analysis and impact

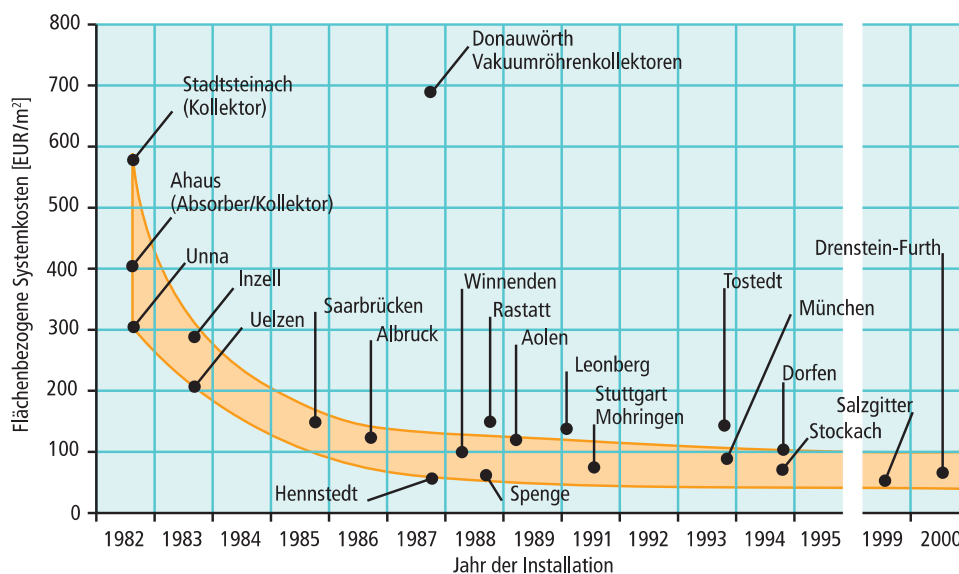
An important fact for the end user is a cost benefit analysis. Here the common costs for Solar thermal systems, including system and installation costs per m<sup>2</sup>, are stated. An estimation of the size of the national market is done, not including small private pools. And the gain of heating power per m<sup>2</sup> collector surface and the resulting savings of CO<sub>2</sub> are described.

### Market size:

- 3.550 outdoor swimming pools (approx 1.000 in the new Bundesländer)

### System costs per m<sup>2</sup> collector, whole costs with installation:

- 50 – 600 €/m<sup>2</sup>, mostly 100 €/m<sup>2</sup>



**Figure 2: Development of specific investment costs over the years (Source: DGS)**

Heat gain in kWh per m<sup>2</sup> collector according to solar radiation and opening duration of the pool:

- 250 – 350 kWh/m<sup>2</sup>

**Table 1: Energy and CO<sub>2</sub> savings per m<sup>2</sup> collector:**

Heating system	CO <sub>2</sub> Emission in g/kWh	Saved CO <sub>2</sub> in g/kWh per m <sup>2</sup>
Electric	953	238.250 - 333.550
Oil	375	93.750 - 131.250
Natural gas	356	89.000 - 124.600
Heat pump Air	187	46.750 - 65.450
Heat pump Soil	167	41.750 - 58.450
Heat pump Water	146	36.500 - 51.100
Solar Thermal	30	7.500 - 10.500

Data: Umweltbundesamt Germany

## 2 Requirement Sheet Germany

In this sheet the requirements of a solar thermal system, regarding the needs of the end users

Requirements of the End Users	Very Important	Less Important
Power gain for heating system	+	
Saving of energy costs	+	
Cost benefit from installing ST system	+	
Long time durability of the system	+	
Low effort for installation		+
Low effort and costs for maintenance	+	
Low required space for collectors	+	
Integration in existent heating systems	+	
No problems with the pool hygiene	+	
Plant safety, no risk for pool users	+	
Easy handling of the system	+	
Availability of grants /subsidies	+	
Independency from increasing energy costs	+	
Environmental protection		+
Other		

### 3 Funding Sheet Germany

The table shows the information of national and regional available grant programmes. They mainly should list the programmes for solar thermal use for outdoor swimming pool heating, but also schemes, which will support the use of solar thermal systems

<b>Funding sheet</b> <b>“Germany _DGS”</b>		
<b>Contact information</b>	<b>Title</b>	Programme Renewable Energy
	<b>Street</b>	Palmengartenstr. 5-9
	<b>Postal code</b>	60325
	<b>City</b>	Frankfurt
	<b>Email</b>	www.kfw-foerderbank.de
	<b>Telephone</b>	+49 - 69 - 7431-0
<b>Financing Information</b>	<b>Organisation</b>	KfW
	<b>Type of Support</b>	Credit with reduced redemption
	<b>Available Money</b>	Maximum number of 30 Installations for 2007
	<b>Share of total budget</b>	Financing 80% of investment costs and 30% reduction of loan redemption
	<b>Who can apply</b>	Local authorities, owners and operators of swimming pools
	<b>Requirements for application</b>	Verification of minimum yield by the used solar collector
	<b>Targeted areas</b>	Solar thermal systems with collector area > 40m <sup>2</sup>
	<b>Short description</b>	For outdoor swimming pools 80% of investment costs will be financed by credit whereas 30% of the redemption amount will be remitted
	<b>Documents</b>	Local authority: application directly to KfW, private company: application via house bank
	<b>Source of information</b>	<a href="http://www.kfw.de">www.kfw.de</a>
	<b>Year of beginning</b>	2007
	<b>Information website</b>	www.kfw-foerderbank.de

## 4 References

[www.kfw-foerderbank.de](http://www.kfw-foerderbank.de)

[www.umweltbundesamt.de](http://www.umweltbundesamt.de)